US008339493C1

(12) EX PARTE REEXAMINATION CERTIFICATE (11977th)

United States Patent

Nakano et al.

(10) Number: US 8,339,493 C1

(45) Certificate Issued: Dec. 30, 2021

(54) **ELECTRIC CAMERA**

(75) Inventors: **Takahiro Nakano**, Hitachinaka (JP); **Ryuji Nishimura**, Yokohama (JP); **Toshiro Kinugasa**, Hiratsuka (JP)

(73) Assignee: **MAXELL, LTD.**, Kyoto (JP)

Reexamination Request:
No. 90/014,628, Dec. 10, 2020

Reexamination Certificate for:

Patent No.:	**8,339,493**
Issued:	**Dec. 25, 2012**
Appl. No.:	**12/845,266**
Filed:	**Jul. 28, 2010**

Certificate of Correction issued May 5, 2020

Related U.S. Application Data

(60) Continuation of application No. 10/660,710, filed on Sep. 12, 2003, now Pat. No. 8,059,177, which is a division of application No. 09/520,836, filed on Mar. 8, 2000, now Pat. No. 6,765,616.

(30) **Foreign Application Priority Data**

Jan. 11, 2000 (JP) 2000-006064

(51) **Int. Cl.**

H04N 5/372	(2011.01)
H04N 9/04	(2006.01)
H04N 5/232	(2006.01)
H04N 5/374	(2011.01)

(52) **U.S. Cl.**

CPC ***H04N 5/372*** (2013.01); ***H04N 5/23248*** (2013.01); ***H04N 5/23258*** (2013.01); ***H04N 5/23274*** (2013.01); ***H04N 5/23293*** (2013.01); ***H04N 5/3741*** (2013.01); ***H04N 9/04515*** (2018.08); *H04N 9/04555* (2018.08); *H04N 9/04557* (2018.08); *H04N 2209/045* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

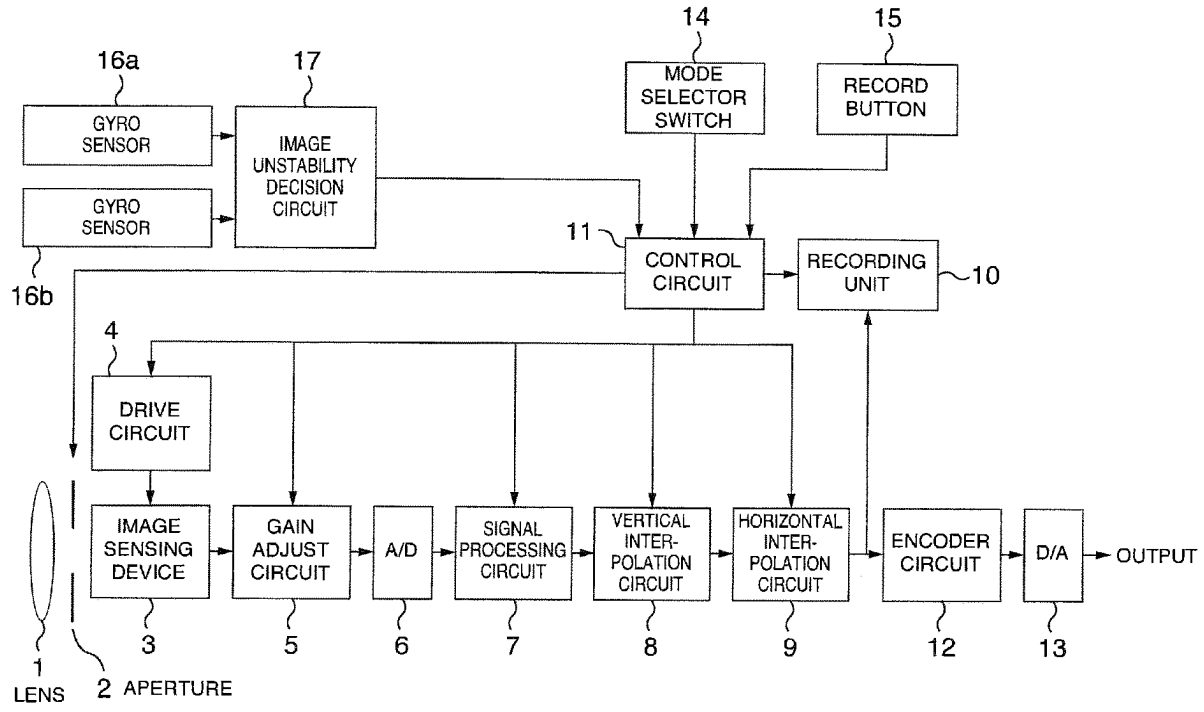
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,628, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Peng Ke

(57) **ABSTRACT**

An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.



EX PARTE REEXAMINATION CERTIFICATE

NO AMENDMENTS HAVE BEEN MADE TO THE PATENT

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **5** and **6** is confirmed.

Claims **1-4** and **7-14** were not reexamined.

* * * * *

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,628	12/10/2020	8339493	2638-19.00	6100

177632 7590 12/09/2021

BANNER & WITCOFF, LTD.
1100 13th STREET, N.W.
SUITE 1200
WASHINGTON, DC 20005-4051

EXAMINER	
KE, PENG	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
12/09/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,628* .

PATENT UNDER REEXAMINATION *8339493* .

ART UNIT *3992* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Notice of Intent to Issue Ex Parte Reexamination Certificate	**Control No.** 90/014,628	**Patent Under Reexamination** 8339493	
	Examiner PENG KE	**Art Unit** 3992	**AIA Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☑ Prosecution on the merits is (or remains) closed in this *ex parte* reexamination proceeding. This proceeding is subject to reopening at the initiative of the Office or upon petition. *Cf.* 37 CFR 1.313(a). A Certificate will be issued in view of
   (a) ☑ Patent owner's communication(s) filed: 10/22/2021.
   (b) ☐ Patent owner's failure to file an appropriate timely response to the Office action mailed: _____.
   (c) ☐ Patent owner's failure to timely file an Appeal Brief (37 CFR 41.31).
   (d) ☐ The decision on appeal by the ☐ Board of Patent Appeals and Interferences ☐ Court dated _____
   (e) ☐ Other: _____.
2. The Reexamination Certificate will indicate the following:
   (a) Change in the Specification: ☐ Yes ☑ No
   (b) Change in the Drawing(s): ☐ Yes ☑ No
   (c) Status of the Claim(s):
      (1) Patent claim(s) confirmed: 5-6.
      (2) Patent claim(s) amended (including dependent on amended claim(s)): _____
      (3) Patent claim(s) canceled: _____.
      (4) Newly presented claim(s) patentable: _____.
      (5) Newly presented canceled claims: _____.
      (6) Patent claim(s) ☐ previously ☐ currently disclaimed: _____
      (7) Patent claim(s) not subject to reexamination: 1-4 and 7-14.
3. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
4. ☐ Note the attached statement of reasons for patentability and/or confirmation. Any comments considered necessary by patent owner regarding reasons for patentability and/or confirmation must be submitted promptly to avoid processing delays. Such submission(s) should be labeled: "Comments On Statement of Reasons for Patentability and/or Confirmation."
5. ☐ Note attached NOTICE OF REFERENCES CITED (PTO-892).
6. ☐ Note attached LIST OF REFERENCES CITED (PTO/SB/08 or PTO/SB/08 substitute).
7. ☐ The drawing correction request filed on _____ is: ☐approved ☐disapproved.
8. ☑ Acknowledgment is made of the priority claim under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☑ All b) ☐ Some* c) ☐None of the certified copies have
   ☐been received.
   ☐not been received.
   ☑been filed in Application No. 10/660,710.
   ☐been filed in reexamination Control No. _____.
   ☐been received by the International Bureau in PCT Application No. _____.
   * Certified copies not received: _____.
9. ☐ Note attached Examiner's Amendment.
10. ☐ Note attached Interview Summary (PTO-474).
11. ☐ Other: _____.

All correspondence relating to this reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

cc: Requester (if third party requester)

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Detailed Action

1. This is an *ex-parte* reexamination of claims 5 and 6 U.S. Patent No. 8,339,493 ("the '493 patent") based on the reexamination request filed 12/10/20 ("Request"). This Office Action is a response to 10/22/21.

2. Claims 5 and 6 remain pending. Clams 5 and 6 are confirmed.

Information Disclosure Statement

3. With respect to the Information Disclosure Statements considered with this action, the citations has been considered as described in the MPEP. MPEP 2656 indicates that degree of consideration to be given to such information will be normally limited by the degree to which the party filing the information citation has explained the content and relevance of the information.

Citations

References cited:

i. Casio LCD Digital Camera QV-800SX User's Guide ("Casio").

ii. U.S. Patent No. 7,903,162 to Juen ("Juen").

iii. U.S. Patent No. 5,502,483 To Takase et al. ("Takase").

iv. U.S. Patent No. 5,444,482 To Misawa et al. ("Misawa").

Antedating Casio

Examiner has determined that PO's declarations, filed on April and October 2021, and their supporting materials are sufficient to antedate the Casio.

4. 37 C.F.R. § 1.131 Affidavit or declaration of prior invention or to disqualify commonly owned patent or published application as prior art.

(b) The showing of facts for an oath or declaration under paragraph (a) of this section shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or **conception** of the invention prior to the effective date of the reference coupled with **due diligence** from prior to said date to a subsequent **reduction to practice** or to the filing of the application. Original exhibits of drawings or records, or photocopies thereof, must accompany and form part of the affidavit or declaration or their absence must be satisfactorily explained.

5. Conception:

Conception has been defined as "the complete performance of the mental part of the inventive act" and it is "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice...." *Townsend v. Smith,* 36 F.2d 292, 295, 4 USPQ 269, 271 (CCPA 1930).

The Examiner has found that the declarations and exhibits have shown a date of conception of the claimed invention of the '493 patent to be prior to November 1, 1999.

Casio was shown publicly available on November 1, 1999. (see Exhibits 1007-1009;)

This finding is supported by Takahiro Nakano, Ryuji Nishimura, Toshiro Kinugasa, and Masanobu Sakata Declaration made in April 28, 2021, which swear behind a set of documents (Exhibits A-E filed on April 28, 2021) to be substantially completed prior to November 1, 1999. The documents have shown basic structures and concepts of the invention.

Therefore, Examiner has found the Patent Owner has established conception of the invention of the claims of the '493 Patent prior to the critical dates of Casio.

6. Reduction To Practice

The filing of a patent application serves as conception and constructive reduction to practice of the subject matter described in the application. *Hyatt v. Boone,* 146 F.3d 1348, 1352, 47 USPQ2d 1128, 1130 (Fed. Cir. 1998).

The Examiner has found the '493 patent was reduce to practice on January 11, 2000. The '493 Patent has a prior claim to January 11, 2000 based on a chain of continuation, divisional, and Japanese Patent applications. And the PO is not asserting an earlier date of reduction to practice.

7. Diligence

"[T]he point of the diligence analysis is not to scour the patent owner's corroborating evidence in search of intervals of time where the patent owner has failed to substantiate some sort of activity. It is to assure that, in light of the evidence as a whole, the invention was not abandoned or unreasonably delayed . . . One must weigh the collection of evidence over the entire critical period to make such a determination." *Perfect Surgical*, 841 F.3d at 1009. That is, one must consider the entirety of the evidence as a whole under a rule of reason to determine if the inventor was diligent. *Id.* at 1008; *Brown v. Barbacid*, 436 F.3d 1376, 1380 (Fed. Cir. 2006) (diligence may be shown by a variety of activities, and consideration is based on all of the evidence as a whole under a rule of reason); *Price v. Symsek*, 988 F.2d 1187, 1195 (Fed. Cir. 1993) ("An evaluation of *all* pertinent evidence must be made so that a sound determination of the credibility of the inventor's story may be reached.").

Under *reasonably continuous diligence standard,* the Examiner has found PO has shown diligence between the date of conception (prior to critical date of Casio November 1, 1999) to the date of the reduction to Practice (Priority claim date of '493 January 11, 2000). *Perfect Surgical*, 841 F.3d.

Specifically PO has shown due diligence in following periods:

November 10, 1999 to November 22, 1999:

The application was being actively drafted and revised.

November 24 to December 12, 1999:

The application was being actively drafted and revised.

December 15, 1999 to January 11, 2000

The application was being processed for final review and approval before filing; and the office was closed for winter holiday during second half of December and early January.

STATEMENT OF REASONS FOR PATENTABILITY AND/OR CONFIRMATION

Clams 5 and 6 are confirmed.

The following is an examiner's statement of reasons for patentability and/or confirmation of the claims found patentable in this reexamination proceeding:

Because Casio has been antedated as a valid reference, the 103 rejections applied against claims 5 and 6 are no longer valid and withdrawn. Since the only rejections applied against the claims 5 and 6 are withdrawn, claims 5 and 6 are confirmed.

Any comments considered necessary by PATENT OWNER regarding the above statement must be submitted promptly to avoid processing delays. Such submission by the patent owner should be labeled: "Comments on Statement of Reasons for Patentability and/or Confirmation" and will be placed in the reexamination file.

Conclusion

All correspondence relating to this ex-partes reexamination proceeding should be directed as follows:

By U.S. Postal Service Mail to:

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P.O. Box 1450
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By FAX to:

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Central Reexamination Unit

By hand to:

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EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

Any inquiry concerning this communication or earlier communications from the Reexamination Legal Advisor or Examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

/PENG KE/
Primary Examiner, Art Unit 3992

Conferees:
/William H. Wood/
Primary Examiner, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Certificate Date	Certificate Number
		C1

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
ERISE IP, P.A. 7015 COLLEGE BLVD., STE 700 OVERLAND PARK, KS 66211

LITIGATION REVIEW ☑	PK (examiner initials)	13 January 2021 (date)
Case Name		Director Initials
Maxell, Ltd. v ZTE Corporation et al. 5:16 cv 179 (Closed)		
Maxell, Ltd. v Apple Inc et al. 5:19 cv 36 (Closed)		
Maxell, Ltd. v. Huawei Technologies Co. Ltd. et al. 5:16cv179 (Closed)		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
IPR	2020-00597 (Closed)
IPR	2018-00236 (Closed)
IPR	2018-00904 (Closed)
IPR	2018-00909 (Closed)
IPR	2018-00910 (Closed)
IPR	2018-00908 (Closed)

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

CPC						
Symbol					Type	Version
H04N	/	5	/	372	F	2013-01-01
H04N	/	9	/	04515	I	2018-08-01
H04N	/	5	/	23248	I	2013-01-01
H04N	/	5	/	23258	I	2013-01-01
H04N	/	5	/	23274	I	2013-01-01
H04N	/	5	/	23293	I	2013-01-01
H04N	/	5	/	3741	I	2013-01-01
H04N	/	9	/	04557	A	2018-08-01
H04N	/	9	/	04555	A	2018-08-01
H04N	/	2209	/	045	A	2013-01-01

CPC Combination Sets							
Symbol					Type	Set	Ranking	Version
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	2	
/PENG KE/ Primary Examiner, Art Unit 3992	29 November 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	5	1

U.S. Patent and Trademark Office — Part of Paper No.: 20211126

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04N5/372	/	5	/	372
H04N9/04	/	9	/	04
H04N5/232	/	5	/	232
H04N5/374	/	5	/	374

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE (Assistant Examiner) (Date)	Total Claims Allowed: 2	
/PENG KE/ Primary Examiner, Art Unit 3992 (Primary Examiner) 29 November 2021 (Date)	O.G. Print Claim(s) 5	O.G. Print Figure 1

U.S. Patent and Trademark Office Part of Paper No.: 20211126

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	2	
/PENG KE/ Primary Examiner, Art Unit 3992	29 November 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	5	1

U.S. Patent and Trademark Office — Part of Paper No.: 20211126

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Prosecution History Review	01/13/2021	PK
Litigation Search Review	08/24/2021	PK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Bibliographic Data

Application No: 90/014,628

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /PENG KE/ [ ]

Examiner's Signature | Initials

Title: ELECTRIC CAMERA

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/10/2020	348	3992	2638-19.00
RULE			

APPLICANTS

INVENTORS

8339493,

MAXELL, LTD., OTOKUNI-GUN KYOTO, JAPAN

APPLE INC. (3RD PTY REQ.), CUPERTINO, CA, UNITED STATES

CONTINUING DATA

This application is a REX of 12845266 07/28/2010 PAT 8339493

12845266 is a CON of 10660710 09/12/2003 PAT 8059177

10660710 is a DIV of 09520836 03/08/2000 PAT 6765616

FOREIGN APPLICATIONS

JAPAN JP2000006064 01/11/2000

IF REQUIRED, FOREIGN LICENSE GRANTED**

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 90/014,628	Filing Date 12/10/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	10/22/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/RHONDA BELL/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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(*EX PARTE* REEXAMINATION)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket No. 009379.00002\US

In re *Ex parte* Reexamination of:
U.S. Patent No. 8,339,493

Control No. 90/014,628

Inventor: Takahiro Nakano et al.

Application Serial No. 12/845,266

Filed: July 28, 2010

Issue Date: December 25, 2012

For: Electric Camera

Examiner: Ke, Peng

Group Art Unit: 3992

Confirmation No. 6100

SUPPLEMENTAL DECLARATION UNDER 37 CFR 1.131

Commissioner for Patents
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

I , Masanobu Sakata declare the following:

1. On April 26, 2021, I executed a prior declaration in the above-referenced ex parte reexamination regarding the preparation of the Japanese priority application of the above-identified patent (Japanese Application No. 2000-006064, herein "Japanese priority application"). I understand that my prior declaration was submitted in this ex parte reexamination on April 28, 2021. The content of my prior declaration is incorporated herein by reference.

2. This declaration supplements my prior declaration, further explaining my understanding of the actions taken during the preparation of the Japanese priority application.

3. In late 1999 and early 2000, I worked in the IP department of Hitachi, Ltd. during preparation of the Japanese priority application. During my employment in the IP department of

Hitachi, Ltd., I was personally responsible for working with Hitachi, Ltd. engineers to review invention disclosure forms submitted by the engineers to the IP department. I was the IP department's patent engineer responsible for coordinating filing of the Japanese priority application that became U.S. Pat. No. 8,339,493.

4. During the time period of 1999-2000, my responsibilities included reviewing invention disclosure forms, scheduling meetings with inventors to discuss invention disclosure forms and their inventions, requesting that inventors revise or finalize invention disclosure forms, working with the IP department to obtain appropriate approvals, submit the finalized invention disclosure forms and specification to Japanese patent attorneys to proceed with preparing and filing of Japanese patent applications based on the content of the invention disclosure forms. Once a decision had been made to proceed with a patent application, in many cases I would work with the inventors to personally draft and revise a patent specification based on the disclosure provided by the inventors and provide this content to Japanese patent attorneys to prepare and draft the patent application, and interface between the patent attorneys and the inventors to ensure that the patent application reflected their inventions. Once an application was prepared and revised, I would work with the inventors to assist their review of the draft patent application to make sure the patent attorneys accurately described the inventions in their disclosure materials, obtaining approvals and/or signatures from inventors for purposes of filing the patent applications, and obtaining any additional approvals needed from the IP department to file the patent application.

5. During my employment at Hitachi, Ltd., I was involved in the process mentioned in the above paragraph for numerous inventions/patent applications, including the Japanese priority application that led to U.S. Patent No. 8,339,493. In the case of this Japanese priority application, I worked with Japanese patent attorneys internally within the Hitachi IP Department to proceed with the process of preparing and filing a patent application. Once the specification was complete, it was provided to Japanese patent attorney in Hitachi's IP Department who were then in charge of preparing a patent application using the specification prepared by the inventors and me. I can confirm that this is true because the face of the Japanese patent application lists the name of Yasuo Sakuda as shown below. Yasuo Sakuda was a Japanese patent attorney that worked in Hitachi's IP Department at that time. Thus, from December 14th to January 11th (excluding the holidays), Japanese patent attorneys at Hitachi's IP Department worked to prepare a patent

application using the specification, obtained appropriate approvals and signatures, and filed the patent application on January 11, 2000.

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号
特開2001－197371
(P2001－197371A)
(43)公開日　平成13年７月19日(2001.7.19)

(51)Int.Cl.⁷		識別記号	F I		テーマコード(参考)	
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	27/14			9/07	Ａ	５Ｃ０２４

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最終頁に続く

(54)【発明の名称】　撮像装置

Excerpt from Japanese priority patent application

(19) Japan Patent Office (JP)

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(22) Date of application 11 Jan 2000

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Cont'd on last page

Excerpt from Certified Translation Of Japanese Examined Patent Application Publication

6. Due to my involvement in numerous patent applications, I have personal knowledge of the typical time period it took from the time an invention disclosure form was submitted by the inventors to the time a patent application was filed in the Japanese Patent Office. While the time period varied based on the complexity of the invention and number of inventors involved, a time period of three months was well-within the typical time frame it took to go through the process outlined above (which often took longer). Our typical process did take three or more months, as it included (for example) several meetings with the inventors, obtaining approvals from the relevant individuals to proceed with a patent application, preparing and revising a patent application based on the disclosure materials, working with Japanese patent attorneys to prepare a patent application, working with the inventors to review and revise the draft patent application, seeking final review and approval to file the patent application, and finally the step of filing the application.

7. To the best of my knowledge and recollection, our team at Hitachi, Ltd. was reasonably diligent in preparing and filing the Japanese priority application that led to U.S. Patent No. 8,339,493 at all times subsequent to the submission of the relevant application request forms

on October 27, 1999. The Japanese priority application was completed and filed on January 11, 2000, less than three months after the initial submission. This was well-within our typical processing time in my experience, particularly given the complexity of the inventions disclosed in the patent application.

8. To the best of my knowledge and recollection, during the period of October 27, 1999, to January 11, 2000, none of the inventors nor patent attorneys involved ever unreasonably delayed or abandoned their work in preparing and filing the Japanese priority application that led to U.S. Patent No. 8,339,493.

9. I have again reviewed Exhibit C, submitted with my prior declaration, which I understand is a copy of the co-inventors' submitted documents and records from the IP department. On information and belief, Exhibit A, as previously submitted, is an accurate English language translation of Exhibit C. A certificate of translation accuracy was provided in Exhibit B. In Exhibits C / A, I understand that pages 1-2 and 4-39 are the co-inventors' submitted documents, and that page 3 includes the records from the IP department relevant to the Japanese priority application.

10. The Patent Application Preparation Record Table, shown in Exhibits C and A on page 3, is a typical record maintained by the IP department relating to preparation of a patent application. Each of my statements below is based on my review of the Patent Application Preparation Record Table and my own recollection.

11. To the best of my knowledge and recollection, the inventors submitted the invention disclosure form on October 27, 1999. On October 29, 1999, I conducted an internal assessment of the submitted documents.

12. Regarding activity between November 10, 1999, and November 22, 1999, as well as between November 24, 1999 and December 12, 1999, to the best of my knowledge and recollection, throughout each of these time periods the application was being actively drafted and revised pursuant to our typical process, as shown in the Table. I personally held a meeting with the inventors on November 9, 1999, after they had submitted the invention disclosure form. During this meeting we identified particular focuses of the patent application and decided to revise certain portions of the specification. Subsequent to the November 9, 1999 meeting, the specification

continued to be revised with the help of the inventors, with additional versions being generated at least as of November 23, 1999, and December 13, 1999.

13. Despite the Table not indicating activity every day, I believe that the records indicate that this patent application was prepared with reasonable diligence typical of our practice at the time throughout these time periods (as well as from submission through filing, generally), and was not unreasonably delayed or abandoned. In my recollection, it was typical that activity would be recorded only when a draft reached certain milestones or was passed on for review. The absence of a daily entry did not mean that the case did not receive attention on a given day, it merely meant that the application remained in a current stage of development, even as it progressed daily.

14. The initial draft specification submitted by the inventors was thirty-five pages, and recited multiple inventions. To the best of my knowledge and recollection, diligent work was performed throughout each of these periods to prepare and revise portions of the draft specification. The records shown in the Patent Application Preparation Record Table show that the inventors and I never unreasonably delayed or abandoned the invention, but instead continued to diligently work on the complex process steps involved in preparing and revising a complex patent application.

15. Regarding activity between December 15, 1999, and January 11, 2000, to the best of my knowledge and recollection, throughout this time period the application was subject to our typical processes for final review and approval for filing, followed by the act of filing. Specifically, once the specification was complete, it was provided to Japanese patent attorney Yasuo Sakuda in Hitachi IP Department to prepare a patent application based on the materials prepared by the inventors. The process of preparing and filing the patent application was subject to the availability of the team during the winter holiday period typically observed by Hitachi, Ltd. and nearly every other company in Japan.

16. On December 14, 1999, I revised the specification to include corrections by the inventors and completed the specification. After this I provided it to Japanese patent attorneys including Yasuo Sakuda who used the specification to prepare a patent application that is in compliance with the requirement of the Japanese patent office. Once the patent application was

completed, it was subject to final approvals prior to filing. However, Hitachi, Ltd. was typically closed for winter holidays during the second half of December and early January. During this time, our team members would typically take extended time off from work as is customary in Japan to celebrate the holiday season. The time period between completing the specification on December 14, 1999, preparing a corresponding Japanese patent application, and then filing on January 11, 2000, is attributable to final approvals for filing the application and reasonable time restrictions due to office closures and celebration of the winter holidays.

17. Our IP department for Hitachi, Ltd. including the Japanese patent attorney Yasuo Sakuda were busy and responsible for a large number of patent applications, both in preparation and already filed. It was not unusual for it to take a month to prepare a patent application based on materials provided by the inventors and then obtain final approval for filing. This is particularly true here, where the preparation and approval process coincided with widely celebrated winter holidays where most employees took time off in a practice typical of most Japanese businesses.

18. Even despite the holiday period, the Japanese priority application that led to U.S. Patent No. 8,339,493 was filed on January 11, 2000, a little over two months after the invention disclosure form was submitted and well-within the average time it typically took to go through all the necessary processes at Hitachi, Ltd. to file a patent application at that time.

19. At the time of the above activity, I lived in Japan, and all of the activity referenced above was conducted by us in Japan.

20. I represent that I am over 18 years of age and of competent mind.

All statements made of my own knowledge are true and all statements made on information and belief are believed to be true; and further, these statements were made with the knowledge that willful, false statement so made are punishable by fine or imprisonment or both, under 18 U.S.C. § 1001 and that such willful, false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

Respectfully submitted,

/Masanobu Sakata/	October 15, 2021
Masanobu Sakata	Date

Electronic Acknowledgement Receipt	
EFS ID:	44100568
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Rachel Lichter
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	22-OCT-2021
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Time Stamp:	13:44:44
Application Type:	Reexam (Patent Owner)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		493_Patent_-_Reexam_8339493_-_Resp_to_OA_FINAL_21541452.pdf	55058 835185789ee5772bfd0ec1235498034038ae815b	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response after non-final action-owner timely	1	8
	Reexam Certificate of Service	9	9

Warnings:					
Information:					
2	Affidavit-Rule 131-pre-AIA (FTI) ONLY	Executed_-_Sakata-san_Supplemental_1131_Declaration_21541453.pdf	83768 a532ae635e98758ec39f225afa7c3ff81c882166	no	8
Warnings:					
Information:					
		Total Files Size (in bytes):	138826		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the RESPONSE TO NON-FINAL OFFICE ACTION filed in Reexamination Control Number 90/014,628 is being served in its entirety via First Class Mail, postage prepaid, on the following counsel of record:

Jennifer C. Bailey & Adam P. Seitz
ERISE IP, P.A.
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211

on October 22, 2021.

Respectfully submitted,

By: /Rachel Lichter/
Rachel Lichter

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Ex Parte* Reexamination of:

Takahiro Nakano et al.

Reexamination Control Nos. 90/014,628

Patent Under Reexamination: U.S. Pat. No. 8,339,493 Confirmation No.: 6100

Issue Date: Dec. 25, 2012 Art Unit: 3992

Title: Electric Camera Examiner: Ke, Peng

RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop *Ex Parte* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box. 1450
Alexandria, VA 22313-1450

Commissioner,

Patent Owner respectfully submits this Response to the non-final Office Action mailed September 1, 2021 regarding the above-captioned *Ex parte* Reexamination of U.S. Pat. No. 8,339,493 (the "'493 Patent").

A listing of claims currently under examination begins on Page 2

Patent Owner's response regarding notification of concurrent proceedings begins on Page 2

Remarks in response to the non-final office action mailed on September 1, 2021 begin on page 3.

The Commissioner is hereby authorized to charge any required fees or credit any overpayment of fees to Deposit Account No. 19-0733.

LISTING OF CLAIMS CURRENTLY UNDER EXAMINATION

5. (Original) An electric camera comprising:

an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines;

a signal processing unit that generates image signals by processing the output signals of the image sensing device; and

a display unit with a display screen, that displays an image corresponding to the image signals;

wherein when recording an image in a static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in all N number of vertically arranged pixel lines of the image sensing device, to provide N pixel lines;

wherein when monitoring the image in the static image mode, the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance; and

wherein when recording the image in a moving video mode, the signal processing unit generates the image signals by using a portion of, or the entirety of, pixel lines which have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a second distance, where the second distance is different from the first distance.

6. (Original) An electric camera according to the claim 5, further comprising:

an image-instability detector which detects an image-instability of the electric camera; and

wherein when recording in the moving video mode, in order to correct the image-instability, the signal processing unit generates the image signals by changing the pixel lines used, and the portion of the pixel lines used, according to an amount of image-instability detected by the instability detector.

REMARKS

Patent Owner hereby submits the following Remarks in response to the non-final Office Action mailed September 1, 2021. The subject '493 Patent sets forth fourteen claims (1-14). Only claims 5 and 6 are subject to reexamination. These claims remain pending (without amendment).

Status of Concurrent Proceedings

This *ex parte* reexamination stems from a litigation between Patent Owner and Apple, which was pending when the requests for *ex parte* reexamination were filed and granted, had since terminated pursuant to a settlement agreement and the case was dismissed on April 7, 2021. Thus, the status of the case is closed.

Patent Owner properly filed a Notice of Prior and Concurrent Proceedings indicating this change in the status of the relevant litigation on April 29, 2021. (See Notice filed April 29, 2021, at p. 3). No pending litigation remains, and there have been no other changes in litigation status nor concurrent proceedings since Patent Owner's filing of April 29, 2021.

Status of Prior Art Rejections Under 35 U.S.C. § 103

The Office Action rejects claim 5 under 35 U.S.C. § 103 as unpatentable over Casio[1] in view of Juen[2] and Takase.[3]

The Office Action rejects claim 6 under 35 U.S.C. § 103 as unpatentable over Casio in view of Juen, Takase, and Misawa.[4]

Patent Owner respectfully traverses these rejections for the reasons discussed below.

Cancellation of Patent Owner Initiated Interview

Patent Owner had submitted a draft of a Supplemental Declaration of former Hitachi employee, Masanobu Sakata along with an interview agenda for the interview scheduled for October 13, 2021. On October 12, 2013, however, Examiner Ke called the undersigned and

[1] Casio LCD Digital Camera QV-800SX User's Guide.
[2] U.S. Patent No. 7,903,162.
[3] U.S. Patent No. 5,502,483.
[4] U.S. Patent No. 5,444,482.

indicated that no interview was necessary as the Supplemental Declaration appeared sufficient to show additional evidence of diligence addressing the gaps noted by the Office Action. Examiner Ke indicated that the Office would consider Patent Owner's formal response but intends to withdraw the rejection and issue a Notice of Intent to Issue Ex Parte Reexamination Certificate (NIRC) confirming the challenged claims.

Patent Owner thanks Examiner Ke and the conferees for considering the draft Supplemental Declaration of Mr. Sakata and confirming that the details therein appeared to overcome the issues raised in the Office Action. The executed Supplemental Declaration submitted herewith aligns with the draft provided and considered by the Examiners. If any issues remain that would prevent the Office from concluding this proceeding and issuing a re-examination certificate confirming patentability of the challenged claims, the Examiner is respectfully requested to contact the undersigned.

Antedating Casio

The Office Action found that the Patent Owner had not provided sufficient evidence to antedate Casio because the Patent Owner had not sufficiently shown due diligence, namely during specific time periods from November 1999 to January 2020. Patent Owner respectfully disagrees in light of Federal Circuit and MPEP guidance, as well as the exhibits previously provided with the Patent Owner Statement on April 28, 2021.

For example, MPEP § 2138.06 and the Federal Circuit confirm that showing "reasonable diligence" does **not** require evidence that an inventor recorded his or her progress on a daily basis but requires a more holistic review of the factual record:

> Under this standard, an inventor is **not** required to work on reducing his invention to practice **every day** during the critical period. … And **periods of inactivity** within the critical period do **not** automatically **vanquish** a patent owner's claim of reasonable diligence…. In determining whether an invention antedates another, the point of the diligence analysis is **not** to scour the patent owner's **corroborating evidence** in search of intervals of time where the patent owner has failed to substantiate some sort of activity. It is to assure that, in light of the **evidence as a whole**, "the invention was not abandoned or unreasonably delayed."... That an inventor overseeing a study did not record its progress on **a daily, weekly, or even monthly basis** does **not** mean the inventor necessarily abandoned his invention or

> unreasonably delayed it. The same logic applies to the preparation of a patent application: **the absence of evidence** that an inventor and his attorney revised or discussed the application on **a daily basis** is alone **insufficient** to determine that the invention was abandoned or unreasonably delayed. One must weigh the collection of evidence over the entire critical period to make such a determination.
>
> . . .
>
> In "the preparation" of a patent application, "the absence of evidence that an inventor and his attorney revised or discussed the application on a daily basis is alone insufficient to determine that the invention was abandoned or unreasonably delayed."

Perfect Surgical Techniques, Inc. v. Olympus Am., Inc., 841 F.3d 1004, 1009, 120 USPQ2d 1605, 1609 (Fed. Cir. 2016) (emphases added).

Here, the factual record with corroborating evidence shows that the inventors conceived of their invention at least by October 27, 1999 when they prepared an invention disclosure form. In less than 2 ½ months—including winter holidays during which Hitachi (Applicant) was shut down—the invention disclosure forms were revised and used to draft a complete **patent application** by Japanese patent attorneys. Thus, the inventors never abandoned their invention. Patent Owner submits that a time period of 2 ½ months to draft and file a patent application is a reasonable time period in light of the complexity and detail of the '493 Patent and the time required to draft an application that is in compliance with legal requirements and formalities.

Nevertheless, in order to advance prosecution and without conceding any deficiency in the previous showing, Patent Owner submits herewith a Supplemental Declaration of former Hitachi employee, Masanobu Sakata. Mr. Sakata was a patent engineer who handled this patent application and worked with the inventors, and he has provided additional corroborating evidence of the specific events during the time periods of November 10, 1999 to November 22, 1999 and November 24, 1999 through December 12, 1999.

Supplemental Declaration Demonstrates Additional Diligence

While no further evidence was believed necessary to antedate Casio, the Supplemental Declaration further demonstrates that during the relevant time period Mr. Sakata personally held a meeting with the inventors on November 9, 1999 to discuss the invention disclosure form. Sakata Supl. Decl. ¶ 12. Further, during this time period Mr. Sakata and the inventors identified "particular focuses" of the invention and revised certain portions of the specification in collaboration with the

inventors. Sakata Supl. Decl. ¶ 12. The record establish that these revisions continued such that additional versions of the specification were generated at least on November 23, 1999 and December 13, 1999.

Mr. Sakata further affirms that:

> "[d]espite the Table not indicating activity every day, I believe that the records indicate that this patent application was prepared with reasonable diligence typical of our practice at the time throughout these time periods (as well as from submission through filing, generally), and was not unreasonably delayed or abandoned. In my recollection, it was typical that activity would be recorded only when a draft reached certain milestones or was passed on for review. The absence of a daily entry did not mean that the case did not receive attention on a given day, it merely meant that the application remained in a current stage of development, even as it progressed daily."

Sakata Supl. Decl. ¶ 13.

Mr. Sakata affirms that once he and the inventors were satisfied with a version of the specification, they provided the materials to Japanese patent attorneys in Hitachi IP Department on or around December 15, 1999 so that a patent application could be drafted using these materials. Sakata Supl. Decl. ¶ 16. The name of one of the Japanese patent attorneys in Hitachi's IP Department at that time is even shown on the cover of the Japanese patent. *See* Japanese Patent Application Publication No. 2001-197371; Sakata Supl. Decl. ¶ 5 (identifying "Yasuo Sakuda").

This process of preparing and filing the patent application was subject to the availability of the Hitachi IP team during the winter holiday period typically observed by Hitachi, Ltd. and nearly every other company in Japan such that the entire office shuts down from second half of December to early January. Sakata Supl. Decl. ¶ 16. These holidays are not the same as in the USA where only December 25th and January 1st are official holidays, but the entire company shuts down for several weeks. The same practice continues today.

Nevertheless, despite the holidays, the Japanese patent attorneys prepared a patent application using the materials prepared by Mr. Sakata and the inventors, obtained all relevant approvals and signatures, and filed the patent application on January 11, 2000, which is less than a month after receiving the materials from Mr. Sakata and the inventors. Sakata Supl. Decl. ¶¶ 15-16.

Mr. Sakata further affirms that this time period of "a little over two months after the invention disclosure form was submitted" is "well-within the average time it typically took to go through all the necessary processes at Hitachi, Ltd. to file a patent application at that time." Sakata Supl. Decl. ¶ 18. And that "during the period of October 27, 1999, to January 11, 2000, none of the inventors nor patent attorneys involved ever unreasonably delayed or abandoned their work in preparing and filing the Japanese priority application that led to U.S. Patent No. 8,339,493." Sakata Supl. Decl. ¶ 8.

Thus, as Examiner Ke has recognized, the record contains facts and evidence sufficiently showing that the inventors and the in-house legal team acted diligently throughout the time period from October 27, 1999 to and January 11, 2000, thus establishing, in conjunction with the demonstrated conception of the invention at least as early as October 27, 1999, a date of invention antedating the earliest public accessibility of Casio (November 1, 1999).

Accordingly, Patent Owner had demonstrated that Casio is not prior art and respectfully requests withdrawal of each of the rejections of under 35 USC § 103. Further, Patent Owner respectfully requests issuance of a NIRC confirming the patentability of claims 5 and 6.

Casio Does Not Disclose the Claimed Elements

Furthermore, even if Casio was prior art (which it is not), Casio does not teach or suggest the elements of claims 5 and 6 as alleged in the September 1, 2021 Office Action.

Claims 5 and 6 of the '493 Patent include, among other things, "the signal processing unit generates the image signals by mixing or culling signal charges accumulated in the N number of vertically arranged pixels…." The Office Action alleges that Casio teaches the mixing or culling limitations. Office Action at 6. However, Casio contains no such disclosure.

Casio is devoid of any details about the operation of a single processing unit to "generate[] the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance," per claim 5. The Office Actions alleges that Casio's disclosure of the general image and video capture functions and modes of a digital camera teach or suggest "using pixel lines that have been mixed or culled." Casio at 16, 27, 47, 53, 57-58, 60-61, 64-69, 71-72, 76, 105, 119; Office Action at 6. There is no explanation in the Office Action of what constitutes the

claimed "mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance." At best, Casio discloses "composing and recording an image" which is not the claimed "generat[ing] the image signals by using pixel lines that have been mixed or culled." This is because Casio only discloses storing an image rather than the underlying methodology of generating image signals by using pixel lines that have been mixed or culled to "only include pixel lines separated from one another by intervals of a first [and second] distance," as claimed.

Therefore, for at least this additional reason, the rejections based on Casio should be withdrawn.

CONCLUSION

Accordingly, the challenged claims of the '493 Patent are novel and nonobvious over the art of record. Patent Owner thus respectfully requests that the Office promptly issue a Notice of Intent to Issue Reexamination Certificate confirming the validity of the challenged claims of the '493 Patent.

If there are any questions, the Examiner is invited to contact the undersigned at (202) 824-3158.

Dated: October 22, 2021

Respectfully submitted,

By: /Scott M Kelly/
Scott M. Kelly
Registration No.: 65,121

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,628	12/10/2020	8339493	2638-19.00	6100

177632 7590 09/01/2021

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EXAMINER	
KE, PENG	

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MAIL DATE	DELIVERY MODE
09/01/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,628* .

PATENT UNDER REEXAMINATION *8339493* .

ART UNIT *3992* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

PTOL-465 (Rev.07-04)

Office Action in Ex Parte Reexamination	**Control No.** 90/014,628	**Patent Under Reexamination** 8339493	
	Examiner PENG KE	**Art Unit** 3992	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

a. ☑ Responsive to the communication(s) filed on 28 April 2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

b. ☐ This action is made FINAL.

c. ☐ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire 2 month(s) from the mailing date of this letter. Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).** If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☑ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ _____.

Part II SUMMARY OF ACTION

1a. ☑ Claims 5-6 are subject to reexamination.
1b. ☑ Claims 1-4 and 7-14 are not subject to reexamination.
2. ☐ Claims _____ have been canceled in the present reexamination proceeding.
3. ☐ Claims _____ are patentable and/or confirmed.
4. ☑ Claims 5-6 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ The drawings, filed on _____ are acceptable.
7. ☐ The proposed drawing correction, filed on _____ has been (7a) ☐ approved (7b) ☐ disapproved.
8. ☑ Acknowledgment is made of the priority claim under 35 U.S.C. 119(a)-(d) or (f).
   a) ☑ All b) ☐ Some* c) ☐ None of the certified copies have
   1 ☐ been received.
   2 ☐ not been received.
   3 ☑ been filed in Application No. 12/845,266.
   4 ☐ been filed in reexamination Control No. _____.
   5 ☐ been received by the International Bureau in PCT application No. _____.
   * See the attached detailed Office action for a list of the certified copies not received.
9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.
10. ☐ Other: _____

cc: Requester (if third party requester)

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Detailed Action

2. This is an *ex partes* reexamination of claims 5 and 6 U.S. Patent No. 8,339,493 ("the '493 patent") based on the reexamination request filed 12/10/20 ("Request"). The rule 1.131 affidavits were received.

Reexamination

1. The Patent Owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. 8,339,493 throughout the course of this reexamination proceeding. The Third Party Requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

2. Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extension of time in *Ex Parte* reexamination proceedings are provided for in 37 CFR 1.550(c).

3. In order to ensure full consideration of any amendments, affidavits or declarations, or other documents as evidence of patentability, such documents must be submitted in response to

this Office action. Submissions after the next Office action, which is intended to be a final action, will be governed by the requirements of 37 CFR 1.116, after final rejection and 37 CFR 41.33 after appeal, which will be strictly enforced.

Information Disclosure Statement

3. With respect to the Information Disclosure Statements considered with this action, the citations has been considered as described in the MPEP 2256. MPEP 2256 indicates that degree of consideration to be given to such information will be normally limited by the degree to which the party filing the information citation has explained the content and relevance of the information.

Citations

References cited:

i. Casio LCD Digital Camera QV-800SX User's Guide ("Casio").

ii. U.S. Patent No. 7,903,162 to Juen ("Juen").

iii. U.S. Patent No. 5,502,483 To Takase et al. ("Takase").

iv. U.S. Patent No. 5,444,482 To Misawa et al. ("Misawa").

Relevant Statutes

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Casio in view of Juen U.S. Patent No. 7,903,162 and Takase U.S. Patent No. 5,502,483.

#	8,339,493	Casio in view of Juen U.S. Patent No. 7,903,162 and Takase U.S. Patent No. 5,502,483
5	An electric camera comprising:	Casio pages 38, 24, 41
	An image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a	Casio pages 118, 10, 35-50, 59, 94, Juen 5:63-6:2; Juen 1:35-42 It would have been obvious to a POSITA to include the CCD of Juen in the digital

	grid pattern, in an N number of vertically arranged pixel lines.	camera Casio because it is well-known use of a CCD as an image sensing device in the Casio digital camera in the same way the Juen CCD is used; and a POSITA would have been motivated to make such a beneficial combination for ease of installation and integration with other components of the Casio digital camera.
	A signal processing unit that generates image signals by processing the output signals of the image sensing device	Casio pages 30-31, 58-59, 61, 71, 118, Juen 3:32-34, 38-44, 6:3-14, 9:52-58. It would have been obvious to a POSITA to include the Juen's processing and converting method with Casio camera in order to achieve a simpler, more compact, and less costly design. Furthermore these inclusion are known methods and would yield a predictable result.
	A display unit with a display screen, that displays an image corresponding to the image signals;	Casio pages 11, 25, 46, 47, 49, 119, 127-128;

	When recording an image in a static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in all N number of vertically arranged pixel lines of the image sensing device, to provide N pixel lines,	Casio pages 46-47, 53, 105, 118,
	When monitoring the image in the static image mode, the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance,	Casio pages 16, 27, 47, 53, 57-58, 60-61, 64-69, 71-72, 76, 105, 119 Juen 3:45-55, 7:41-58; 11:3-7 Takase 5:15-64; Fig. 1; 5:38-43; It would have been obvious to a POSITA to include the Juen's converting method with Casio camera in order to achieve a simpler, more compact, and less costly design. Furthermore these inclusion are known methods and would yield a predictable result. It would have been obvious to a POSITA to include the Takase's converting method with Casio camera in order to achieve a simpler, more compact, and less costly design. Furthermore these

		inclusion are known methods and would yield a predictable result.
	When recording the image in a moving video mode, the signal processing unit generates the image signals by using a portion of, or the entirety of, pixel lines which have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a second distance.	Casio page 10, 61, 62, 76, 78, 119 Juen 6:10-13, 7:53-59; Takase 4:20-29; 5:15-49; It would have been obvious to a POSITA to include the Takase's and Juen's method with Casio camera in order to achieve a simpler, more compact, and less costly design. Furthermore these inclusion are known methods and would yield a predictable result.

5. Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Casio in view of Juen U.S. Patent No. 7,903,162, Takase U.S. Patent No. 5,502,483, and Misawa U.S. Patent No. 5,444,482.

#	8,339,493	Casio in view of Juen U.S. Patent No. 7,903,162, Takase U.S. Patent No. 5,502,483, and Misawa U.S. Patent No. 5,444,482
6	An electric camera according to claim 5, further comprising: an image-instability	Casto teaches instability detector page 30

	detector which detects an image-instability of electric camera; Wherein when recording in the moving video mode, in order to correct the image-instability, the signal processing unit generates the image signals by changing the pixel lines used, and the portion of the pixel lines used, according to an amount of image-instability detected by the instability detector.	Misawa 2:55-59; 3:7-8, 14-48; 4:60-5:8; Fig. 1; 8:7-27; 7:30-33; 10:8-15, 39-51; 11:11-30; A POSITA would have understood the Misawa method may be implemented efficiently by the Casio camera when switching between static and movie recording modes and without increasing processing time in order to able record movie videos at the same pixel signal transfer rate as still image while compensating for blur caused by unintentional movement.

Antedating Casio

Examiner has determined that PO's declarations, filed on April 2021, and their supporting materials are insufficient to antedate the Smith and Reilly references.

6. 37 C.F.R. § 1.131 Affidavit or declaration of prior invention or to disqualify commonly owned patent or published application as prior art.

(b) The showing of facts for an oath or declaration under paragraph (a) of this section shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or **conception** of the invention prior to the effective date of the reference coupled with **due diligence** from prior to said date to a subsequent **reduction to practice** or to the filing of the application. Original exhibits of drawings or records, or photocopies thereof,

must accompany and form part of the affidavit or declaration or their absence must be satisfactorily explained.

7. Conception:

Conception has been defined as "the complete performance of the mental part of the inventive act" and it is "the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice...." *Townsend v. Smith,* 36 F.2d 292, 295, 4 USPQ 269, 271 (CCPA 1930).

The Examiner has found that the declarations and exhibits have shown a date of conception of the claimed invention of the '493 patent to be prior to November 1, 1999.

Casio was shown publicly available on November 1, 1999. (see Exhibits 1007-1009;)

This finding is supported by Takahiro Nakano, Ryuji Nishimura, Toshiro Kinugasa, and Masanobu Sakata Declaration made in April 28, 2021, which swear behind a set of documents (Exhibits A-E filed on April 28, 2021) to be substantially completed prior to November 1, 1999. The documents have shown basic structures and concepts of the invention.

Therefore, Examiner has found the Patent Owner has established conception of the invention of the claims of the '493 Patent prior to the critical dates of Casio.

8. Reduction To Practice

The filing of a patent application serves as conception and constructive reduction to practice of the subject matter described in the application. *Hyatt v. Boone,* 146 F.3d 1348, 1352, 47 USPQ2d 1128, 1130 (Fed. Cir. 1998).

The Examiner has found the '493 patent was reduce to practice on January 11, 2000. The '493 Patent has a prior claim to January 11, 2000 based on a chain of continuation, divisional, and Japanese Patent applications. And the PO is not asserting an earlier date of reduction to practice.

9. Diligence

"[T]he point of the diligence analysis is not to scour the patent owner's corroborating evidence in search of intervals of time where the patent owner has failed to substantiate some sort of activity. It is to assure that, in light of the evidence as a whole, the invention was not abandoned or unreasonably delayed . . . One must weigh the collection of evidence over the entire critical period to make such a determination." *Perfect Surgical*, 841 F.3d at 1009. That is, one must consider the entirety of the evidence as a whole under a rule of reason to determine if the inventor was diligent. *Id.* at 1008; *Brown v. Barbacid*, 436 F.3d 1376, 1380 (Fed. Cir. 2006) (diligence may be shown by a variety of activities, and consideration is based on all of the evidence as a whole under a rule of reason); *Price v. Symsek*, 988 F.2d 1187, 1195 (Fed. Cir. 1993) ("An evaluation of *all* pertinent evidence must be made so that a sound determination of the credibility of the inventor's story may be reached.").

Under *reasonably continuous diligence standard,* the Examiner has found PO has not shown diligence between the date of conception (prior to critical date of Casio November 1, 1999) to the date of the reduction to Practice (Priority claim date of '493 January 11, 2000). *Perfect Surgical*, 841 F.3d.

Specifically PO fails to show due diligence in following periods:

November 10, 1999 to November 22, 1999:

There was no indication in the Affidavits any action was taken.

November 24 to December 12, 1999:

There was no indication in the Affidavits any action was taken except for a statement that they were on holidays during part of December.

December 15, 1999 to January 11, 2000

There was no indication in the Affidavits any action was taken except for a statement that they were on holidays during part of December.

Conclusion

All correspondence relating to this ex parte reexamination proceeding should be directed as follows:

By U.S. Postal Service Mail to:

Mail Stop Ex Parte Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to:

(571) 273-9900
Central Reexamination Unit

By hand to:

Customer Service Window
Randolph Building
401 Dulany St.
Alexandria, VA 22314

By EFS-Web:

Registered users of EFS-Web may alternatively submit such correspondence via the electronic

filing system EFS-Web, at

https://efs.uspto.gov/efile/myportal/efs-registered

EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

Any inquiry concerning this communication or earlier communications from the Reexamination Legal Advisor or Examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

/PENG KE/
Primary Examiner, Art Unit 3992

Conferees:

/RSD/

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
ERISE IP, P.A. 7015 COLLEGE BLVD., STE 700 OVERLAND PARK, KS 66211

LITIGATION REVIEW ☑	PK (examiner initials)	13 January 2021 (date)
Case Name		Director Initials
Maxell, Ltd. v ZTE Corporation et al. 5:16 cv 179 (Closed)		
Maxell, Ltd. v Apple Inc et al. 5:19 cv 36 (Open)		
Maxell, Ltd. v. Huawei Technologies Co. Ltd. et al. 5:16cv179 (Closed)		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
IPR	2020-00597 (Open)
IPR	2018-00236 (Open)
IPR	2018-00904 (Closed)
IPR	2018-00909 (Closed)
IPR	2018-00910 (Closed)
IPR	2018-00908 (Closed)

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Prosecution History Review	01/13/2021	PK
Litigation Search Review	08/24/2021	PK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
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37 CFR 1.501
INFORMATION DISCLOSURE CITATION IN A PATENT

(Sheet 1 of 19)

Docket Number (Optional)	Patent Number
009379.00002\US	8,339,493
Applicant	
Issue Date	Art Unit
December 25, 2012	3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	3,486,128	12-23-1969	US Department of Army	330	285	02-07-1968
	4,131,919	12-26-1978	Lloyd et al.	386	225	05-20-1977
	4,434,435	02-28-1984	Fujimoto	348	277	11-18-1981
	4,541,010	09-10-1985	Alston	348	283	06-17-1983
	4,591,900	05-27-1986	Heeb et al.	348	277	12-12-1983
	4,691,253	09-01-1987	Silver	386	200	05-13-1985
	4,750,041	06-07-1988	Vogel et al.	348	220.1	09-10-1987
	4,766,580	08-23-1988	Go et al.	369	21	09-30-1985
	4,788,672	11-29-1988	Toyooka et al.	369	30.09	07-22-1986
	4,811,421	03-07-1989	Havel et al.	455	69	03-12-1987
	4,827,462	05-02-1989	Flannagan et al.	369	30.09	03-26-1987
	4,855,724	08-08-1989	Yang	345	88	03-23-1987

FOREIGN PATENT DOCUMENTS

/P.K/	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/P.K/	1998/028843	07-02-1998	World Intellectual Property Organization (WIPO)			√	
/P.K/	1998/057491	12-17-1998	World Intellectual Property Organization (WIPO)				√
/P.K/	0840503	05-06-1998	European Patent Office				√
	0587954	03-23-1994	European Patent Office				√
/P.K/	H60136481	05-17-1994	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Digital Still Camera, DSC-F55-F55E Instructional Manual, (1999).
/P.K/		MPEGCAM MP-EG1A, Instruction Manual, Hitachi (1997).
/P.K/		D. Grotta and S. W. Grotta, "Digital Cameras, the Digital Chameleon," PC Magazine, Vol. 16, No. 13, July 1997 ("PCMag July 1997").

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT

(Sheet 2 of 19)

Docket Number (Optional)	Patent Number
009379.00002\US	8,339,493
Applicant	
Issue Date: December 25, 2012	Art Unit: 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	4,901,307	02-13-1990	Gilhousen et al.	370	320	10-17-1986
	4,907,183	03-06-1990	Tanaka	713	340	03-24-1988
	4,910,599	03-20-1990	Hashimoto	348	240.2	08-01-1989
	4,958,915	09-25-1990	Okada et al.	345	97	02-13-1989
	4,963,981	10-16-1990	Todaka et al.	348	240.2	06-21-1989
	4,991,004	02-05-1991	Hayashi et al.	358	527	02-03-1989
	4,992,753	02-12-1991	Jenson et al.	330	129	10-02-1989
	5,018,017	05-21-1991	Sasaki et al.	348	231.3	12-08-1989
	5,054,052	10-01-1991	Nonami	455	574	07-06-1989
	5,056,109	10-08-1991	Gilhousen et al.	370	342	11-07-1989
	5,060,074	10-22-1991	Kinugasa et al.	348	208.6	10-10-1990
	5,083,266	01-21-1992	Watanabe	713	601	12-24-1987

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/P.K/	H03117985	05-20-1991	Japan			√	
	H04092592	03-25-1992	Japan			√	
	H09298755	11-18-1997	Japan			√	
	H10210367	08-07-1998	Japan			√	
	2000-295531	10-20-2000	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Apple QuickTake 200, Getting Started With the QuickTake 200 Camera, QuickTake 200 User's Manual, (1997).
/P.K/		J. Ozer, "Digital Video Cameras," PC Magazine Vol. 18 No. 7 (April 6, 1999).
/P.K/		JVC Digital Camcorder GR-DVL9600 GR-DVL9500, User's Manual, Victor Company of Japan, Ltd., (1999).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

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(Sheet 3 of 19)

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,101,173	03-31-1992	DiPiazza et al.	330	136	11-28-1990
	5,124,963	06-23-1992	Ando	369	30.09	01-07-1991
	5,128,629	07-07-1992	Trinh	330	129	04-22-1991
	5,148,418	09-15-1992	Tsurushima	369	30.23	01-30-1992
	5,173,709	12-22-1992	Lauro et al.	342	443	06-03-1991
	5,177,720	01-05-1993	Kondo	369	30.04	02-06-1990
	5,193,223	03-09-1993	Walczak et al.	455	115.1	07-27-1992
	5,222,104	06-22-1993	Medendorp	375	308	12-30-1991
	5,245,297	09-14-1993	Claydon et al.	330	129	03-02-1992
	5,264,939	11-23-1993	Chang	348	322	05-29-1992
	5,267,262	11-30-1993	Wheatley, III	455	522	10-08-1991
	5,287,192	02-15-1994	Iizuka	348	311	07-15-1992

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
/P.K/	H09275351	10-21-1997	Japan			√	
/P.K/	H06060158	03-04-1994	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Belfor, R. A. **F.**, et al., Subsampling of Digital Image Sequences using Motion Information, Motion Analysis and Image Sequence Processing, (1993).
/P.K/		Sony Consumer Electronics Guide: DCR-TRV900 - More Specifications, Sony Corporation, https://web.archive.org/web/19990424085854/http://www.sel.sony.com/SEL/consumer/ss5/office/camcorder/digitalvideoproducts/dcr-trv900_specs.shtml, (April 24, 1999).
/P.K/		Sony Consumer Electronics Guide: DCR-TRV900, Sony Corporation, https://web.archive.org/web/19990128112515/http://www.sel.sony.com:80/SEL/consumer/ss5/office/camcorder/digitalvideoproducts/dcr-trv900.shtml, (January 28, 1999).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

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(Sheet 4 of 19)

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,287,555	02-15-1994	Wilson et al.	455	115.1	07-22-1991
	5,230,056	07-20-1993	Hoshina	713	340	08-06-1991
	5,283,651	02-01-1994	Ishizuka	348	704	08-01-1991
	5,319,449	06-07-1994	Saito et al.	348	223.1	04-16-1992
	5,321,849	06-14-1994	Lemson	455	67.11	05-22-1991
	5,337,006	08-09-1994	Miyazaki	330	130	07-20-1992
	5,396,290	03-07-1995	Kannegundla et al.	348	312	03-19-1993
	5,383,223	01-17-1995	Inokuchi	375	297	06-04-1993
	5,390,338	02-14-1995	Bodin et al.	455	69	04-11-1994
	5,402,173	03-28-1995	Noguchi et al.	348	322	02-22-1994
	5,402,182	03-28-1995	Sugiura	348	655	07-15-1991
	5,420,632	05-30-1995	Yamagiwa	348	240.3	01-19-1994

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Sony Digital Still Camera, MVC-FD83/FD88 User's Manual, Sony Corporation, (1999).
/P.K/		Sony Digital Video Recorder, DCR-TRV900 User Manual, Sony Corporation, (1998).
/P.K/		Kinugasa, Toshiro, et al., Electronic Image Stabilizer for Video Camera Use, IEEE Transactions on Consumer Electronics, Vol. 36, No. 3, (August 1990).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,423,081	06-06-1995	Thiele et al.	455	116	08-16-1993
	5,434,625	07-18-1995	Willis	348	564	10-26-1992
	5,438,365	08-01-1995	Yamashita et al.	348	297	11-16-1994
	5,440,343	08-08-1995	Parulski et al.	348	316	02-28-1994
	5,448,292	09-05-1995	Matsui et al.	348	224.1	05-18-1994
	5,450,129	09-12-1995	Matoba et al.	348	294	01-24-1994
	5,452,473	09-19-1995	Weiland et al.	455	88	02-28-1994
	5,470,233	11-28-1995	Fruchterman et al.	434	112	03-17-1994
	5,485,486	01-16-1996	Gilhousen et al.	370	335	03-23-1994
	5,493,335	02-20-1996	Parulski et al.	348	231.6	06-30-1993
	5,497,191	03-05-1996	Yoo et al.	348	208.6	12-07-1994
	5,497,192	03-05-1996	Ishizuka	348	208.13	02-28-1995

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	Using the QuickTake 200 AC Adapter, published by Apple Inc., (1997).
/P.K/	Adachi, F., et al., Wideband DS-CDMA for Next-Generation Mobile Communications Systems, IEEE Communications Magazine, (Sep. 1998).
/P.K/	Published advertisement from The Courier-News (Bridgewater, New Jersey) newspaper dated Feb. 17, 1999.

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,502,484	03-26-1996	Okada	348	208.6	07-14-1995
	5,517,239	05-14-1996	Nakayama	348	222.1	08-12-1993
	5,521,636	05-28-1996	Nakayama et al.	348	222.1	06-01-1995
	5,543,789	08-06-1996	Behr et al.	340	995.12	06-24-1994
	5,548,616	08-20-1996	Mucke et al.	375	295	09-09-1994
	5,552,989	09-03-1996	Bertrand	701	516	04-28-1994
	5,559,471	09-24-1996	Black	330	277	12-21-1994
	5,559,778	09-24-1996	Inokuchi et al.	369	53.24	12-28-1994
	5,568,187	10-22-1996	Okino	348	224.1	03-07-1995
	5,574,747	11-12-1996	Lomp	375	144	01-04-1995
	5,592,382	01-07-1997	Colley	701	467	03-10-1995
	5,592,575	01-07-1997	Nakazato	382	312	06-08-1993

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Sasama, J., et al., Multimedia Information Systems Applying MPEGCAM, Hitachi Review, Vol. 48, No. 1, pp. 44-46, (1999).
/P.K/		FlashPix format and Architecture White Paper, Eastman Kodak Company, Rochester, NY., pp. 1-27, (Jun. 17, 1996).
/P.K/		Published advertisement from The Indianapolis News (Indianapolis, Indiana) dated Sep. 4, 1998.

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,603,106	02-11-1997	Toda	455	126	07-11-1995
	5,604,730	02-18-1997	Tiedemann, Jr.	370	252	07-25-1994
	5,608,707	03-04-1997	Ogawa et al.	369	84	01-31-1996
	5,617,060	04-01-1997	Wilson et al.	330	129	04-13-1995
	5,627,857	05-06-1997	Wilson	375	219	09-15-1995
	5,638,132	06-10-1997	Hokari et al.	348	556	12-12-1994
	5,642,378	06-24-1997	Denheyer et al.	375	216	11-17-1994
	5,657,082	08-12-1997	Harada et al.	348	262	12-19-1995
	5,666,160	09-09-1997	Hwang	348	240.2	06-03-1996
	5,666,531	09-09-1997	Martin	1	1	04-07-1995
	5,668,597	09-16-1997	Parulski et al.	348	350	12-30-1994
	5,684,532	11-04-1997	Ely	348	240.99	10-06-1995

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	Cheng, Fu-Sheng, A New Approach to Dynamic Range Enhancement, (Oct. 16, 1994).
/P.K/	Abidi, Asad A., Direct-Conversion Radio Transceivers for Digital Communications, IEEE Journal of Solid-State Circuits, Vol. 30, No. 12, (Dec. 1995).
/P.K/	Published advertisement from The Indianapolis News (Indianapolis, Indiana) dated Sep. 12, 1998.

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,689,815	11-18-1997	Yamazaki et al.	455	69	05-04-1995
	5,701,157	12-23-1997	Kato et al.	348	240.99	07-09-1993
	5,710,981	01-20-1998	Kim et al.	455	69	05-23-1995
	5,734,424	03-31-1998	Sasaki	348	222.1	09-23-1994
	5,734,427	03-31-1998	Hayashi	348	333.11	05-16-1995
	5,752,171	05-12-1998	Akiya	455	126	05-22-1996
	5,774,797	06-30-1998	Kawano et al.	455	127.2	09-22-1995
	5,781,150	07-14-1998	Norris	342	357.34	10-13-1995
	5,790,477	08-04-1998	Hauke	368	10	06-09-1997
	5,793,923	08-11-1998	Sawanobori	386	225	09-19-1996
	5,818,182	10-06-1998	Viswanadham et al.	318	116	12-30-1994
	5,832,373	11-03-1998	Nakanishi et al.	455	126	12-03-1996

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Digital Camera Coolpix 900 Reference Manual, Nikon, pp. 1-79., (1998).
/P.K/		Lowe, Henry J., et al., Using Agent-Based Technology to Create a Cost Effective, Integrated Multimedia View of the Electronic Medical Record, Amia, Inc., University of Pittsburgh, Pittsburgh, PA, (1995).
/P.K/		Excerpts from the JVC America Website, URL: https://web.archive.org/19990117003015/http://jvc-america.com:80/digital_camcorders/digital_camcorders.html.

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	5,903,309	05-11-1999	Anderson	348	333.02	09-19-1996
	5,959,670	09-28-1999	Tamura et al.	348	364	04-16-1997
	5,966,122	10-12-1999	Itoh	715	838	03-10-1997
	5,966,171	10-12-1999	Hieda	348	240.2	06-25-1997
	5,982,298	11-09-1999	Lappenbusch et al.	340	905	11-14-1996
	5,986,698	11-16-1999	Nobuoka	348	208.3	02-19-1997
	6,002,429	12-14-1999	Ochi et al.	348	220.1	05-23-1996
	6,005,613	12-21-1999	Endsley et al.	348	231.6	09-12-1996
	6,020,920	02-01-2000	Anderson	348	222.1	06-10-1997
	6,031,999	02-29-2000	Ogawa	396	303	07-25-1997
	6,049,704	04-11-2000	Peckham et al.	455	232.1	12-10-1997
	6,078,824	06-20-2000	Sogo	455	562.1	08-15-1997

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Published advertisement from The Daily Sentinel (Grand Junction, Colorado) newspaper dated Sunday, Jun. 13, 1999.
/P.K/		Published review from the Iowa City Press (Iowa City, Iowa) newspaper dated Jan. 12, 1999.
/P.K/		Cohen, H. A., Access and Retrieval from Image Databases Using Image Thumbnails, International Symposium on Signal Processing and its Applications, (Aug. 25-30, 1996).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	6,091,686	07-18-2000	Caffarelli et al.	369	53.24	09-09-1996
	6,122,007	09-19-2000	Ishibashi	348	231.6	03-10-1997
	6,125,326	09-26-2000	Ohmura et al.	701	454	09-19-1997
	6,130,710	10-10-2000	Yasuda	348	220.1	05-22-1995
	6,181,375	01-30-2001	Mitsui et al.	348	240.99	12-19-1996
	6,208,377	03-27-2001	Morofuji et al.	348	208.8	08-04-1997
	6,262,763	07-17-2001	Totsuka et al.	348	135	07-01-1999
	6,226,449	05-01-2001	Inoue et al.	386	225	04-17-1997
	6,266,614	07-24-2001	Alumbaugh	701	468	04-20-1998
	6,230,162	05-08-2001	Kumar et al.	382	240	06-20-1998
	6,236,863	05-22-2001	Waldroup et al.	455	522	03-17-1998
	6,288,743	09-11-2001	Lathrop	348	231.9	10-20-1997

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	CNET News Staff, Short take: MPEG camera now works with MAC, CBS Interactive Inc., (Jul. 30, 1997).
/P.K/	Hitachi, Ltd., Hitachi Home Electronics (America), Inc. Announces Compatibility of Mpeg Digital Video Camera with Microsoft Directshow, Press Release, (Oct. 6, 1997).
/P.K/	Published advertisement from Popular Photography magazine dated Oct. 1999.

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	6,292,218	09-18-2001	Parulski et al.	348	220.1	07-16-1997
	6,317,141	11-13-2001	Pavley et al.	715	732	12-31-1998
	6,320,600	11-20-2001	Smith et al.	715	723	12-15-1998
	6,321,158	11-20-2001	DeLorme et al.	701	426	08-31-1998
	6,334,050	12-25-2001	Skarby	455	126	06-12-1998
	6,335,746	01-01-2002	Enokida et al.	715	839	07-23-1997
	6,411,646	06-25-2002	Walley et al.	375	146	06-30-1998
	6,434,130	08-13-2002	Soininen et al.	370	331	08-19-1998
	6,445,412	09-03-2002	Shiohara	348	333.05	04-14-1998
	6,512,858	01-28-2003	Lyon et al.	382	305	07-21-1998
	6,529,236	03-04-2003	Watanabe	348	230.1	09-12-1997
	6,545,687	04-08-2003	Scott et al.	345	629	01-05-1998

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Adobe Photoshop Version 5.0 User Guide, pp. 1-390, (1998).
/P.K/		Asada, K. et al., Development of Low Power MPEG1/JPEG Encode/Decode IC, IEEE Transactions on Consumer Electronics, Vol. 43, No. 3, (Jun. 1997).
/P.K/		Hamilton, E., JPEG File Interchange Format Version 1.02, (Sep. 1, 1992).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	6,559,888	05-06-2003	Doron	348	240.1	03-19-1999
	6,564,070	05-13-2003	Nagamine et al.	455	556.1	09-22-1997
	6,567,119	05-20-2003	Parulski et al.	348	207.2	03-26-1998
	6,580,457	06-17-2003	Armstrong et al.	348	317	11-03-1998
	6,683,649	01-27-2004	Anderson	348	333.05	12-31-1998
	6,693,667	02-17-2004	Doron	348	240.99	01-29-1999
	6,700,607	03-02-2004	Misawa	348	230.1	06-04-1999
	6,701,063	03-02-2004	Komoda et al.	386	241	08-04-1999
	6,727,942	04-27-2004	Miyano	348	223.1	09-07-1999
	6,728,476	04-27-2004	Haseno	386	241	06-04-1998
	6,734,424	05-11-2004	Lennon et al.	250	288	05-16-2002
	6,734,909	05-11-2004	Terane et al.	348	333.05	10-26-1999

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	Kodak, Kodak DC215 Zoom Digital Camera User's Guide, pp. 1-78, (1999).
/P.K/	EE | Times, Hitachi Develops Prototype MPEG Camera, (Nov. 15, 1996).
/P.K/	Japan Electronic Industry Development Association, Design Rule for Camera File System, version 1.0, pp. 1-47, (Dec. 1998).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	6,750,903	06-15-2004	Miyatake et al.	348	218.1	02-25-1999
	6,754,440	06-22-2004	Takahashi et al.	386	353	07-10-2002
	6,757,013	06-29-2004	Matsuzaka	348	240.1	07-08-1997
	6,781,634	08-24-2004	Shiozaki et al.	348	374	09-08-1998
	6,798,448	09-28-2004	Motono et al.	348	222.1	07-20-1999
	6,856,760	02-15-2005	Takahashi et al.	386	224	07-10-2002
	6,876,387	04-05-2005	Lee	348	240.2	12-27-1999
	6,882,366	04-19-2005	Kijima et al.	348	294	01-20-1998
	6,885,399	04-26-2005	Kawashiri	348	273	06-07-2000
	6,937,273	08-30-2005	Loui	348	220.1	06-29-2000
	6,937,277	08-30-2005	Hattori et al.	348	304	04-16-1999
	6,970,191	11-29-2005	Sase et al.	348	220.1	07-20-1999

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	Sony DCS-F55/F55E Service Manual Ver. 1.1, (Jul. 1999).
/P.K/	Kim, S. et al., Development of Mobile Station in the CDMA Mobile System, Vol. 19, No. 3., pp. 202-227, (Oct. 3, 1997).
/P.K/	Shin, S. et al., The CDMA Mobile System Architecture, Vol. 19, No. 3., pp. 98-115, (Oct. 3, 1997).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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009379.00002\US	8,339,493
Applicant	
Issue Date	Art Unit
December 25, 2012	3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
/P.K/	7,352,391	04-01-2008	Hatakeyama	348	223.1	04-30-1997
	7,519,268	04-14-2009	Juen et al.	386	329	04-28-2003
	8,059,177	11-15-2011	Nakano et al.	348	294	09-12-2003
	8,704,768	04-22-2014	Juen et al.	345	158	11-13-2012
	8,736,729	05-27-2014	Nakano et al.	348	294	11-20-2012
	9,100,604	08-04-2015	Nakano et al.	1	1	04-29-2014
	9,544,517	01-10-2017	Nakano et al.	1	1	03-18-2015
	2001/0043276	11-22-2001	UENO	348	322	07-30-1997
	2002/0054218	05-09-2002	KOBAYASHI et al.	348	220.1	10-24-1997
	2002/0000998	01-03-2002	SCOTT et al.	345	667	01-05-1998
	2002/0118291	08-29-2002	Ishigami et al.	348	311	01-22-2002

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Salmasi, A. et al., On the System Design Aspects of Code Division Multiple Access (CDMA) Applied to Digital Cellular and Personal Communications Networks, IEEE (1991).
/P.K/		Sony MVC-FD91 Service Manual Ver. 1.0, (Oct. 1998).
/P.K/		ThumbsPlus Manual, Supported File Types, Feb. 11, (1998).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 15 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

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	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		ThumbsPlus Manual, Release Notes, Version 3.10, Release Notes, (1997).
/P.K/		Shinnick, J., Hitachi MPEG Cam Makes Moves, TidBITS Publishing Inc., (Mar. 23, 1998).
/P.K/		Secretary's Office of Hitachi, Ltd., Hitachi Introduces World's First MPEG Camera in Japan, Press Release, (Jan. 27, 1997).

EXAMINER	/PENG KE/	DATE CONSIDERED	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 16 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/	Proceedings of 1997 IEEE International Symposium on Consumer Electronics, pp. 1-8, (Dec. 2-4, 1997).
/P.K/	Kinugasa, T. et al., A Video Pre/Post-Processing LSI for Video Capture, IEEE Transactions on Consumer Electronics, pp. 776-780, Vol. 42, No. 3., (Aug. 1996).
/P.K/	Slocombe, M., Sony Cybershot DCS-F55E Review, Internet Magazine, (Jun. 1999).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Takahashi, M. et al., A Low-Power MPEG-2 Codec LSI for Consumer Cameras, International Conference on Consumer Electronics, Jun. 28, pp. 501-506, (1999).
/P.K/		Digital Still Camera Image File Format Standard version 2.1, Japan Electronic Industry Development Association (JEIDA), (Jun. 12, 1998).
/P.K/		Cohen, Harvey A., Retrieval and Browsing of Images Using Image Thumbnails, Journal of Visual Computing and Image Representation, Vol. 8, No. 2, (Jun. 1997).

EXAMINER	DATE CONSIDERED
/PENG KE/	08/22/2021

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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 18 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
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U.S. PATENT DOCUMENTS

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	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Hitachi's Multimedia Solutions, Hitachi Review, Vol. 46, No. 5, (Oct. 1997).
/P.K/		Kodak Professional DCS 300 Series Digital Cameras User's Guide, 1-1 - F-1.
/P.K/		Aliftiras, G., Receiver Implementations for a CDMA Cellular System, pp. 1-121, (Jul. 1996).

EXAMINER /PENG KE/	DATE CONSIDERED 08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

Doc Code: IDS
Document Description: Information Disclosure Statement filed

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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 19 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

/P.K/		Kurashige, T. et al., Development of MPEG Camera, 1997 IEEE International Symposium on Consumer Electronics, (1997).
/P.K/		Claim Construction Order in Maxell, Ltd. v. Apple Inc., Case No. 5-19-cv-00036 [EDTX]
/P.K/		Claim Construction Order in Maxell, Ltd. v. ZTE Corporation et al., Case No. 5-16-cv-00179 [EDTX]

EXAMINER /PENG KE/	DATE CONSIDERED 08/22/2021

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the foregoing AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION, is being served in its entirety via First Class Mail, postage prepaid, on the following counsel of record:

Jennifer C. Bailey
ERISE IP, P.A.
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211

on this 27th day of August, 2021.

/Rachel Lichter/
Rachel Lichter

Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	90/014,628
	Filing Date	December 10, 2020
	First Named Inventor	
	Art Unit	3992
	Examiner Name	P. Ke
	Practitioner Docket No.	009379.00002\US

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

[X] Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

[ ] The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

[ ] applicant.

[X] attorney or agent of record. Registration number 65,121.

[ ] attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Scott M Kelly/	August 27, 2021
Signature	Date
Scott M. Kelly	(202) 824-3000
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

[ ] * Total of 1 forms are submitted.

Electronic Acknowledgement Receipt	
EFS ID:	43619913
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Rachel Lichter
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	27-AUG-2021
Filing Date:	10-DEC-2020
Time Stamp:	10:31:05
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Certificate of Service	Certificate_of_Service_August_27_2021_21430896.pdf	11666 91fac929c6c1702bf941a9f169122af377ee1263	no	1

Warnings:

Information:					
2	Reexam Miscellaneous Incoming Letter	Internet_Communications_Authorization_-_009379_21430898.pdf	49344 d4a2081a3c8823095cff012851227bd5b286b8b4	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	61010	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TEXARKANA DIVISION

MAXELL LTD.,	§	
	§	
Plaintiff,	§	
	§	CIVIL ACTION NO. 5:19-CV-00036-RWS
v.	§	
	§	
APPLE INC,	§	
	§	
Defendant.	§	

CLAIM CONSTRUCTION MEMORANDUM AND ORDER

On January 8, 2020, the Court held an oral hearing to construe the disputed claim terms of the patents-in-suit. Having considered the parties' claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318 (2015); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005).

BACKGROUND

Plaintiff Maxell brings suit alleging that Apple infringes the following ten patents: U.S. Patent Nos. 6,748,317 (the " '317 patent); 6,580,999 (the " '999 patent"); 6,430,498 (the " '498 patent"); 8,339,493 (the " '493 patent"); 6,329,794 (the " '794 patent"); 6,408,193 (the " '193 patent"); 6,928,306 (the " '306 patent"); 10,084,991 (the " '991 patent"); 7,116,438 (the " '438 patent"); and 10,212,586 (the " '586 patent). Eight of the asserted patents contain disputed terms.

Maxell previously asserted five of the patents (the '438 patent, the '317 patent, the '493 patent, the '193 patent and the '794 patent) against other defendants in prior litigation—*Maxell Ltd. v. Huawei Device USA, Inc.*, 297 F. Supp. 3d 668 (E.D. Tex. 2018). However, the Court has not construed any of the presently disputed terms.

APPLICABLE LAW

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips*, 415 F.3d 1303 at 1312 (en banc) (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court first examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims themselves, the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 861 (Fed. Cir. 2004). . The general rule—subject to certain specific exceptions discussed *infra*—is that each claim term is construed according to its ordinary and accustomed meaning as understood by one of ordinary skill in the art at the time of the invention in the context of the patent. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003); *see also Azure Networks, LLC v. CSR PLC*, 771 F.3d 1336, 1347

(Fed. Cir. 2014) ("There is a heavy presumption that claim terms carry their accustomed meaning in the relevant community at the relevant time.").

"The claim construction inquiry . . . begins and ends in all cases with the actual words of the claim." *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1248 (Fed. Cir. 1998). "[I]n all aspects of claim construction, 'the name of the game is the claim.' " *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1298 (Fed. Cir. 2014) (quoting *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998)). First, a term's context in the asserted claim can be instructive. *Phillips*, 415 F.3d at 1314. Other asserted or unasserted claims can also aid in determining the claim's meaning, because claim terms are typically used consistently throughout the patent. *Id.* Differences among the claim terms can also assist in understanding a term's meaning. *Id.* For example, when a dependent claim adds a limitation to an independent claim, it is presumed that the independent claim does not include the limitation. *Id.* at 1314–15.

"[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning than it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own

lexicographer. *See Irdeto Access, Inc. v. EchoStar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

"Although the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988)); *see also Phillips*, 415 F.3d at 1323. "[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited." *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004).

The prosecution history is another tool to supply the proper context for claim construction because, like the specification, the prosecution history provides evidence of how the U.S. Patent and Trademark Office ("PTO") and the inventor understood the patent. *Phillips*, 415 F.3d at 1317. However, "because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Id.* at 1318; *see also Athletic Alternatives, Inc. v. Prince Mfg.*, 73 F.3d 1573, 1580 (Fed. Cir. 1996) (ambiguous prosecution history may be "unhelpful as an interpretive resource").

Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide

definitions that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Functional Claiming and 35 U.S.C. § 112, ¶ 6(pre-AIA)/ § 112(f) (AIA)

A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112 ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means . . . for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

But § 112 ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112 ¶ 6 applies when the claim language includes "means" or "step for" terms and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (Section 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Personalized Media Communications, L.L.C. v. Int'l Trade Commission*, 161 F.3d 696, 704 (Fed. Cir. 1998)

(" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ").

When it applies, § 112 ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step . . . is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction for the following terms:

TERM	AGREED CONSTRUCTION
"function devices" ('794 patent, claims 1, 3, 6)	Function: equipped with independent functions

	Structure: modem devices, audio communication devices and videophone devices; or equivalents thereof
"component devices" ('794 patent, claims 9, 14)	Function: performing different functions Structure: modem devices, audio communication devices and videophone devices; or equivalents thereof
"a time zone which is set up in advance" ('306 patent, claim 14)	"a duration of time or a range of hours set up in advance"
"an authentication process for allowance to use said display apparatus" ('438 patent, claim 1)	"a process that authorizes the user to use the display apparatus"
"an authentication process for allowance to use said information-processing terminal" ('438 patent, claim 4)	"a process that authorizes the user to use the information-processing terminal"
"A cellular telephone adapted to be used in a CDMA system" ('193 patent, claims 1, 7)	The preamble is limiting.
"variable amplitude amplifier" ('193 patent, claims 1, 6, 7)	"an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal"
"function defining a relation between bias data and gain data stored in said memory" ('193 patent, claim 7)	"a relationship between bias data and gain data stored in memory such that each gain data value has a corresponding bias data value"
"voice signal code" and "voice code signal" ('193 patent, claims 1, 7)	The two terms have the same meaning.
"an image-instability detector" ('493 patent, claims 4, 6)	"a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera"
"an image-instability of the electric camera" ('493 patent, claims 4, 6)	"instability caused by vertical and/or horizontal movement of the electric camera"
"a device for getting a direction information denoting an orientation of said portable terminal"	Function: getting direction information denoting an orientation of said portable terminal

('317 patent, claims 1, 10; '498 patent, claims 1, 10; '999 patent, claim 1)	Structure: a compass, gyroscope, and/or sensor such as a clinometer in conjunction with a CPU, or equivalents thereof

The Court adopts the constructions agreed to by the parties as listed above.

DISPUTED TERMS

A. The '371, '498 and '999 Patents

The '317 patent, the '498 patent and the '999 patent share a specification. The '317 patent is a continuation of the '999 patent, which is a continuation of the '498 patent. The patents have the same title: "Portable Terminal with the Function of Walking Navigation." The '317 patent's abstract is reproduced below:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

More particularly, the patents disclose a portable terminal which includes devices for obtaining a location and direction of the user's present place so that the user does not have to input such information. '317 patent at 2:51–3:26. A block diagram of a portable terminal is illustrated in Figure 10 in the '317 patent. In the figure, the portable terminal has various devices (input device, display device, etc.) coupled to a CPU that provides for the walking navigation functions described in the patent.

Claim 1 of the '317 patent is an asserted claim and is reproduced below:

1. A portable terminal, comprising:

a device for getting location information denoting a present place of said portable terminal;

a device for getting a direction information denoting an orientation of said portable terminal;

an input device for inputting a destination; and

a display,

wherein said display displays positions of said destination and said present place, and a relation of said direction and a direction from said present place to said destination, and

said display changes according to a change of said direction of said portable terminal orientation for walking navigation.

The Court construed various terms in the '317 in the prior litigation, but none of them are currently disputed.

The parties dispute four terms in the '317, '498 and '999 patents. All are agreed to be means-plus-function limitations. Three of the disputed terms have the same dispute as to the corresponding structure and are thus grouped together for similar analysis.

1. "a device for getting location information denoting a present place"

Maxell's Proposed Construction	**Apple's Proposed Construction**
Agreed function: getting location information denoting a present place of said portable terminal Structure: a wireless or cellular antenna, a GPS, a PHS, or the like; such a data receiver as an infrared ray sensor, or the like; and a CPU for analyzing received data; or equivalents thereof.	Agreed function: getting location information denoting a present place of said portable terminal Structure: a wireless or cellular antenna, or a GPS, or a Personal Handyphone System (PHS); and an infrared ray sensor; and a control unit for analyzing received data, with the control unit calculating location information as disclosed in '498 at 5:48-56 and Fig. 2; or equivalents thereof

The term "a device for getting location information denoting a present place" appears in claims 1 and 10 of the '317 patent, claims 1 and 10 of the '498 patent and claim 1 of the '999 patent.

(1) The Parties' Positions

The parties agree that the term is a means-plus-function term and agree on the recited function. The parties dispute whether the corresponding structure must include an "infrared ray sensor" or whether it may include other "data receivers."

The parties first dispute whether statements made in a prior IPR proceeding mandate the inclusion of an "infrared ray sensor" as opposed to a general "data receiver." *See, e.g.*, Docket No. 161 at 26. Apple asserts that Maxell disclaimed claim scope to defeat an *Inter Partes* review ("IPR") petition filed by ASUStek Computer Inc. ("ASUS"). *Id.* Specifically, Maxell distinguished each prior art reference in the petition as lacking an infrared ray sensor. *Id.* To Apple, "by distinguishing the claimed invention over prior art, [Maxell has] indicat[ed] what the claims do not cover." *Id.* at 26 (quoting *Bd. of Regents of the Univ. of Texas Sys. v. BENQ Am. Corp.*, 533 F.3d 1362, 1373 (Fed. Cir. 2008)). Apple argues this is a "clear disclaimer of claim scope." *Id.*

Maxell asserts that the Court is not bound by the PTAB's claim interpretation because, at the time of the IPR in question, the PTAB had a different claim construction standard.[1] Docket No. 136 at 28. Maxell further contends that it did not clearly disclaim claim scope. Docket No. 165 at 10. Instead, Maxell asserts that it used ASUS's proposed construction to argue that ASUS failed to meet the PTAB's requirements, but did not adopt its construction, reserving its right to contest that construction later. *Id.*

Apple then asserts that, even if the IPR proceedings are not binding, the corresponding structure is limited to an "infrared ray sensor." Docket No. 161 at 28. Apple notes that the specification depicts a "device for getting location information" in Figure 10 and describes the

[1] The PTAB has since abandoned the broadest reasonable interpretation standard and adopted the *Phillips* standard for claim construction. *See* 37 C.F.R. 41.100(b).

structure of this device as containing three components: (1) a wireless antenna, GPS or PHS; (2) an infrared ray sensor; and (3) a control unit. *Id.* Apple asserts that "because an 'infrared ray sensor' is part of the only disclosed embodiment for performing the recited function," the claim construction must include an "infrared ray sensor." *Id.* at 28 (citing *Mettler-Toledo, Inc. v. B-Tek Scales, LLC*, 671 F.3d 1291, 1296 (Fed. Cir. 2012)). Apple asserts that the phrase "such a receiver as an infrared ray sensor" does not disclose any structure beyond an infrared ray sensor because "data receiver" itself is not sufficiently definite structure. *Id.*; Docket No. 187 at 17:10–11.

Maxell asserts that Apple's construction is overly narrow because it "rewrites the non-limiting phrase of 'such a data receiver as an infrared ray sensor or the like' to 'and an infrared ray sensor.' " Docket No. 136 at 27.[2] Maxell also contends that in the context of the patent—portable telephones—and the rest of the corresponding structure, "data receiver" recites sufficient structure. Docket No. 187 at 26:21–27:4.

(2) Analysis

The parties agree that the term is a means plus function term and that the recited function is "getting location information denoting a present place of said portable terminal." "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* Under § 112 ¶ 6, means-plus-function terms are limited "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Consistent with the claims, the specification discloses that the portable terminal has a "device for getting location information 77," depicted in

[2] Maxell also asserted in briefing that the patents disclose "data receiver" as an alternative to a GPS or PHS. Docket No. 136 at 27. However, during the *Markman* hearing, Maxell agreed that "data receiver" was a separate requirement from the GPS or PHS. Docket No. 187 at 28:4–6.

Figure 10 of the '498 patent. Both parties agree that device 77 is corresponding structure for the recited function. The specification describes device 77 as follows:

> The device for getting location information 77 is provided with such a wireless antenna, a GPS or PHS, or the like; such a data receiver as an infrared ray sensor, or the like; and a control unit for analyzing received data, thereby calculating location information.

'498 patent at 9:40–44. The parties dispute whether the "infrared ray sensor" is an exemplary "data receiver," which is itself disclosed structure, or whether the corresponding structure requires an "infrared ray sensor." For the reasons detailed below, the Court finds that the corresponding structure is not limited to an infrared ray sensor.

Maxell's statements during the IPR proceedings are not a clear disavowal of claim scope. In its IPR petition, ASUS proposed a construction for the corresponding structure of the currently disputed limitation: "a wireless or cellular antenna, OR a GPS, OR a Personal Handyphone System, AND an infrared ray sensor; AND a control unit for analyzing received data, with the control unit calculating information as disclosed in 5:48–56, and Fig. 2." Docket No. 165-4 at 18–19. ASUS then applied this limitation to the prior art. *Id.*

Maxell responded:

> While Patent Owner ***does not contend that such a construction is proper***, for purposes of the IPR, it is Petitioner's burden to propose a construction and then explain how the construed claim is unpatentable. *See* 37 C.F.R. § 42.104(b)(4). The Petition fails to do so. Thus, the Petition does not comply with the requirements set forth in 37 C.F.R. § 42.104, and for this reason alone, the Petition should not be instituted.

Id. at 14 n.4 (emphasis added). Maxell then argued that ASUS had failed to meet its burden of demonstrating that institution of the IPR was warranted because it had not shown that the cited prior art included an infrared ray sensor, part of ASUS's own proposed construction. *Id.* at 14–15. Maxell never agreed that the corresponding structure is limited to an "infrared ray sensor" and

instead expressly reserved its right to contest the construction. *Id.* at 10–11, n. 3. Maxell had no reason to contest the propriety of ASUS's construction because Maxell successfully used ASUS's own proposed construction to defeat the IPR petition. These statements are far from clear and unmistakable surrender of claim scope.

Turning to the traditional claim construction analysis, then, Apple's proposed structure improperly limits the corresponding structure. Section 112 ¶ 6 requires that a means-plus-function term be given the full scope of the structure described in the specification. *IP Innovation LLC v. Red Hart, Inc.*, No. 2:07-cv-447, 2009 WL 2460982, at *6 (E.D. Tex. Aug. 10, 2009); *see also Home Diagnostics, Inc v. LifeScan, Inc.*, 381 F.3d 1352, 1357 (Fed. Cir. 2004). The description for the "device for getting location information 77" recites "such a data receiver as an infrared ray sensor." '498 patent at 9:40–44. "Data receiver" is clearly associated with the agreed function. *See Williamson*, 792 F.3d at 1352 (Corresponding structure is adequate if "a person of ordinary skill in the art would be able to recognize the structure in the specification and associate it with the corresponding function of the claim.").

Just as a non means-plus-function term may cover a broad class of structures, the corresponding structure in a means-plus-function term can include a broad class of structures if the class of structures is identifiable by a person of ordinary skill in the art. *See Linear Tech. Corp. v. Impala Linear Corp.*, 379 F.3d 1311, 1322 (Fed. Cir. 2004) (holding that corresponding structure is not limited to a single structure); *Network Appliance Inc. v. Sun Microsystems, Inc.*, No. C-07-06053 EDL, 2008 WL 4193049, at *20 n.7 (N.D. Cal. 2008) (confirming that *Linear Tech's* holding applies to corresponding structure of MPF terms).

Courts routinely conclude that "receiver" connotes sufficiently definite structure. *See, e.g., EnOcean GmbH v. Face Intern. Corp.*, 742 F.3d 955, 959 (Fed. Cir. 2014) ("The term receiver

presumptively connotes sufficiently definite structure to those of skill in the art."); *Ambato Media, LLC v. Clarion Co., Ltd.*, No. 2:09-cv-242-TJW, 2011 WL 2912764, at *8–9 (E.D. Tex. July 18, 2011) (declining to limit corresponding structure for means-plus-function term to a subset of exemplary receivers "such as television receivers, VCRs, cable interface boxes and the like" because broader "receiver" was structure clearly linked to the function); *see also Mobile Telecommunications Tech. LLC v. LG Elec. Mobilecomm USA, Inc.*, No. 2:13-cv-947-JRG-RSP, 2015 WL 2250418, at *18 (E.D. Tex. May 13, 2015) (construing a "receiver" as corresponding structure for a means-plus-function term). Apple's expert does not opine that "data receiver" is not structural. Instead, Apple's expert stated that not all data receivers were capable of determining location information in the same way as infrared ray sensors and that "infrared ray sensor" was the only example of a data receiver disclosed. *See* Docket No. 161-5 at ¶ 34. This does not render data receiver not structural.

Because "data receiver" is structure that is clearly linked to the recited function, data receiver is disclosed structure. *See Ambato Media*, 2011 WL 2912764, at *8–9 (construing means-plus-function term to have corresponding structure of "receiver" because receiver was structure linked to the recited function for the disputed term). Limiting the corresponding structure to require more specifically an "infrared ray sensor" would be improper. *Id.*

It would also be improper for the construction to include "infrared ray sensor" as an exemplary data receiver. The phrase "such a data receiver as an infrared ray sensor" is properly read as disclosing a "data receiver" and providing "infrared ray sensor" as an example. Such exemplary language could be interpreted as limiting. *See Hitachi Consumer Elecs. Co. Ltd. v. Top Victory Elecs. (Taiwan) Co. Ltd.*, No. 2:10-cv-260-JRG, 2012 WL 5494087, at *13 (E.D. Tex. Nov. 13, 2012) (omitting exemplary language from the construction because examples were

"unnecessary and might be read as limiting"). That would be improper for the reasons discussed above.

Accordingly, the Court construes "**a device for getting location information denoting a present place**" to mean:

Function: getting a location information denoting a present place of said portable terminal

Structure: a wireless or cellular antenna, a GPS, a PHS, or the like; a data receiver; and a CPU for analyzing received data; or equivalents thereof.

2. "device for getting a location information . . ." / "device for retrieving"

Term	Maxell's Proposed Construction	Apple's Proposed Construction
"a device for getting a location information of another portable terminal from said another portable terminal via connected network" ('317 patent, claim 10)	Agreed function: getting a location information of another portable terminal from said another portable terminal via connected network Structure: CPU and device for data communication 76 of a portable terminal; or equivalents thereof	Agreed function: getting a location information of another portable terminal from said another portable terminal via connected network Structure: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, '317 Patent at 9:40–50); or equivalents thereof
"a device for getting a location information of another portable terminal"; ('999 patent, claim 1)	Agreed function: getting a location information of another portable terminal Structure: [same as above]	Agreed function: getting a location information of another portable terminal Structure: [same as above]
"a device for retrieving a route from said present place to said destination" ('317 patent, claim 15)	Agreed function: retrieving a route from said present place to said destination Structure: [same as above]	Agreed function: retrieving a route from said present place to said destination Structure: [same as above]

The disputed term "a device for getting a location information of another portable terminal from said another portable terminal via connected network" appears in claim 10 of the '317 patent.

The disputed term "a device for getting a location information of another portable terminal" appears in claim 1 of the '999 patent. The disputed term "a device for retrieving a route from said present place to said destination" appears in claim 15 of the '317 patent.

(1) Parties Positions

The parties agree that the terms are means-plus-function terms. The parties also agree on the recited functions and that the corresponding structure for each of the above disputed terms is the same.

Maxell asserts that the patents disclose as corresponding structure "portable terminals," including a "portable telephone and Personal Handyphone System (PHS) . . . and a personal data assistance (PDA) terminal provided with portable telephone or PHS data communication functions." Docket No. 136 at 29 (citing '498 patent at 1:5–10). As such, Maxell argues the portable terminal is not limited to a device for data communication of both a portable telephone and a PHS. *Id.* at 29. To Maxell, the patents provide "exemplary structures" and additional disclosures refer to the use of a portable telephone or a PHS. *Id.* Maxell concludes that using "device for data communication 76 of a portable terminal" ensures that the disclosed embodiment of the PDA is not excluded. *Id.*

Apple notes that in the prior litigation the Court construed a means-plus-function term in claim 6 of the '317 patent—"a . . . device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server"—as having the corresponding structure a "device for data communication, which is 'described in the specification as a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal.' " *Id.* at 29–30 (citing *Huawei*, 297 F. Supp. 3d at 722). Apple asserts that the corresponding structure for both

this term and the term construed in the prior litigation are the same, and therefore the Court's prior construction must control. Docket No. 161 at 30.

Maxell responds that the Court's prior construction of a different term is not controlling. Docket No. 165 at 10.

(2) Analysis

As an initial matter, the prior term is not the same or similar to the currently dispute term, so collateral estoppel does not apply. Nevertheless, the Court agrees with Apple's proposed construction. Claim 10 of the '317 patent discloses in part:

- A device for getting location information denoting a present place of said portable terminal;
- A device for getting direction information denoting an orientation of said portable terminal;
- A device for getting a location information of another portable terminal from said another terminal via connected network

Consistent with claim 10, the specification discloses in Figure 10 a portable terminal with (1) "a device for getting location information 77"; (2) a "device for getting direction information 78"; and (3) "a device for data communication 76." '317 patent at Fig. 10. The specification further describes Figure 10 as including a "CPU 71, which is a control unit" and "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." '317 patent at 9:47–49. This is the only structure disclosed and clearly linked to the function in claim 10. The parties agree that the corresponding structure for the disputed terms includes a CPU and device for data communication 76.

Maxell's argument regarding the specification is also unpersuasive. The specification's references to "portable telephone and/or a PHS terminal" do not overcome the clear disclosure of device for data communication 76's structure: "an ordinary portable telephone and a PHS." '317

patent at 9:47–49 (emphasis added). Those other references in the specification are not "clearly linked" to the recited function or the specific device for data communication 76. *See Mettler-Toledo*, 671 F.3d at 1296 (rejecting a broader corresponding structure of A/D converter because, although referenced in the specification, such broader structures were not clearly linked to the function). In fact, the specification's reference to "portable telephone and/or a PHS terminal" often describes the inventions display component, not the function of getting location information. *See, e.g.*, '317 patent at 2:55–5'6 (reciting the "use of a narrow screen of a portable telephone and/or PHS terminal").

Accordingly, the Court adopts Apple's proposed construction and construes the disputed terms to have the agreed recited functions and the following corresponding structure: **CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, '317 Patent at 9:40–50); or equivalents thereof.**

B. The '794 Patent

The '794 patent is entitled "Information Processing Device and Method for Controlling Power Consumption Thereof." The patent relates to an information processing device in which a plurality of independent function devices are driven by a common power supply, where the device prioritizes power to independent function devices with higher usage priorities. '794 patent at 1:6–8, 49–52. "Another object of the present invention is to provide a method for controlling power consumption of an information processing device." *Id.* at 1:52–54. The'794 patent's abstract recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be

maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

More particularly, the '794 patent describes a device that sets priority levels for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. *See, e.g.*, 2:21–27, 3:57, 4:12, Figs. 8 and 9. The device turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables longer operation of function devices with higher priority. *Id.* at 5:17–27.

The '794 patent discloses a "capacity detector" that detects a remaining capacity of a battery. *See, e.g.*, *id.* at 1:34–40; 4:18–34; Figs. 1 and 4. Figure 1 shows capacity detector 107 and Figure 4 shows various operations the capacity detector performs according to one embodiment. The '794 patent was asserted in prior litigation, and the prior parties agreed that the "capacity detector" term had its plain and ordinary meaning. *See, e.g.*, *Maxell*, 297 F. Supp. 3d. at 684.

3. "capacity detector" ('497 patent claims 1 and 9)

Maxell's Proposed Construction	**Apple's Proposed Construction**
Plain and Ordinary Meaning	Function: detecting a remaining capacity of a battery Structure: Capacity Detector 107 (as configured in Figs. 1, 6, 10, or 11) performing the steps shown in Fig. 4.; or equivalents thereof

The disputed term appears in claims 1 and 9 of the '497 patent.

(1) The Parties' Positions

Maxell contends that "capacity detector" is readily understood by one of skill in the art and should have its plain and ordinary meaning. *See, e.g.*, Docket No. 136 at 3–5. Maxell points out that the term had its plain and ordinary meaning in the prior litigation, and the parties, experts and jury in that case had no trouble understanding the term without construction. *Id.* at 3. Maxell also argues that capacity detector has sufficient structure to one of skill in the art—both as to the term "detector" itself and the word "capacity detector." Maxell further contends that both parties' experts "agree that the term connotes sufficient structure to a person of ordinary skill in the art," and they identified software and hardware solutions for implementing the capacity detector. *Id.* at 5.

Apple contends that "capacity detector" is a means-plus-function term because it "merely describes the function of detecting battery capacity without reciting any structure." Docket No. 161 at 7–8. Apple argues that, although "detector" has identified structure in unrelated contexts, Maxell presented no evidence that "capacity detector" has meaning in the relevant field—power management. *Id.* at 6–7 (citing *Kensey Nash Corp. v. Perclose, Inc.*, No. 98-1629, 2001 U.S. Dist. LEXIS 12754, at *18–19 (E.D. Pa. Aug. 21, 2001) (finding "location detector" to be a means-plus-function term because it "recites no specific structure or material for performance of location detection")). Apple also asserts that Maxell "mischaracterizes" Apple's expert reports because neither expert testified that "capacity detector" connotes structure. *Id.* at 7.

As to the corresponding structure, Apple asserts that the only structure disclosed in the specification is the Capacity Detector 107, shown as a box in Figures 1, 6, 10 and 11. Apple asserts that the corresponding structure must also include the algorithm associated with Capacity Detector

107, in the specification shown in the flowchart of Figure 4. *Id.* at 8 (citing '794 patent at 2:55–57 ("FIG. 4 is a flowchart showing the operations performed by a capacity detector . . . .").

Maxell disputes Apple's application of § 112 ¶ 6. First, Maxell asserts that "detector" alone connotes sufficient structure to avoid the ambit of § 112 ¶ 6. Docket No. 136 at 4 (citing *Apple*, 757 F.3d at 1299 (noting that courts find "detector" to be a structural term)). Maxell also emphasizes that the claim language and specification connotes sufficient structure to the term. *Id.*

Maxell further disputes Apple's proposed corresponding structure as "an attempt to shoehorn additional limitations into the claims." *Id.* at 5. Specifically, Maxell contends that Apple's proposed structure includes steps (402–405) which are not stated functions of the capacity detector, such as "providing a notification when the battery reaches a particular capacity." *Id.*

(2) Analysis

Section 112 ¶ 6 presumptively does not apply to a claim term that does not use "means." *Williamson*, 792 F.3d at 1349. The presumption is rebuttable if a party can "demonstrate[] that the claim term fails to 'recite sufficiently definite structure' or else recites 'function without reciting sufficient structure for performing that function.' " *Id.* (quoting *Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000)).

Here, "capacity detector" does not recite the word "means," and § 112 ¶ 6 presumptively does not apply. Apple has not demonstrated that "capacity detector" "fails to recite sufficiently definite structure" or else "recites function without reciting sufficient structure for performing that function" so as to overcome this presumption. *See Williamson*, 792 F.3d at 1349.

The term "capacity detector" has sufficiently specific structure. In claim 1, the "capacity detector" is described as a component in a "power supply circuit." '794 patent at 8:33–36 ("said power supply circuit including a battery, a capacity detector for detecting a remaining capacity of

said battery"). The claim language connotes sufficient structure by describing how the "capacity detector" operates within the claim invention. *See Free Stream Media Corp. v. Alphonso Inc.*, No. 2:15-cv-1725-RWS, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017).

The specification further establishes the structural character of "capacity detector." *See Finjan, Inc. v. Proofpoint, Inc.*, No. 13-cv-05808-HSG, 2015 WL 7770208, at *11 (N.D. Cal. Dec. 3, 2015) (finding "content processor" had sufficient structure because the specification described how the processor interacted with the invention's other components and illustrated the processor's location and relationship to other components). The specification describes "capacity detector 107" as a "capacity detector circuit." '794 patent at 4:48. Figure 11 further illustrates capacity detector 107's location in "power supply circuitry" and its relationship to other components in the invention. '794 patent at Fig. 11. These structural descriptions, which show how the elements are connected together and show "how the function is achieved the context of the invention," removes "capacity detector" from means-plus-function usage. *See Inventio AG v. ThyssenKrupp Elevator Americas Corp.*, 649 F.3d 1350, 1358 (Fed. Cir. 2011); *Williamson*, 792 F.3d at 1349; *Apple Inc.*, 757 F.3d at 1298–1300; *Personalized Media*, 161 F.3d at 704–05.

The expert testimony Apple relies on does not negate the intrinsic evidence showing that "capacity detector" is a known class of structure. "Extrinsic evidence may not be relied upon during claim construction when intrinsic evidence unambiguously defines the disputed claim language." *Personalized Media*, 161 F.3d at 706. Indeed, Apple's expert was able to identify structures for the "capacity detector" term. *See* Docket No. 161-2 ¶ 63. Further, consistent with the structural descriptions in the specification, Maxell's expert explained that a person of ordinary skill would have known of "several commercially available integrated circuits designed for measuring analog signals, including, for example, integrated circuits manufactured by Texas

Instruments and National Semiconductor, and others such as Linear Technology's LTC1325 Battery Management IC." *See* Docket No. 136-1 ¶ 32. Based upon these factors, Apple has not rebutted the presumption that "capacity detector."

Accordingly, the Court construes the term "**capacity detector for detecting a remaining capacity of said battery**" to have its **plain and ordinary meaning**.

C. The '306 Patent

The '306 patent is entitled "Portable Mobile Unit." The patent generally relates to a portable mobile unit for alerting a user of an incoming signal by ringing and, in particular, to a portable mobile unit suitable for alerting a user of an incoming phone call using a ringing sound. '306 patent at 1:6–10. The'306 patent's abstract is reproduced below:

> A portable mobile unit for alerting on incoming of a signal by a ringing sound, comprises: a ringing sound generator for generating the ringing sound in a plurality of patterns; and a controller for controlling operations of the portable mobile unit, wherein the controller select one pattern from the a plurality of patterns based on conditions which are set up in advance, when the signal comes in, so as to control the ringing sound generator to generate the ringing sound for alerting a user of the incoming call, thereby providing the portable mobile unit being superior in the usability, with which various conditions can be grasped by means of change in the ringing sound when the telephone call comes in, while achieving the discrimination of the ringing sound for alerting of the incoming call.

Figure 15 of the '306 patent depicts a "ringing sound generator 1519" within the structure of the "portable mobile unit. '306 Patent at Fig.15. Figure 1 shows the "ringing sound generator 1519" and its operation with a communication controller 1516, in more detail. *Id.* at Fig.1.

4. "ringing sound generator"

Maxell's Proposed Construction	Apple's Proposed Construction
Plain and Ordinary Meaning	Function: to generate a ringing sound Structure: Element 1519 in Figure 15 comprising 1, 3a- 3c, and 4a-4c in Figure 1; or equivalents thereof

(1) Parties' positions

Maxell contends that "a person of ordinary skill in the art would have understood the meaning of this term when used in the context of a 'portable mobile,' as claimed." Docket No. 136 at 7 (citing Docket No. 136-4 ¶ 31). Specifically, Maxell contends that, in context, " 'ringing sound generator' refers to a class of structure, namely the circuitry and software in portable devices that produces audio alerts." *Id.* Maxell cites to the claims and the specification, which both describe exemplary structures for the ringing sound generator, and an expert report as showing that a person of ordinary skill in the art would have understood the meaning of the term. *Id.* at 8. Maxell's expert opined that "ringing sound" refers to the notification of an incoming call and "ringing sound generator," in context, recites structure. Docket No. 136-4 ¶ 35.

Apple asserts that the phrase "ringing sound generator" is a means-plus-function term because it "does not connote sufficiently definite structure to a POSA" and because it is not the "name of a known structure in the field of portable mobile devices." Docket No. 161 at 9. Apple asserts that courts have found similar phrases, such as "alert sound generator" and "symbol generator," to be means-plus-function terms. *Id.* at 9 (citing *Mobilemedia Ideas, LLC v. Apple Inc.*, 178 F. Supp. 3d 209, 218–19 (D. Del. 2016) and *Advanced Ground Info. Sys. v. Life360, Inc.*, 830 F.3d 1341, 1346–49 (Fed. Cir. 2016)). Apple's expert opined that "one of ordinary skill in the art would understand that 'ringing sound generator' could be anything that generates a ringing sound. For example, a person ringing a cowbell could be a 'ringing sound generator.' " Docket No. 161-3 ¶ 33. The expert further stated that, even considering the fields of electrical engineering, computer engineering or computer science, he could identify "many different classes of structures that could generate a ringing sound." *Id.* ¶ 34.

Apple then proposes construing the term as a means-plus-function term with the function to generate a ringing sound" and Ringing Sound Generator 1519 in Figure 15 as the corresponding structure. Docket No. 161 at 9. Apple adds that the corresponding structure includes the details shown in Figure 1, *i.e.*, elements 1 ("reproduction timing memory"), 3a–3c (multiple "sound source[s]") and 4a–4c ("multiple "sound data reproduction portion[s]"). *Id.* (citing '306 patent at 4:34–65, Fig.1). Apple also asserts that the specification's disclosure of MP3 as potential "data" does not disclose "structure" for the ringing sound generator. *Id.* at 9–10.

Maxell responds that Apple's expert testimony regarding the potential class of structures such as a cowbell "ignores the context of the patent (mobile phones)." Docket No. 136 at 7. Maxell also argues that Apple's proposed structure is improper because it limits the term to one embodiment to the exclusion of others. Specifically, Maxell contends that the proposal excludes the specification's teaching that "the sound data of the MP3 method can be used." '306 patent at 5:1–8.

(2) Analysis

Section 112 ¶ 6 presumptively does not apply to "ringing sound generator" because it does not use the word "means." Apple has not demonstrated that the term "fails to recite sufficiently definite structure" or else "recites function without reciting sufficient structure for performing that function" to overcome this presumption. *See Williamson*, 792 F.3d at 1349.

The claims show that "ringing sound generator" is structural. The claims provide some detail as to how the ringing sound generator interacts with other components of the claim invention and describes the input data for the "ringing sound generator." *See Linear Tech* 379 F.3d at 1319–21 (finding "circuit [for performing a function]" to be sufficient definite structure where claims recite the circuit's "operation in sufficient detail to suggest structure to persons of ordinary skill in

the art"); *Free Stream Media*, 2017 WL 1165578, at *25 ("declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claims invention to achieve its objections"). For example, claim 1 discloses a "ringing sound generator having a plurality of sound sources therewith" and a controller that "controls the ringing sound generator so as to generate the ringing sound using at least two of said sound sources when the signal comes in."

The specification confirms that "ringing sound generator" connotes structure. *See Inventio AG*, 649 F.3d at 1358 (finding term structural based on description in specification); *Finjan, Inc.*, 2015 WL 7770208, at *11. Figure 15 depicts the ringing sound generator as a component in the "circuit constructions of the cellular phone" where it is connected to a communication controller and a speaker. '306 patent at 15:50–51. The specification describes the operation of the "ringing sound generator 1519":

> A reference numeral 1519 indicates a ringing sound generator for generating the ringing sound when it receives the radio-wave signal, and a 1520 speaker for outputting the alerting signal that is reproduced in the ringing sound generator 1519 audibly. Further . . . "reproduce" means to output a sound data that is stored or a sound data that is received with the incoming call, or to put an audible frequency signal that is converted from an inputted sound data.

Id. at 4:24–33. In Figure 1, the patent shows additional "details of the communication controller 1516 and the ringing sound generator 1519," further describing how the controller and ringing sound generator operate to "reproduce" sound data. *Id.* at 4:34–65. These structural descriptions confirm that "ringing sound generator" is not a means-plus-function term. *See Free Stream Media*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017); *Finjan, Inc*, 2015 WL 7770208, at *11.

Apple's expert testimony does not negate the intrinsic evidence showing that the full phrase "ringing sound generator" is structural. *See Personalized Media*, 742 F.3d at 706. Though "generator" may connote a broad class of structures, the context of the term in mobile phone

technology and the "ringing sound" modifier limits the potential class of structures. *See Williamson*, 792 F.3d at 1351; *Free Stream Media*, 2017 WL 1165578, at *24–25 (noting that a modifier "further narrows the scope of these structure covered by the claim") (citations omitted). Further, though the "ringing sound generator" covers a broad class of structures and identifies the structure by its function, this does not necessarily render it insufficiently structural. *See Skky, Inc. v. MindGeek, s.a.r.l.*, 859 F.3d 1014, 1019 (Fed. Cir. 2017) (finding a term may be sufficiently structural "even if the term covers a broad class of structures and even if the term identifies the structure by their function' "); *Personalized Media*, 161 F.3d at 705 ("Even though the term 'detector' does not specifically evoke a particular structure, it does convey to one knowledgeable in the art a variety of structures known as 'detectors.' ").

The structural descriptions in the specification distinguish this case from *Mobilemedia Ideas*, which Apple cites for the proposition that a ringing sound generator has no structural meaning. There, the court found "alert sound generator for generating an alert sound when the call is received from the remote caller" to be means-plus-function in part because the specification did not describe the term. *Mobilemedia Ideas*, 178 F. Supp. 3d at 218–19. Importantly, the court subsequently concluded that "alert sound generator" provided sufficient corresponding structure for the means-plus-function limitation because, in the context of a cellular phone, the alert sound generator was "understood by persons of ordinary skill in the art to refer to an electronic circuit, including a speaker or vibrator, that was capable of generating sounds, as well as stopping the generation of such sounds." *Id.* The Court thus concluded that "those of skill in the art would recognize the structure in the specification and associate it with the corresponding functions in the claim." *Id. Advanced Ground Info* is similarly unavailing because the patentees in that case

acknowledged that the term "symbol generator" was coined for purposes of the patent. 830 F.3d at 1348.

For these reasons, the Court construes "**ringing sound generator**" to have its **plain and ordinary meaning**.

D. The '438 Patent

The '438 patent, entitled "Terminal for Information Processing," "relates to an information-processing terminal having a communication function and relates to a system for displaying information on a notice board at a request made by the information-processing terminal." '438 Patent at 1:6–10. "More particularly the present invention relates to an electronic notice-board system having an information processing terminal in addition to a display apparatus." *Id.* at 1:10–12. An object of the patent is to provide an electronic notice-board system that simplifies a command to start use of a nearby notice board and allows only users close to the notice board to contribute an article to the notice board and/or inspect the notice board. *Id.* at 1:46–50. Maxell asserts claims 1 and 4 of the '438 patent which are:

> **1**. An information-processing terminal comprising:
>
> an input unit for receiving an input entered by a user;
>
> a first short-distance communication unit for carrying out a short-distance communication with a display apparatus; and
>
> a second communication unit for carrying out a communication with said display apparatus through a network; wherein
>
> said first short-distance communication unit using said input, carries out an authentication process for allowance to use said display apparatus;
>
> said second communication unit carries out data exchange with said display apparatus if said authentication process is affirmed; and
>
> said second communication unit does not carry out data exchange with said display apparatus if said authentication process is not affirmed. . . .

4. A display apparatus for presenting information to users surrounding said display apparatus, comprising:

a first short-distance communication unit for carrying out a short-distance communication with an information processing terminal; and

a second communication unit for carrying out a communication with said information-processing terminal through a network; wherein

said first short-distance communication unit carries out an authentication process for allowance to use said information-processing terminal;

said second communication unit carries out data exchange with said information-processing terminal if said authentication process is affirmed; and

said communication unit does not carry out data exchange with said information-processing terminal if said authentication process is not affirmed.

The '438 patent describes a preferred embodiment "implementing an electronic notice-board system provided by the present invention." *Id.* at 2:60–62. The embodiment discloses a mobile terminal, illustrated in Figure 2, and a display terminal, whose internal configuration is shown in Figure 3.

5. "an input unit for receiving an input entered by a user"

Maxell's Proposed Construction	**Apple's Proposed Construction**
Plain and Ordinary Meaning	Function: to receive input entered by a user Structure: a keyboard; or equivalents thereof

The disputed term "an input unit for receiving an input entered by a user" appears in claim 1 of the '438 patent.

(1) Parties' arguments

Maxell asserts that "an input unit for receiving an input entered by a user" is readily understood by a person of ordinary skill in the art and that the specification uses the term "input unit" consistent with its plain and ordinary meaning. Docket No. 136 at 9–10. Maxell further

argues that extrinsic evidence—including the dictionary definition of input unit—reflects that the term refers to a definite class of structures that are used to receive an input entered by a user. *Id.* at 10 (citing IBM's 1994 Dictionary of Computing at 343 (defining "input unit" as a "device in a data processing system by means of which data can be entered into the system")).

Apple contends that "unit for" is a nonce phrase, and "input" imparts no further structure. Docket No. 161 at 10–11. Apple asserts that "input unit" is defined "only by its function . . . without imposing any structural limits." *Id.* at 11. Accordingly, Apple asserts that the term must be construed according to § 112 ¶ 6 and proposes a recited function of "to receive input entered by a user" and, as structure, "a keyboard; or equivalents thereof." *Id.* at 10.

(2) Analysis

The parties dispute whether this term is a means-plus-function term according to § 112 ¶ 6. Because the claims do not recite the word "means," there is a rebuttable presumption that § 112 ¶ 6 does not apply. While "unit" is a nonce term that can be "tantamount using the word means," *Williamson*, 792 F.3d at 1350, the full term in question is "input unit." The "input" modifier imparts structural significance to the term, and, as such, "input unit" is structural. *See id.* (holding that modifiers can provide structure to otherwise nonce nonstructural terms); *Alcatel USA Resources Inc. v. Microsoft Corp.*, No. 6:06-cv-500, 2008 WL 2625852, at *17 (E.D. Tex. Jun 27, 2008) (finding term "input unit" sufficiently structural). Apple has not overcome the presumption that "input unit" connotes structure.

One of ordinary skill would understand that an input unit connotes structure. *See Alcatel USA Resources*, 2008 WL 2625852, at *17 (finding "input unit" not a means-plus-function term and applying plain and ordinary meaning); *see TiVo Inc. v. EchoStar Commc'ns Corp.*, No. 2:04-

CV-1, 2005 U.S. Dist. LEXIS 46879, at *25 (E.D. Tex. Aug. 18, 2005) (applying the plain and ordinary meaning to "input section").

The specification provides some structural description for the term. The specification discloses an embodiment comprising a "mobile terminal" and a "display terminal." The mobile terminal serves as the "information processing terminal" and, as depicted in Figure 2, contains an "input/output unit" connected to other components. Specifically, the input/output unit is connected to a processor, a storage unit, a transmission/reception unit, a camera unit and a short distance communication unit which are all "connected to each other by an internal bus so that they are capable of exchanging information with each other." '438 patent at 3:39–42, Fig. 2. The specification further provides an exemplary structure for the input/output unit, including but "not limited to the liquid crystal display device and the ten-key board." '438 patent at 50–67; *Cf. Linear Tech.*, 379 F.3d at 1320 (finding that the term "circuit" when coupled with a description of the circuit's operation is sufficiently structural). The specification also describes the operation of the input/output unit, allowing a user to enter a comment to be displayed, and examples of inputs received by the user. *Id.* at 8:5; 8:57–60.

Extrinsic evidence further indicates that "input unit" connotes structure. *See, e.g.*, IEEE STANDARD DICTIONARY OF ELECTRICAL AND ELECTRONICS TERMS, "input device," 524 (6th ed. 1997) (defining "input device" as a "device used to enter data into a computer system" and listing "input unit" as a synonym for input device."); *see also MIT*, 462 F.3d at 1355 (relying on technical dictionaries to determine whether the term "circuitry" connotes structure). The fact that a term is described according to its function does not necessarily mean that the term fails to designate structure. *See Skky,* 859 F.3d at 1019 (Fed. Cir. 2017) (citing *TecSec, Inc. v. Int'l Bus. Machs. Corp.*, 731 F.3d 1336, 1347 (Fed. Cir. 2013)).

Apple's expert recognized that "input unit" refers to various known structures such as a "mouse, keyboard, touch screen, touch-pen, [and] voice activated inputs." Docket No. 136-2 ¶ 79. Nevertheless, the expert stated that "input unit" is not a term in the field "because many different classes of structure can act as an 'input unit.' " *Id.* However, as discussed previously, the fact that "a disputed term is not limited to a single structure does not disqualify it as corresponding structure, as long as the class of structures is identifiable by a person of ordinary skill in the art." *Linear Tech*, 379 F.3d at 1322. Even if the term covers a broad class of structures, it is sufficient if the claim term is used by persons of ordinary skill in the art to designate structure. *Id.*; *Skky,* 859 F.3d at 1019 (Fed. Cir. 2017); *see also Personalized Media*, 161 F.3d at 704–05 (finding the term "detector" to not be a means-plus-function limitation because it conveyed to one of skill in the art a variety of structures known as "detectors"). The fact that an "input unit" may refer to a "wide variety of structures" does not render the term nonstructural, nor does the fact that term is defined by its structure. *Personalized Media*, 161 F.3d at 704–05.

Accordingly, the Court construes "**an input unit for receiving an input entered by a user**" according to its **plain and ordinary meaning**.

6. "means for selecting an object displayed on said display apparatus"

Maxell's Proposed Construction	**Apple's Proposed Construction**
Agreed function: "selecting an object displayed on said display apparatus" Structure: Input/output unit 103 and associated software that allows for the claimed selection function.	Agreed function: "selecting an object displayed on said display apparatus" Structure: input/output unit 103, including a liquid crystal display device and a keyboard, and associated software; or equivalents thereof

(1) Parties' Positions

The parties agree that the term is a means-plus-function term and that the recited function is "selecting an object displayed on said apparatus." The parties also agree that the corresponding

structure relates to input/output unit 103 but dispute whether the associated structure requires further specificity.

Maxell argues that the disclosed structure is "input/output unit 103 and associated software that allow for the claimed function." Docket No. 136 at 13. Maxell asserts that the input/output unit connotes sufficient structure. *Id.* at 14.

Apple cites its arguments for the previous term asserting that "for the same reasons that 'input unit' is a means-plus-function limitation . . . 'input/output unit' does not recite sufficiently definite structure." Docket No. 161 at 12. Apple contends that "Maxell's construction simply replaces a black box that performs a recited function with another black box." *Id.* at 12 (citing *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1383–84 (Fed. Cir. 2009)). Apple then asserts that "a liquid crystal display device and ten-key board" are the only disclosed structures.

(2) Analysis

Input/output unit 103 is clearly linked to the function of selecting an object displayed on said display apparatus. *See* '438 patent at 8:57. For the reasons discussed for the previous term, the Court finds that input/output unit connotes sufficient structure to one of ordinary skill in the art. Accordingly, the Court construes "**means for selecting an object displayed on said display apparatus**" as a means-plus-function term:

Function: "**selecting an object displayed on said display apparatus**" and

Structure "**Input/output unit 103 and associated software that allows for the claimed selection function.**"

7. "display apparatus"

Maxell's Proposed Construction	Apple's Proposed Construction
"a display device comprising a first short-distance communication apparatus for carrying out a short distance communication with an information processing terminal and a second communication apparatus for carrying out a communication with the information-processing terminal through a network"	"an electronic notice board"

(1) The Parties' Positions

Maxell contends that the inventors of the '438 patent acted as lexicographers and defined "display apparatus" in the summary of the invention, describing the "display apparatus" according to the recited limitations in claim 4. *See, e.g.*, Docket. No. 136 at 11–12. Maxell argues that Apple's proposed construction improperly limits the term to a preferred embodiment. *Id.* Maxell further contends that Apple's construction violates the doctrine of claim differentiation because dependent claims 6 and 7 explicitly limit "display apparatus" to an "electronic notice board." Docket No. 165 at 6.

Apple agrees that the term has special meaning within the context of the '438 patent but argues for a narrower construction. *See* Docket. No. 161 at 12–13. Apple argues that the patent's repeated description of the invention as an "electronic notice-board system" limits the invention's scope and trumps claim differentiation. *Id.* at 12–14. In accordance with such limitation, Apple asserts that the patent uses the terms "electronic notice board" and "notice board" to describe the claimed "display apparatus" *Id.* at 13 (citing Docket No. 161-1 ¶ 73). Apple further asserts that the patent describes a "display apparatus" as a "display terminal," which is in turn defined as an "electronic notice board." *Id.* at 13–14 (citing '438 patent at 4:27–28; 4:46–47; 9:33–36). Accordingly, Apple asserts that "display apparatus" should be construed as an "electronic notice board."

Apple further asserts that Maxell's construction improperly attempts to import the specification's paraphrasing of claim 4 to define "display apparatus" which would render claim 4 superfluous. *Id.* at 14.

(2) Analysis

The parties' dispute amounts to a conflict, familiar in claim construction analysis, between the teachings in the specification and claim differentiation. *See, e.g.*, *Marine Polymer Tech. Inc. v. HemCon, Inc.*, 672 F.3d 1350 (Fed. Cir. 2012) (where an evenly divided en banc panel split over whether a construction dictated by the specification or a construction dictated by claim differentiation was more proper).

The claims support Maxell's proposal. Claims 1 and 4 define the invention from opposite directions: claim 1 is directed to and claims an "information-processing terminal" that communicates with a "display apparatus," while claim 4 is directed to and claims a "display apparatus" that communicates with an "information processing terminal." Claim 4 claims a "display apparatus . . . comprising a first short-distance communication apparatus for carrying out a short distance communication with an information processing terminal and a second communication apparatus for carrying out a communication with the information-processing terminal through a network." The "display apparatus" term also appears in claims 1–3 and 5–7. For example, claim 1 specifies that an "information processing terminal" has a "first short-distance communication unit" and a "second communication unit" for communicating with a "display apparatus." Unlike claim 4, claim 1 provides no further detail on the "display apparatus."

The parties agree that the "display apparatus" in claims 1 and 4 is the same. It follows that claim 4's limitations are incorporated into "display apparatus" in all the claims. Such a construction does not violate the principles of claim differentiation because claim differentiation

principles operate differently in the context of two independent claims. *Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1381 (Fed. Cir. 2006) (explaining that claim differentiation arguments have less force in the context of two independent claims because "two claims can use different terminology to define the exact same subject matter").

Apple asserts that "display apparatus" should be limited to an "electronic notice board." However, dependent claims 6 and 7 claim an electronic notice board system "including a display apparatus . . . wherein said display apparatus is an electronic notice board." The doctrine of claim differentiation therefore creates a rebuttable presumption that "display apparatus" is not limited to an "electronic notice board." *Liebel-Flarsheim*, 358 F.3d at 910. This presumption is strongest where, as here, "the limitation sought to be 'read into' an independent claim is the only meaningful difference between the two claims." *InterDigital Commns. LLC v. Inter. Trade Com'n*, 690 F.3d 1318, 1324 (Fed. Cir. 2012); *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001); *SunRace Roots Enter. Co. v. SRAM Corp.*, 336 F.3d 1298, 1303 (Fed.Cir.2003).

Apple argues that the written description overcomes the presumption against claim differentiation because it teaches that "display apparatus" is limited to an "electronic notice board." Apple argues that the patent repeatedly and consistently characterizes the invention as an electronic notice board system and characterizes the "display apparatus" as an "electronic notice board." *Id.* (citing *Verizon Servs. Corp. v. Vonage holdings Corp.*, 503 F.3d 1295, 1308 (Fed. Cir. 2007) (when a patent describes the features of the "present invention" as a whole, this description limits the scope of the invention)). Apple also argues that "the specification uses the terms 'electronic notice board' and 'notice board' 47 times to describe the claimed 'display apparatus.' " *Id.* at 13 (citing *GPNE Corp. v. Apple, Inc.* 830 F.3d 1365 (Fed. Cir. 2016) ("A patent's repeated and consistent characterization of a claim term in a particular way may require the claim term to be

construed in accordance with that characterization.")). Apple asserts that these statements in the specification overcome the presumption from claim differentiation. *Id.*

Apple does not, however, overcome the strong presumption of claim differentiation here. While the specification does discuss the "present invention" as relating to an "electronic notice board system," the specification also describes the invention as containing a general "display apparatus," not an "electronic notice board." '438 patent at 1:10–12 ("[T]he present invention relates to an electronic notice-board system having an information-processing terminal in addition to a display apparatus"); *see id.* at 2:5–17 (describing the "display apparatus of the present invention" in broad terms as used in claim 4).

The patent includes a single preferred embodiment "implementing an electronic-notice board system provided by the present invention." *Id.* at 2:61–63. The description of this embodiment does not use "electronic notice board" in place of "display apparatus." Instead, the specification describes a "display terminal" with generic components that serves as the "display apparatus" in the embodiment.

The patentees' broad descriptions of "display terminal" shows that they did not intend to limit "display apparatus" to an "electronic notice board." The patent discloses a broad "display apparatus" capable of serving as an electronic notice board in an electronic notice board system. For example, rather than simply disclosing an "electronic notice board," the embodiment describes a generic "display unit" which "serv[es] as a notice board" in the embodiment. '438 patent at 4:46–47. Moreover, the embodiment describes installing an "electronic notice-board program for implementing an electronic notice board function" on the display terminal, which again suggests that the display terminal/display apparatus is broader than an electronic notice board. *Id.* at 4:66–5:33.

That the inventors anticipated the invention being used in an electronic notice board system does not limit the scope of the patent to that narrow context where, as here, the specification uses broader terms to describe the invention. *See Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1301 (Fed. Cir. 2003) ("[T]he fact that the inventor anticipated that the invention may be used in a particular manner does not limit the scope to that narrow context."); *Vehicular Techs. Corp. v. Titan Wheel Int'l.* 141 F.3d 1084 (Fed. Cir. 1998). Advantages described in the body of the specification are not *per se* limitations to the claimed invention. *Vehicular Techs.*, 141 F.3d at 1096. The principal invention—the display terminal and display apparatus capable of performing two-way communication—appears to be useful in contexts outside of the electronic notice board system. Thus, the patentee's focus on the effect of the claimed invention in electronic notice board systems does not clearly "disavow the use of the invention outside the context of the electronic notice board system." *See Teleflex*, 299 F.3d at 1328. Ultimately, the specification's discussion of the invention in relation to an electronic notice board system does not "compel" a contrary construction despite the claim differentiation presumption. *See Marine Polymer* (Dyk, J., dissenting in part) (explaining that courts should adopt a construction violating the principles of claim differentiation only if it is the only construction consistent with the claim language and the written description).

With that said, Maxell's reasoning is also unpersuasive. Maxell asserts that the repetition of claim 4's language in the Summary of Invention is an express definition. The Court disagrees. Repeating claim language in the Summary of the Invention is a common practice by patent practitioners and does not ordinarily constitute an express definition. Moreover, the Court declines to include the phrase "display device" in the construction as Maxell proposes. "Display device" as used in the specification, refers to structure *within* the display terminal/display apparatus, not

structure for the display apparatus itself. *See* '438 patent at 4:50–52 (explaining that the "display unit" in the "display terminal" can be "any display device as long as the display device is capable of displaying information"). It would be improper to use "display device" in the construction of "display apparatus."

Accordingly, the Court construes "**display apparatus**" to mean **"a display comprising a first short-distance communication apparatus for carrying out a short distance communication with an information processing terminal and a second communication apparatus for carrying out a communication with the information-processing terminal through a network."**

7. "adding a comment to contributed data"

Maxell's Proposed Construction	**Apple's Proposed Construction**
Plain and Ordinary Meaning	"written content responsive to the contributed data"

The disputed term "adding a comment to contributed data" appears in claim 2 of the '438 patent.

(1) The Parties' Positions

Maxell asserts that the term is readily understood by those of skill in the art and requires no construction. *See* Docket No. 136 at 12–13. Maxell argues that the term is not limited to "written content" and that Apple inserts words that do not appear in the specification. *Id.* at 13.

Apple asserts that a construction is required because the word "comment" has different meanings in different contexts. Docket No. 161 at 15 (citing Docket No. 161-11 at 98:3–23). Apple then asserts that the specification requires that a comment added to contributed data be a "written content responsive to that data." *Id.* (citing '438 patent at 8:64–9:6 ("Subsequently, the user . . . ***writes a comment*** into the display field 1302. The content ID 502 is an ID identifying a

content for which the ***comment is written***. . . . Finally, the user selects a transmission button 1303 to start a process to select the content and input the ***written comment***.") (emphasis added)). To Apple, its construction is supported by the patent's goal—writing and posting text on an electronic notice board in response to "contributed data" already on the board. *Id.* (citing Docket No.161-2 ¶ 92).

(2) Analysis

Nothing in the intrinsic evidence supports limiting the meaning of "adding a comment to contributed data." Claim 2, for example, requires that the information-processing terminal of claim 1 have (i) a function of contributing data to said display apparatus and (ii) a function of adding a comment to contributed data. This language does not require the comment to be "written." To the extent that Apple's proposed requirement that the comment be "responsive" is different than the plain meaning of "adding . . . to contributed data," such limitation finds no support in the claim language.

Likewise, the specification does not support limiting the meaning of "adding a comment to contributed data." Apple has not pointed to language of lexicography, disavowal or disclaimer mandating that the content must be written or responsive. *See GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014); *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009). The descriptions in the Background of the Invention and Summary of the Invention do not indicate any intent to limit the term to written and responsive content.

Instead, Apple cites non-limiting descriptions of the preferred embodiment to support its proposed construction. However, "even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus.,*

Inc. v. Bridgeport Fittings, Inc., 632 F.3d 1246, 1254 (Fed. Cir. 2011); *see Innova/Pure Water*, 381 F.3d at 1117. Even within the description of the preferred embodiment, the patent does not describe "written" and "responsive" content as relevant or necessary to the patent's goal.

Apple has not demonstrated a clear intent to limit the claim term from its plain and ordinary meaning. The embodiment's description of a comment as written does not suggest a clear intent to limit the scope. The Court hereby construes the term "**adding a comment to contributed data**" to have its **plain and ordinary meaning**.

E. The '493 Patent

The '493 patent is entitled "Electric Camera." The patent generally relates to an electric camera that solves a problem of conventional electric cameras incapable of taking both moving and static images of satisfactory quality. *Id.* at 2:62–3:7. The'493 patent's abstract is reproduced below:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

More particularly, the '493 patent describes an electric camera including an image sensing device having a number (*e.g.*, 1200 pixels) of vertically arranged pixels and a number (*e.g.*, 1600 pixels) of horizontally arranged pixels. *Id.* 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. *Id.* at 7:31–39. When taking moving video, a number (*e.g.*, 1200/240 = 5) of the vertically arranged pixels are mixed or culled so that the number of lines of output signals conforms to the number of

effective scanning lines (*e.g.*, 240 lines if in an NTSC system) of a television monitor. *See, e.g.*, 4:64–5:6; 9:30–43.

Claim 1 of the '493 patent is reproduced below:

1. An electric camera comprising:

an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines, wherein N is equal to or greater than three times a number of effective scanning lines M of a display screen;

a signal processing unit, that generates image signals by using the output signals of the image sensing device; and

a display unit with the display screen, to display an image corresponding to the image signals;

wherein during monitoring in a static image mode, the signal processing unit generates the image signals by mixing or culling signal charges accumulated in the N number of vertically arranged pixel lines to provide pixel lines only at pixel intervals of K1 pixels;

wherein during recording in a moving video mode, the signal processing unit generates image signals by mixing or culling signal charges accumulated in the N number of vertically arranged pixel lines to provide pixel lines only at pixel intervals of K2 pixels, a value of K1 being different from a value of K2; and

wherein during recording in the static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in the N number of vertically arranged pixel lines, to provide N pixel lines.

8. "effective scanning lines . . . of a display screen"

Maxell's Proposed Construction	**Apple's Proposed Construction**
"lines on a display screen corresponding to an actually displayed image"	"the lines displayed in a single field of an interlaced scanning display"

The disputed term "effective scanning lines . . . of a display screen" appears in claim 1 of the '493 patent.

(1) The Parties' Positions

The parties' dispute centers on whether the patent is limited to "interlaced scanning" displays. Interlaced scanning involves displaying half of the pixel lines in one frame and the other half in the next frame. Docket No. 136 at 18. Another scanning technique, developed after interlaced scanning, is progressive scanning, which involves displaying each of the pixel lines in sequence for each frame. *Id.* at 19. According to Maxell, by the time of the invention of the '493 patent, those of skill in the art were familiar with progressive scanning techniques. *Id.* at 19.

Maxell claims that the term should be construed to mean "the number of lines on a display screen corresponding to an actually displayed image." Docket No. 136 at 18. Maxell contends that the term "effective" is used consistently to refer to "that which is actually being used." *Id.* at 20. As such, Maxell argues that "effective scanning lines" mean the "lines actually being utilized to display an image." *Id.* at 20. At bottom, Maxell asserts that descriptions of interlaced scanning and the use of terms such as "field" and "vertical blanking period" relate only to a nonlimiting embodiment. *Id.* at 22.

According to Apple, a person of ordinary skill would have understood that television displays at the time of the alleged invention utilized interlaced scanning. *Id.* at 19. Apple's expert acknowledges that "interlaced" and "progressive" scanning were both known at the time of the patent but states that interlaced scanning displays were more "common." Docket No. 161-4 ¶ 34.

Apple asserts that the invention aims to produce "signals conforming to a television system such as NTSC and PAL," and all disclosed embodiments refer to interlaced television standards. *Id.* at 21 (citing '493 patent at 1:30–34; 10:18–21). Accordingly, Apple argues that the construction of "effective scanning lines" should reflect this goal. Docket No. 161 at 18.

Apple argues that its proposed construction is consistent with the specification's definition of "effective scanning line" as part of a display field, a term relevant only in interlaced scanning systems.

> The NTSC system, for example, performs interlaced scanning on ***two fields, each of which has an effective scanning line*** number of about 240 lines (the number of scanning lines actually displayed on the monitor, which is equal to the number of scanning lines in the vertical blanking period subtracted from the total number of scanning lines in each field).

'438 patent at 1:39–43.

Maxell argues that Apple's proposed construction impermissibly excludes progressive scanning displays. *Id.* at 19. According to Maxell, the claim language does not support such a limitation. Maxell further points to the specification, which states that the "invention can also be applied to other television systems," to allege that the invention covers progressive scanning systems. Docket No. 136 at 21 (citing '493 patent at 10:18–21).

(2) Analysis

The claims do not support limiting the term to interlaced scanning. The term appears in claim 1 of the '493 patent, which is reproduced below in relevant part:

> An electric camera comprising:
>
> > an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines, wherein N is equal to or greater than three times a number of **effective scanning lines M of a display screen**; …

'493 patent at 15:57–63 (emphasis added). The claim specifies that pixels are arranged vertically and horizontally in a grid pattern, where N is the number of vertically arranged pixel lines and M is the number of effective scanning lines. The claim does not reference "interlaced" scanning, nor does it mention a "single field," "vertical blanking period" or any other term unique to interlaced scanning.

Nor does the specification support limiting the term to interlaced scanning. The specification describes the patent in general terms as relating to "photography of video cameras, camcorders, digital still cameras and others using solid state image sensing device, and more particularly to an electric camera using a solid state image sensing device with a large number of pixels." *Id.* at 2:57–61. This does not support any limitation.

Contrary to Apple's position, the patent's stated goal is quite broad: to solve issues in the prior art by providing an "image sensing device with a sufficient number of pixels for still images and enables taking of highly details still images of a moving video taking with reduced image quality degradation without increasing circuitry such as field memory." '438 patent at 3:8–13. The patent discusses limitations in prior art systems adapted to interlaced scanning systems. *See* '493 patent at 1:51–53 (describing prior art image sensing devices designed to take moving images according to the NTSC system). However, describing the patent as providing an advantage over these systems, without more, is not a *per se* limitation to the claimed invention. *See Teleflex*, 299 F.3d at 1328. The patent's use of NTSC standards in the embodiments similarly fails to limit the term. *See Comark Commc'ns, Inc.*, 156 F.3d at 1187 ("Although the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims."); *Arlington Indus.*, 632 F.3d at 1254; *Innova/Pure Water*, 381 F.3d at 1117; *see also Liebel-Flarsheim Co.*, 358 F.3d at 906. Both parties rely on the following portion of the specification to define "effective scanning lines."

> The NTSC system, for example, performs interlaced scanning on two fields, each of which has an effective scanning line number of about 240 lines (the number of scanning lines actually displayed on the monitor which is equal to the number of scanning lines in the vertical blanking period subtracted from the total number of scanning lines in each field).

'493 patent at 1:30–50 (emphasis added). This discussion of the NTSC standard is a non-limiting example in the specification used to explain the limitations of prior art systems. *See Comark Commc'ns, Inc*, 156 F.3d at 1187. This phrase is best read as both broadly defining "effective scanning lines"—the number of scanning lines actually displayed on the monitor—and applying that meaning to the exemplary NTSC system. Consistent with this provision, the term "effective scanning lines" refers to the "number of scanning lines actually displayed on the monitor."

Accordingly, the Court construes "**effective scanning lines**" as "**the number of scanning lines displayed on the display screen.**"[3]

9. "culling" and "mixing"

Term	Maxell's Proposed Construction	Apple's Proposed Construction
"mixing … signal charges"/ "mixed"	"combining signal charges from multiple pixels" / "combined"	"collecting charges from multiple pixels for combined transfer" / "collected"
"culling signal charges" / "culled"	Plain and ordinary meaning	"selecting pixels for output by skipping pixels at predetermined intervals" / "selected"

The disputed terms "culling signal charges" / "culled" and "mixing . . . signal charges" / "mixed" appear in claims 1, 4, 5 and 10 of the '493 patent. These terms are combined for analysis based on the similarity of the terms as used in the patent and the parties' positions as to these terms.

(1) The Parties' Positions

Maxell proposes construing "mixing" to mean "combining signal charges from multiple pixels" and "mixed" as "combined." Maxell asserts that its proposed constructions use language from Apple's constructions and supported by the specification. Docket No. 136 at 25. Maxell

[3] The court utilizes the term "display" instead of "monitor" to remain consistent with the language in the claims referring to displays.

argues that Apple's construction is unclear and improperly limits the claims to an undefined "combined transfer."

Apple asserts that further clarification is necessary. Apple argues that the patent "consistently describes 'mixing' as collecting charges from multiple pixels for combined transfer" and that " 'mixing' occurs as part of the charge transfer process." *Id.* at 22. Apple further explains that the specification's disclosure that pixels are "mixed together to reduce the number of output lines from the image sensing device" teaches that the combination "of pixel charges occurs as part of charge transfer to reduce the number of output lines from the image sensor." *Id.* Apple further asserts that post-transfer processing is "disparaged" by the '493 patent. *Id.* (citing '493 patent at 2:10–17). Specifically, the patent criticizes prior art systems that combined signal charges after they were read out from the image sensing device as requiring "a large processing circuit, such as field memory." *Id.* at 23 (citing '493 patent at 2:18–25). Because the patent purports to eliminate the need for field memory, Apple asserts that the mixing must be " part of the transfer process."

As to "culling," Maxell contends that it requires no construction because one of ordinary skill in the art would have no difficulty understanding its meaning. Docket No. 136 at 23 (citing 136-8 ¶¶ 49–50). Maxell asserts that Apple's construction is unduly limiting and at least "partially redundant" with the other limitations because "skipping" and "predetermined intervals" are not used to describe "culling" and because the patent's description of "culling" would be familiar to and easily understood by persons of ordinary skill. Docket No. 136 at 23.

Apple and its expert assert that "culling" has special meaning within the context of the '493 patent. Docket No. 161-12 at 66:18–68:18. Apple argues that the specification's only explanation of "culling"—which equates culling with skipping pixel lines—supports its construction. *Id.* at 24; Docket No. 161 at 23 (citing '493 patent at 10:9–12 ("The number of

lines of output signals can also be reduced by a so-called culling operation, by which only one line of signal charges of pixels is read out for every predetermined number of lines.")). Apple argues that Maxell's construction stretches "culling" to cover any operation that results in fewer than all pixels in the array.

(2) Analysis

The claim language does not expressly define the "mixing" or "culling" terms. Rather, the surrounding claim language specifies the result of the mixing/culling operations. *See* '493 patent at 16:1–6. The claims explain that mixing/culling results in pixel lines only at pixel intervals of K1 pixels (for claim 1) or pixel lines separated from one another by intervals of a first/given distance (claims 5 and 10). Claim 1 further explains that the "signal processing unit" performs the mixing/culling operation using the "output signals of the image sensing device." *Id.* at 15:64–16:5.

The specification has numerous references to the "mixing" and "culling" terms. Consistent with the claims, the specification makes clear that "mixing" or "culling" reduces the number of pixel lines of output signals. *See* '493 patent at 1:6–12 ("vertically adjoining pixels are mixed together to reduce the number of output lines"); 5:3–5 ("vertically mixing five pixels (1200 pixel rows/240 scanning lines) can match the number of lines of output signals from the image sensing device to the number of effective scanning lines"); 1:43–50 (describing that for an image sensing device having about 480 pixel rows, two vertically adjoining pixels in each field are mixed together inside or outside the image sensing device to generate 240 scanning lines). The joint usage of "mixing" and "culling" in the patent suggests that the operations use on the same input and result in a similar output (*i.e.*, a reduced number of pixel lines), and are performed by the same device. The main difference appears to be the manner by which the pixel rows are reduced.

The parties agree that "mixing" involves combining signal charges. Apple's expert describes the "mixing" process as "combining signal charges from multiple pixels." *See* Docket No. 161-4 at ¶ 49 (further describing lines of pixels as "vertically mixed together by combining charges accumulated in four pixels"). Maxell's construction incorporates this understanding; indeed, Maxell proposes aconstruction using Apple's expert's own language: "combining signal charges from multiple pixels." Maxell's construction also comports with the teaching of the claim and specification that the "mixing" function combines pixels to reduce signal lines.

Apple argues that a more limited construction is required based on the patent's disparagement of the prior art. But the phrases "collecting" and "combined transfer" are not found anywhere in the claims or specification.

Apple explains that its proposed construction limits the mixing process to "part of transferring the charges from the sensor" rather than including the post-transfer processing approach disparaged by the patent (Maxell's position)." Docket No. 161 at 22. According to Apple, the only way to distinguish the invention from the prior art "is to perform mixing as part of the signal transfer, to combine these charges ***as it is being transferred from image sensor to another device.***" Docket No. 153 at 35 (emphasis added). Apple's expert testimony likewise suggests that Apple's construction aims to restrict the mixing function specifically to the image sensing device. Docket No. 161-4 ¶ 52 (stating that Maxell's construction is too broad because it "permits the combination of pixels to occur anywhere in the system, for example, in the camera system after all effective pixels were read out from the image sensing device"). Apple's counsel likewise asserted in the *Markman* hearing that the only way for the invention to make sense "is to perform mixing as part of the signal transfer, to combine the charges as it is being transferred from image sensor to another device." Docket No. 187 at 153:1–7.

Apple's proposed construction does not clearly limit the mixing operation as Apple suggests. Apple's construction makes no mention of the image sensing device. Notably, Apple's counsel later stated during rebuttal that that its "construction is that mixing can occur inside the image sensor ***or outside the image sensor***" but that the "mixing operation has to be performed as part of a signal transfer from one place to another." *Id.* at 154:19–20 (emphasis added).

If Apple's construction requires the mixing process to occur in the image sensing device or as signals are transferred from the image sensing device, then the construction would contradict the language of claim 1, which states:

> a signal processing unit, that generates signals by using ***the output signals of the image sensing device***; . . . wherein . . . the signal processing unit generates the image signals by mixing or culling signal charges accumulated in the N number of vertically arranged pixel lines to provide pixel lines only at pixel intervals of K1 pixels.

Under Claim 1, then, mixing occurs *after* the image sensing device outputs the charges to the signal processing unit.

The specification's criticism of a prior art system utilizing post-transfer processing does not overcome the plain language of claim 1. The specification does not describe the invention as requiring mixing to occur before transfer from the image sensing device or as part of the transfer process. The specification des not "repeatedly extoll the virtues" of combined transfer or repeatedly criticize post transfer processing. *See UltimatePointer, L.L.C. v. Nintendo Co., Ltd.*, 816 F.3d 816 (Fed. Cir. 2016) (finding the "repeated description of the invention as a direct pointing system, the repeated extolling of the virtues of direct pointing, and the repeated criticism of indirect pointing clearly indicated that "handled device" should be limited to "direct-pointing device"). And in fact, the specification also criticizes a prior art system that performs mixing

inside the image sensing device. *See* '493 patent at 2:44–53. Ultimately, neither the claims nor the specification requires mixing to occur as signals are transferred from the image sensing device.

Apple's alternative argument that the mixing function may occur anywhere, so long as it is performed "as part of a transfer process," is likewise unsupported by the claims. Again, neither the claims nor the specification contains this language. Claim 1 explains that the mixing is performed by the "signal processing unit" and does not discuss any related transfer operation. Apple's argument appears to be derived from the patent's discussion of an embodiment. '493 patent at 5:56–66 (explaining, in the context of the embodiment, that signals are mixed in the "horizontal transfer unit 33" of an image sensing device). As discussed previously, terms will not be narrowed according to embodiments in the specification absent a clear intent to so limit the terms. Further, this embodiment is targeted to a system where the image sensing device performs the mixing function. However, the patent clearly did not intend to limit the invention to this embodiment because Claim 1 performs the mixing operation on signals output from the image sensing device. Further, the specification does not indicate that this process is necessary to address limitations in prior art. Ultimately, Apple has not shown that its construction is required pursuant to prior art disparagement or that its construction is otherwise supported or mandated.

As to the "culling" and "culled" term, Apple and Maxell's experts disagree as to whether term is understood by persons of ordinary skill in the art. As discussed above, the claims themselves do not define "culling." However, the specification defines "culling:"

> The number of output signals can also be reduced by a so-called culling operation, by which only one line of signal charges of pixels is read out for every predetermined number of lines.

'493 patent at 10:9–12.

Though provided in the context of an embodiment, this statement is not simply a description of an embodiment or a single example of the culling operation. Instead, it explains the

"culling operation" referred to in the invention. Though there is always tension in determining "whether a statement was designed to define the claim term or to describe a preferred embodiment," *E-Pass Technologies, Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369 (Fed. Cir. 2003), an express definition should not be ignored just because it appears in the context of a preferred embodiment, as the term does here. *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322 (Fed. Cir. 2009). Accordingly, culling should be construed consistent with this description.

Apple asserts that its construction imports the same meaning. The Court disagrees. First, the phrase "selecting" is not explained or consistent with any language in the specification. Further, the specification requires one line of signal charges of pixels to be read out for every predetermined number of lines—*e.g.* reading out any one line for every five pixels. Apple's construction appears more limiting, requiring skipping pixels at predetermined intervals—*e.g.* always selecting the first line and skipping the next four. Though the result is the same—one pixel line for every 5 pixels—the operation is not the same. Ultimately, such rephrasing, even if true to the outcome described in the patent, is unnecessary because the definition in the patent is clear on its own.

Accordingly, the Court construes "**mixing . . . signal charges**" and "**mixed**" as "**combining signal charges from multiple pixels"** and **"combined."** Further, the Court construes "**culling signal charges**" and "**culled**" as "**reading out only one line of signal charges of pixels for every predetermined number of lines**" and "**only one line of signal charges of pixels is read out for every predetermined number of lines**."

F. The '991 Patent

The '991 patent is entitled "Communication Apparatus and Method for Receiving an Inbound Videophone Call Notice While Displaying Digital Information on the Display." The

Background of the patent explains that a telephone communication system and a TV broadcast system are independent systems and different apparatuses, and various problems exist with a conventional telephone and TV system. *See* '991 patent at 1:39–2:31. To provide a solution to conventional systems, the '991 patent discloses "a new and improved TV receiver with TV function (referred to as videophone function-added TV 35 receiver hereafter) set having videophone call handling functionality, which performs both the reception of a digital broadcast program signal and the transmission and reception of a videophone signal between itself and another videophone function-added TV receiver at the other end of a 40 communication line." *Id.* at 2:32–40.

Maxell asserts claim 1 of the, reproduced below:

> A communication apparatus for transmitting and receiving digital information to and from another communication apparatus, comprising:
>
> a network interface configured to receive first digital information which is received from a contents server which is coupled to the communication apparatus via the network interface and second digital information from the another communication apparatus;
>
> a camera configured to generate video information which is included in third digital information;
>
> a display configured to display at least the first and the second digital information; and
>
> a processor;
>
> wherein when the processor receives an inbound videophone call notice while displaying the first digital information on the display, the processor pauses the displaying of the first digital information and renders the camera operative;
>
> wherein the processor outputs the third digital information to the another communication apparatus and displays the second digital information of the videophone call on the display; and
>
> wherein when the processor receives an input for stopping the videophone call, the processor stops output of the third digital information and stops the camera.

10. "communication apparatus"

Maxell's Proposed Construction	Apple's Proposed Construction
Plain and Ordinary Meaning	"videophone function-added TV receiver"

The disputed term "communication apparatus" appears in claims 1–4, 8–10 and 12 of the '991 patent.

(1) The Parties' Positions

Maxell asserts that a person of ordinary skill in the art would understand "communication apparatus" according to its plain and ordinary meaning. Docket No. 136 at 15 (citing *Biscotti Inc. v. Microsoft Corp.*, No. 2:13-cv-01015, 2016 U.S. Dist. LEXIS 155336, at *16 (E.D. Tex. Nov. 9, 2016) (construing "communication device" according to its plain and ordinary meaning)).

Apple asserts that "communication apparatus" should be construed according to the patent's "repeated and consistent characterization of the alleged invention" as a "videophone function-added TV receiver." Docket No. 161 at 15–16 (citing *GPNE*, 830 F.3d at 1370). Apple notes that the phrase "communication apparatus" is not used anywhere in the specification, whereas "videophone function-added TV receiver" is used 284 times. *Id.* According to Apple, such a construction is consistent with the patent's goal of improving television receivers. *Id.* at 16. Apple also asserts that its proposed construction is consistent with the prosecution history because, throughout the substantive examination, the application was titled "Television Receiver with a TV Phone Function." *Id.* at 17.

Maxell responds that Apple's construction is improper for two reasons. First, Maxell asserts that the proposed construction excludes preferred embodiments which describe a "video telephone system using but not including the videophone function-added TV receiver sets."

Docket No. 136 at 16 (citing '991 patent at 3:29–33; 4:8–10; 5:16–28; 6:8–10). Maxell also argues that Apple's expert "confuses repetition with redefinition." *Id.* at 16.

Apple argues that its construction does not exclude alternative embodiments because such embodiments include a plurality of videophone function-added TV receiver sets. *Id.* at 16 n.8 (citing '991 patent at 2:56–60).

(2) Analysis

The parties dispute centers on whether the specification's repeated characterization of the invention limits the construction of "communication apparatus." The claim terms themselves do not require limitation. However, the specification is always highly relevant to claim construction analysis. "Usually it is dispositive; it is the single best guide to the meaning of a disputed term." *Honeywell Intern. Inv. v. ITT Industries, Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006).

Describing features of the "present invention" as a whole can be "clear and unmistakable statements constituting disavowal or disclaimer." *Luminara Worldwide, LLC v. Liown Elecs. Co.*, 814 F.3d 1343, 1353 (Fed. Cir. 2016); *Honeywell Int'l Inv.*, 452 F.3d at 1318; *Verizon Serv. Corp*, 503 F.3d at 1308. Similarly, when a patent "repeatedly and consistently characterizes a claim term in a particular way, it is proper to construe the claim term in accordance with that characterization." *See, e.g., GPNE.*, 830 F.3d at 1370; *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1318 (Fed. Cir. 2014).

Here, the patent characterizes the invention as relating to videophone function-added TV receivers. In the "Summary of the Present Invention," the specification describes in detail eight features of the "technology" of the invention, each time referring to a "videophone function added TV receiver." *See* '991 patent at 2:33–3:26. ("This technology provides a new and improved TV receiver with TV function (referred to as a videophone function-added tv receiver hereafter");

2:56-57; 3:29–30; 4:8–10; 4:53–54; 5:26–27; 5:58-59; 6:78. Each embodiment similarly describes using a "videophone function-added TV receiver." The specification never uses the phrase "communication apparatus," but uses the phrase "videophone function-added TV receiver" over 200 times. These statements impose a limit on the term "communication apparatus." Maxell has not demonstrated that Apple's proposed construction excludes any embodiments. In fact, every embodiment is focused on features of the "video telephone-function added TV receiver," even those embodiments disclosing a "video telephone system." "When, as here, the written description clearly identifies what the invention is, an expression by a patentee during prosecution that he intends his claims to cover more than what his specification discloses is entitled little weight." *Honeywell*, 452 F.3d at 1319; *see also Biogen, Inc. v. Berlex Labs*, 318 F.3d 1132, 1140 (Fed. Cir. 2003).

Accordingly, the Court construes "**communication apparatus**" as "**videophone function-added TV receiver.**"

CONCLUSION

The Court adopts the constructions above for the disputed and agreed terms of the '317, '999, '498, '493, '794, '193, '306, '991 and '438 patents. Furthermore, the parties should ensure that all testimony that relates to the terms addressed in this Order is constrained by the Court's reasoning. However, in the presence of the jury the parties should not expressly or implicitly refer to each other's claim construction positions and should not expressly refer to any portion of this Order that is not an actual construction adopted by the Court. The references to the claim construction process should be limited to informing the jury of the constructions adopted by the Court.

So ORDERED and SIGNED this 18th day of March, 2020.

Robert W Schroeder III

ROBERT W. SCHROEDER III
UNITED STATES DISTRICT JUDGE

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TEXARKANA DIVISION

MAXELL LTD., Plaintiff, v. HUAWEI DEVICE USA INC, HUAWEI DEVICE CO., LTD., Defendants.	§ § § § § § § § § §	CIVIL ACTION NO. 5:16-CV-00178-RWS LEAD CASE
MAXELL LTD., Plaintiff, v. ZTE CORPORATION, ZTE USA INC., Defendants.	§ § § § § § § § § §	CIVIL ACTION NO. 5:16-CV-00179-RWS

CLAIM CONSTRUCTION
MEMORANDUM AND ORDER

On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. See Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005); Teva Pharm. USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831 (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a Markman hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " Phillips v. AWH Corp., 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc., 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to

[1] The Court consolidated the case against Huawei (Case No. 5:16-cv-178) with the case against ZTE (Case No. 5:16-cv-179) for pretrial purposes.

define the patented invention's scope. Id. at 1313–14; Bell Atl. Network Servs., Inc. v. Covad *Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. Phillips, 415 F.3d at 1312–13; Bell Atl. Network Servs., 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. Phillips, 415 F.3d at 1312–13; Alloc, Inc. v. *Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

Claim language guides the Court's construction of claim terms. Phillips, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." Id. Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." Id. Differences among claims, such as additional limitations in dependent claims, can provide further guidance. Id.

"[C]laims 'must be read in view of the specification, of which they are a part.' " Id. (quoting Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " Id. (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)); Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. Phillips, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own

lexicographer. See Irdeto Access, Inc. v. EchoStar Satellite Corp., 383 F.3d 1295, 1301 (Fed. Cir. 2004).

The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." Teleflex, Inc., 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " Globetrotter Software, Inc. v. Elam Computer Group Inc., 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting Vitronics Corp., 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1571 (Fed. Cir. 1988); see also Phillips, 415 F.3d at 1323.

"A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." Teva Pharm. USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 840–41 (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." Id. at 841. "In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." Id.

Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." Phillips, 415 F.3d at 1317

(quoting C.R. Bard, Inc., 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent. Id. at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. Id. Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." Id.

A. Departing from the Ordinary Meaning of a Claim Term

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." Golden Bridge Tech., Inc. v. Apple Inc., 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting Thorner v. *Sony Computer Entm't Am.* LLC, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); see also GE Lighting Solutions, LLC v. AgiLight, Inc., 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." GE Lighting Solutions, 750 F.3d at 1309.

To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." Id. (quoting Thorner, 669 F.3d at 1365); see also Renishaw, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." Renishaw, 158 F.3d at 1249.

To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. Cordis Corp. v. Boston Sci. Corp., 561 F.3d 1319, 1329 (Fed. Cir. 2009); see also Thorner, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." 3M Innovative Props. Co. v. Tredegar Corp., 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

A patent claim may be expressed using functional language. See 35 U.S.C. § 112, ¶ 6; Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means . . . for performing a specified function" and that an act may be claimed as a "step for performing a specified function." Masco Corp. v. United States, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. Masco Corp., 303 F.3d at 1326; Williamson, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. See Media Rights Techs., Inc. v. Capital One Fin. Corp., 800 F.3d 1366, 1372 (Fed.

Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing Williamson, 792 F.3d at 1349; Robert Bosch, LLC v. Snap-On Inc., 769 F.3d 1094, 1099 (Fed. Cir. 2014))); Williamson, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); Personalized Media Communications, L.L.C. v. *Int'l Trade Commission*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." Williamson, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step . . . is a determination of the function of the means-plus-function limitation." Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc., 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." Id. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." Id. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." Id. The corresponding structure "must include all structure that actually performs the recited function." Default Proof Credit Card Sys. v. Home Depot U.S.A.,

Inc., 412 F.3d 1291, 1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." Micro Chem., Inc. v. Great Plains Chem. Co., 194 F.3d 1250, 1258 (Fed. Cir. 1999).

For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. WMS Gaming Inc. v. *Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. Aristocrat Techs. Austl. Pty Ltd. v. *Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " Biosig Instruments, Inc. v. Nautilus, Inc., 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120, 2124 (2014)). Whether a claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. Nautilus, 134 S. Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. Id. at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." ePlus, Inc. v. Lawson Software, Inc., 700 F.3d 509, 517 (Fed. Cir. 2012).

When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." Biosig Instruments, Inc. v. Nautilus, Inc.,

783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1351 (Fed. Cir. 2005); accord Interval Licensing LLC v. AOL, Inc., 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing Datamize, 417 F.3d at 1351).

In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. Williamson, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." Id. at 1352.

AGREED TERMS

Before the Markman hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit . . . , said mobile communication terminal device comprising" / "A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit . . . , said mobile communication terminal device comprising"	The preambles of claims 1 and 9 of the '517 patent are limiting.

('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system" ('139 Patent claims 1 and 11)	The preambles of claims 1 and 11 of the '139 patent are limiting.
Preambles ('491 Patent claims 1 and 2)	The preambles of claims 1 and 2 are limiting.
"voice signal code" ('193 Patent claims 1 and 7)	Plain and ordinary meaning
"an input portion to which video signals are inputted" ('901 Patent claim 1)	Plain and ordinary meaning
"black side" ('901 Patent claim 2)	Plain and ordinary meaning
"video signal[s]" ('901 Patent claims 1 and 2)	Plain and ordinary meaning
"obtaining an index of communication quality between the terminal and the base stations" ('139 Patent claims 1 and 11)	"obtaining an indication of communication quality between the terminal and the base stations"
"using said input" ('438 Patent claim 1)	Plain and ordinary meaning
"an authentication process for allowance to use said display apparatus" ('438 Patent claim 1)	"a process that authorizes the user to use the display apparatus"
"a predetermined constant period of time" ('443 Patent claim 1)	Plain and ordinary meaning
"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function:** selecting an object displayed on said display apparatus **Structure:** Input/output unit 103 and associated software that allows for the claimed selection function. See, e.g., 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning

"a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function:** receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure:** An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof" ('491 Patent claim 2)	Plain and ordinary meaning
"from an outside" ('491 Patent claim 7)	Plain and ordinary meaning
"an input device for inputting a destination" ('317 Patent claim 1)	Plain and ordinary meaning
"a device for getting a location information of another portable terminal from said another terminal via connected network" ('317 Patent claim 10)	Plain and ordinary meaning

"a device for retrieving a route from said present place to said destination" ('317 Patent claim 15)	Plain and ordinary meaning
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" ('493 Patent claim 5)	Plain and ordinary meaning
"a display unit with a display screen, that displays an image corresponding to the image signals" ('493 Patent claim 5)	Plain and ordinary meaning
"an image-instability detector" ('493 Patent claim 6)	Plain and ordinary meaning
"an image-instability of the electric camera" ('493 Patent claim 6)	Plain and ordinary meaning
"an encoder/decoder apparatus" ('193 Patent claims 1 and 7)	Plain and ordinary meaning
"open-loop power control" ('193 Patent claims 1 and 7)	Plain and ordinary meaning
"closed-loop power control" ('193 Patent claims 1 and 7)	Plain and ordinary meaning
"bias condition" ('193 Patent claims 1 and 7)	"the bias voltage and/or current setting of the amplifier"
"a function defining a relation between bias data and gain data stored in said memory" ('193 Patent claim 7)	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
"capacity detector for detecting a remaining capacity of said battery" ('794 Patent claim 1)	Plain and ordinary meaning
"controller for controlling operation of said function devices based on said remaining capacity" ('794 Patent claim 1)	Plain and ordinary meaning
"a capacity detector detecting a remaining battery capacity of said battery" ('794 Patent claim 9)	Plain and ordinary meaning
Preambles	Preambles are limiting

('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('695 Patent claims 1 and 4)	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence" ('695 Patent claims 1 and 4)	Plain and ordinary meaning
"a memory" ('695 Patent claims 1 and 4)	Plain and ordinary meaning
"begins decoding processing" ('695 Patent claims 1 and 4)	Plain and ordinary meaning
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	**Function:** displaying on said display means that said apparatus is in one of a standby state and an active state in response to said power saving state and said non- power saving state, respectively **Structure:** State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones	**Function:** displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure:** display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:45–47; 13:49–51; 13:54–57;

of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function:** displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure:** display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115-2 at B-1–B-14.

At the oral hearing the parties also agreed to the constructions of the following terms:

"GPS receiver means for receiving GPS-oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function:** receiving GPS oriented signals and generating received GPS signals **Structure:** GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof

"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57–60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each

> group, the characterizing quantities of the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. See, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is

[2] The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115-1.

stored" or (2) the phrase "is stored in RAM." Id. Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." Id. (citing Docket No. 100-1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." Id. (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. Id. Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited to the RAM embodiment. Id. (citing Docket No. 106-7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " Id. (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." Id. (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined

by 'storage unit,' and the latter part of the claim term is simply describing information that **is stored** in the already claimed storage unit." Id. at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

> The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:
>
> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S. Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued . . . only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." Novo Indus., L.P. v. Micro Molds Corp., 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. See Interval Licensing LLC v. AOL Inc., 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing Nautilus, Inc., 134 S.Ct. at 2130, n.8 (2014)).

The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would

recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. See Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. See Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—i.e., 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." Id. at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket No. 95-1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. Id.

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input

to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." Id. Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to . . . using either . . . alone.' " Id. (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. Id. at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." Id. at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. Id. at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." Id. According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." Id. at 18–19. But, Huawei contends, "that is selecting, not combining." Id. at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." Id. (citing On Demand Machine Corp. v. Ingram Indus., Inc., 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction

would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." See H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. Id. at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. Id. at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular]

positioning means [with] the reliability of the positioning. . . [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l*

Ltd. v. Beyond Innovation Tech. Co., 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400), (3:12–17), (5:3–7).	**Function:** combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean

disclosed in Figure 3. Id. Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. Id. at 24 (citing Docket 95-1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. Id. (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. Id. at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. Id. (stating that lines 36–41 of 4:36–56 is not structure for the combiner;

4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." Medtronic Inc., 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." Id. The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. See '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an exemplary embodiment of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the

specification. See Medtronic, Inc., 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (1:23–27), (3:10–11; block 604 in Fig. 2), (4:4–16), (2:66–3:6), (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular based position result. **Structure:** position calculation unit for cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites

sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; see also '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. Id. at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." Id. at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[] the receive operations" of baseband signal modulation, synchronization acquisition, and reception timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." Id. (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention

can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. Id.

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing'292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. Id. According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." Id. (quoting ePlus, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated- or non-structure. Id. (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not identify an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." Id. (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one could devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. Id.

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be

implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions . . . [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." Id. at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite specific algorithms for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique

for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (2:60–65; block 602 in Fig. 2), (3:38–4:3), (5:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used. . . .
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205. . . .

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." Id.

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. Id. at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various

signals. Id. Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. Id. Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. Id. Maxell contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. Id.

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS- and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites . . . and the received signal quality' of the GPS signals. Id. (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." Id. (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). Id. at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. Id. at 20 (citing Noah Sys., Inc. v. Intuit Inc., 675 F.3d 1302, 1317 (Fed. Cir. 2012); ePlus, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10) .

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." Id. Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. Id.

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. Id. at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." Id. (citing ePlus, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. Id. (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms

include using the number of GPS satellites or cellular base stations **as** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations **as** the GPS/cellular reliability value. Id. (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201. . . .

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites. . . and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability

calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (3:10–11; block 605 in Fig. 2), (4:15–42), (3:6–11), (5:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations . . . and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using

the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

Structure: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have pixels smaller than the moving pictures, still pictures encoded by a second

encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. See '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

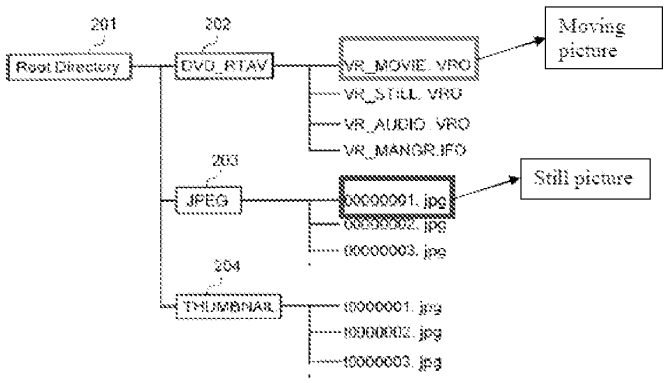
11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method. . . ." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." Id. Maxell contends that Huawei imports a limitation

by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. Id. at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. Id. at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). Id. at 11.



Id. (citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. Id. While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. Id. Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. Id. (citing '440 Patent 12:61–63 ("if no fine still picture signal is output . . . the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still

pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures

are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). Id. at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving picture) so that a device that only reproduces moving pictures can now reproduce a still picture." Id. at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. Id. at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. Id. (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." Id. (citing Docket No. 100-19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." Id. at 13 (citing Docket No. 100-19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. Id. at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. Id. at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

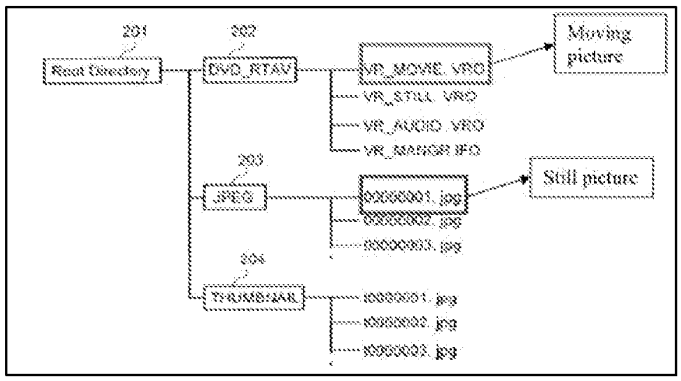
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

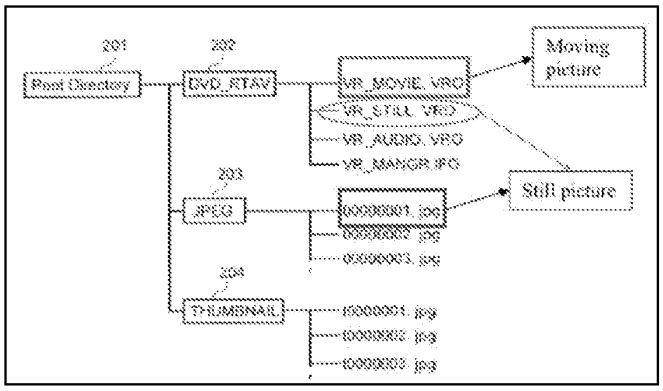
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119-3 at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. See H'rg Tr. at 73:2–74:16 .

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file . . . as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 . . ..' " Id. (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. Id. at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. Id. at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc., 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the

specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106-1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." Id. (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106-2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106-3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106-4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106-5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations in the claim, but it did not do so in the '440 Patent. Id.

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer

mandating that the still pictures must also be ones produced by the first encoding method. See GE Lighting Solutions, 750 F.3d at 1309; Cordis Corp., 561 F.3d at 1329.

Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. Arlington Indus., Inc. v. Bridgeport Fittings, Inc., 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal is output." Id. at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100-19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. See

Phillips, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and first pictures having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119-3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an

alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. See Phillips, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); see also Athletic Alternatives, Inc., 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15)

Maxell's Proposed Construction	**Huawei's Proposed Construction**
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." Id. (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. Id.

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method and a still picture encoding method. Docket No. 100 at 15. According to Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. Id. Huawei repeats the arguments presented above with regard to the "still pictures encoded by. . ." term to assert that encoding a still picture using both a still picture encoding method **and** a moving picture encoding method is "one of the primary inventive contributions of the patent." Id. (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture **and** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals . . .

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. Id. Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG) Second still picture (JPEG)	X (no disclosure) Compressed image data
A picture	Thumbnail
X (no dislosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture".

Id. (citing Docket No. 100-23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. Id. at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." Id.

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. Id. at 17 (citing Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc., 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100-23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." Id. According to Maxell, Huawei's proposed constructions would

"render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." Id. at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. See GE Lighting Solutions, 750 F.3d at 1309; Cordis Corp., 561 F.3d at 1329.

As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100-23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." Id. at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. Phillips, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." Phillips, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

'517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. See, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication

determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"
('517 Patent claim 1)

Maxell's Proposed Construction[3]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure**: Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (3:33–39),(5:25–50), (5:65–6:44), (7:32–67), (8:52–9:5), (9:28–10:9), and (3:5–10).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

[3] Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115-1 at A-6.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. Id. (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100-2 (Wells Decl.) ¶ 43, Noah Systems, 675 F.3d at 1317 and ePlus, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. Id. (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." Id. (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. Id. (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. Id. (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407-1) but does not vary the wait time before switching. Id. at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. Id. at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. Id. (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. Id. (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." Id. (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." Id. (citing '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, i.e., CPU or microcomputer." Id. (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106-6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." Id. (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. Id. (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is

predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." Id. (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. Id. (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. Id. at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. Id. (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest-State" and "Moving-State" priorities identified in Figure 4(b). Id. Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. Id. at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the claimed function are not

disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. §112 ¶ 6 is not disclosed. See WMS Gaming Inc., 184 F.3d at 1349; Aristocrat Techs., 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster." '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. See '517 Patent Figure 4 (block S407), Figure 6 (block S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. Id. at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. Id. at 9:2–18. Neither passage references

changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. See WMS Gaming Inc. v. *Int'l* Game Tech., 184 F.3d at 1349.

Accordingly, the Court construes the "selection switching determination unit for . . ." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

[4] The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

14. "waits a longer time until switching" ('517 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." Id. (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. Id. at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. Id. at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device

> 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. Id. According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. Id. at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. Id. at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. Id. (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. Id. Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. Id. (citing Docket No. 100-24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. Id. Huawei contends that unlike a passive word like "takes" (i.e., "takes

a longer time"), "wait" implies an intentional delay. Id. Huawei further states that the specification likewise speaks of "setting" the delay. Id. (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." Id. at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. Id.

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface **when said movement determination unit determines** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the

specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus

in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. See, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure**: A sensor, a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof	This term is written as a means-plus-function **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling system, and Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figs. 14 and 15)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent

discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. Id. (citing '443 Patent 11:42–46). Maxell further points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices . . ." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing'443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. Id. According to Defendants, as originally presented, claim 1 was written so as to capture both

approach type and contact type systems. Id. (citing Docket No. 100-27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user . . . approaches or comes in contact with . . . the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." Id. (citing Docket No. 100-28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. Id. (citing Docket No. 100-29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. Id. Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. Id.

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing Docket No. 100-28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> [a)] a detecting means for detecting whether [an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user] a user-associated medium at least approaches [or comes in contact with a whole of or] at least a part of a housing of [the] said apparatus; and

Docket No. 100-29 at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." Phillips, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." See *Seachange Int'l, Inc.* v. C-COR, Inc., 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The

> location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking, not driving, in a system that is not usable in an object car that is running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc.* v. Raytek Corp., 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a

[5] The parties did not submit oral argument for this term.

walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." Id. (citing'317 Patent 1:34–37). Maxell contends that the same passage explains that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. Id. (citing'317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. Id. Maxell contends that the term "walking navigation" is readily understood and has a common meaning. Id. at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). Id. Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing Tronzo v. Bimet, Inc., 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that

> the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition . . . it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. Id.

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. Id. (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39-46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction[6]	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure**: insufficient corresponding structure is disclosed

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100-6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing In re Katz, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." Id. at 14–15 (quoting In re Katz, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that

[6] At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." Id. (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. Id.

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server. . .wherein. . .said device connected to said server outputting. . .and receiving. . .." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. Id. at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. See Braasch Decl. at ¶¶ 50–54; Teva Pharm. USA, 135 S.

Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. See '317 Patent 9:40–9:51.

ZTE invokes WMS Gaming, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in In re Katz. See In re Katz, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

Structure: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent

[7] The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for image sensing" **Structure**: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (2:59) See also FIGs 10, 13A, and 13B; [6:17–22]; [15:23–35]

The parties dispute whether or not the term is a means-plus-function term.

[8] The parties did not provide oral argument for this term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. Id. Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. Id. (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95-4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. Id.

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." Id. at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. Id.

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. Id. ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure for image sensing:

'493 Patent	'729 Patent
an image sensing device with **a light receiving sensor** having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern;

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. Id. at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. Id. For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." Id. (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words with a light receiving sensor transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words with a light receiving sensor are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell

argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. Id. And, according to Maxell,the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, image sensing) in conjunction with the word device places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36-65, Figure. 2, Free Stream Media Corp. v. Alphonso Inc., 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

Though a term that does not use "means" is presumed not to be a means-plus-function term, Williamson does note that "device" maybe a nonce word "that is tantamount to using the word means." Williamson, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In Williamson, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–

55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in Williamson.

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." Id. at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device. . . [where reference number] 30 are **pixels each formed of a photodiode**, which are arranged horizontally and vertically in a grid pattern." Id. at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. See Free Stream, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100-4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

Maxell's Proposed Construction	**ZTE's Proposed Construction**
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "detecting an image-instability of the electric camera" **Structure**: insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post Williamson decisions have held that "'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." Id. (citing Personalized Media v. *Int'l Trade Comm'n*, 161 F.3d at 705; Raytheon Co. v. Cray, Inc., 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); NetFuel, Inc. v. F5 Networks, Inc., 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16a, 16b, that detect vertical and horizontal image-unstabilities." Id. (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." Id. (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." Id. (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. Id. (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." Id. (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if

the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is unclear how that measurement would be converted into pixel displacement. Id. (citing Mansoorian Decl. at ¶ 55).

In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'. . . would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." Id. (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area . . . due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. Id.

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and

lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. See Personalized Media, 161 F.3d at 705; Raytheon Co., 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the understanding of one skilled in the art regarding the use of gyro

sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. See Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"an amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera" refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" Id. (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." Id. at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. Id. at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. Id. ZTE contends that the specification is silent on the meaning of "image instability." Id. ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. Id. (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. Id. (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. Id. ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. See Id. In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability"	"Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability"

The parties dispute whether the last portion of the term must be a shift "in a direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. Id. Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

[9] The parties did not provide oral argument for this term.

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. See GE Lighting Solutions, 750 F.3d at 1309; Cordis Corp., 561 F.3d at 1329; Arlington Indus., 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure**: "display screen of a television system" (3:22–23) or other screen compatible with NTSC or PAL format (1:35–36; 10:19–21)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. Id. at 49 (citing Free Stream, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. Id. (citing Madisetti Decl. at ¶¶ 52–54).

[10] The parties did not provide oral argument for this term.

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
a display unit with the display screen, to display an image corresponding to the image signals;	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit."

Id. at 41–42.

ZTE contends that Maxell's reliance on Free Stream is unavailing because, in contrast to the device construed in Free Stream, here, the claim does not include reference to a display screen, structure required for a display unit to work. Id. at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. Id. at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

ZTE again argues that Williamson would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by Williamson. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one

skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the

> transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and bias values in memory (e.g., G_1B_1, G_2B_2. . . G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

28. "variable amplitude amplifier" ('193 Patent claims 1 and 7)

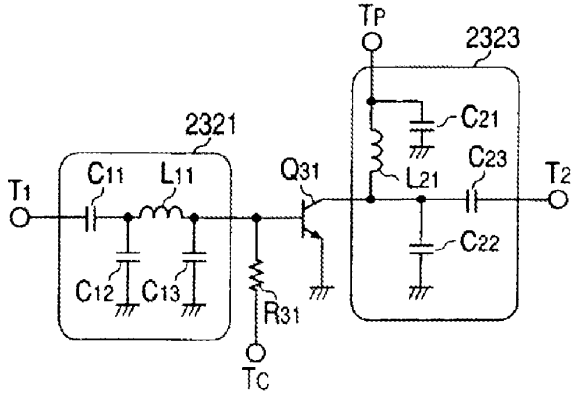
Maxell's Proposed Construction	**ZTE's Proposed Construction**
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of

amplification formed by amplifiers 232 and 234. Id. (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. Id. (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. Id. at 53 (citing Docket No. 95-3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. Id. at 45 46 (citing Docket No. 100-7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. Id. at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. Id. at 45–46. The higher the voltage

of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. Id. at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. Id.

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. Id. at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." Golden Bridge Tech., 758 F.3d at 1365 (Fed. Cir. 2014) (quoting Thorner, 669 F.3d at 1365); see also GE Lighting Solutions, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." GE Lighting Solutions, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. Cordis Corp., 561 F.3d at 1329; see also Thorner, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." Arlington Indus., Inc., 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. Id. at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. See Teva Pharm. USA, 135 S. Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to

discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. Id. at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230. . . ." Id. at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. Id. at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. Id. at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." Id. at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while

a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)
"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"hardware, software, or a combination of the two that consumes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure**: insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. See H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." Id. (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106-10 (Kiaei Decl.) at ¶¶ 46–49, 56).

According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. Id. Maxell argues that each function device can perform a single function or a function device can perform multiple functions. Id. (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." Id. at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. Id.

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing Wenger Mfg., Inc., v. Coating Mach. Sys., Inc., 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim. . .") and Mass Engineered Design, Inc. v. Ergotron, Inc., 559 F. Supp. 2d 740, 747–48 (E.D. Tex. 2008) ("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device

that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100-3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. Id. (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2. . . ." Docket No. 100 at 51 (citing'794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. Id. (citing Williamson, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); Bosch, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." Id. at 50 n. 16 (citing'794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the Aristocrat Techs line of cases would require the inclusion of an algorithm in the structure. See H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32)), ZTE provides an alternative function

directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. See Applied Med. Res. Corp. v. U.S. Surgical Corp., 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." Medtronic, Inc., 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." Id. Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and

independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." Id. at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." Id. at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. See Phillips, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. See Medtronic, Inc., 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the

> method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (e.g., a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	**ZTE's Proposed Construction**
Function: detecting change in said method of	**Function**: claim 1: "for detecting change in

[11] The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. See H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. See Id. at 113–114.

compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor – such as a CPU –programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S5–S9), Fig. 9 (including steps S3–S14) and corresponding citations in the specification at 5:60–64, 6:30–7:54, 9:13–18, 9:28– 44, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read only memory to said first memory" **Structure**: claims 1 & 2: an external CPU (FIG 1) connected via a bus between a read only memory and the first memory, running the algorithm of Figs. 4 and 5. (6:30–7:54)

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. Id. at 37. Maxell contends that the claims are directed to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio

data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. Id. at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. Id. (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term external merely describes a location of the CPU (e.g., CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises. . . an audio decoder 20, [and] an external CPU 50. . .")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. Id.

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller

function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. Id. at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises . . . an external CPU 50." Id. (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. Id. (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. Id. According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. Id. (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC §112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." Williamson, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step . . . is a determination of the function of the means-plus-function limitation." Medtronic, Inc., 248 F.3d

at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." Id.

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. Id. Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. Id. at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises . . . an external CPU 50." Id. 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded, to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence . . . ," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. Id. at 38–39 (citing Docket No. 95-2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. Id. at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106-8 (Maher Decl. B) at ¶¶ 25, 28–32).

[12] The parties did not provide oral argument for this term.

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself. . . extracts the method of compression and encoding." Id.

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. Id. (citing Interval Licensing LLC v. AOL, Inc., 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. Id. (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). Id.

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. Id. (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include **what** is receiving the input. The claim language itself does not make such a mandate and the claim language is understandable to

just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. See Teva Pharm. USA, 135 S. Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 Patent claims 1 and 4)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding to said memory from outside said memory" **Structure**: an external CPU (FIG 1) connected via a bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (6:30–7:54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95-5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing Sound View Innovations, LLC v. Facebook, Inc., 2017 WL 222177, at *5 (D. Del. May 19, 2017) ("'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc.* v. Universal Avionics Sys. Corp., 264 F. Supp. 2d 135 (D. Del. 2003) ("controller" is not an MPF term); 911EP v. *Whelen Eng'g* Co., Inc., 512 F. Supp. 2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller. . . . Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); SynQor, Inc. v. Artesyn Techs., Inc., 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd,* 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining . . ." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's en banc decision in Williamson, which removed the heavy presumption against Section

112(6) application where "means" is not recited. Id. ZTE contends that the sole remaining case is Sound View, which ZTE submits was decided incorrectly. Id. ZTE contends that Williamson itself is a close analogue as the term in that case was "distributed learning control module." Williamson, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. Id. at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. Id. at 53. ZTE contends that these claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. Id. Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). Id.

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. Id. at 53.

In its reply, Maxell contends that as to Sound View Innovations, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. Masco Corp., 303 F.3d at 1326; Williamson, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the

functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. See Media Rights Techs., Inc., 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing Williamson, 792 F.3d at 1349)); Robert Bosch, LLC, 769 F.3d at 1099; Williamson, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); Masco Corp., 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); Personalized Media Communications, L.L.C., 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function . . . even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. Id. at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes

that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

SIGNED this 31st day of January, 2018.

Robert W Schroeder III

ROBERT W. SCHROEDER III
UNITED STATES DISTRICT JUDGE

Electronic Acknowledgement Receipt

EFS ID:	42736285
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
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Application Type:	Reexam (Patent Owner)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	Apple_QuickTake_200_Getting_Started_With_the_QuickTake_200_Camera_QuickTake_200__21237895pt1.pdf	16013525 4f544923f6ee9b85c19e2f2275fd6a8fe651ae13	no	49

Warnings:

Information:					
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3	Non Patent Literature	Sony_DCS-F55F55E_Service_Manual_Ver_11_Jul_1999_21238098pt1.pdf	25222660 429e67e5fb3002dbe4369b604c0cef04d77df099	no	57
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4	Non Patent Literature	Sony_DCS-F55F55E_Service_Manual_Ver_11_Jul_1999_21238098pt2.pdf	9669446 f69091a1cab2a9efe0e104053b1999bb00257157	no	58
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5	Non Patent Literature	Kim_S_et_al_Development_of_Mobile_Station_in_the_CDMA_Mobile_System_Vol_19__21238013.PDF	426368 f6b3f533873ed9f369449e401a4be8ff7e031580	no	26
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6	Non Patent Literature	Shin_S_et_al_The_CDMA_Mobile_System_Architecture_Vol_19_No_3_pp_98-115_21238077.PDF	235478 56937698b82d08170e9310963d4d77b56bfddb4e	no	18
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7	Non Patent Literature	Salmasi_A_et_al_On_the_System_Design_Aspects_of_Code_Division_Multiple_Access__21238051.PDF	647646 3032ca6f9c2c7f93d031f44d1b5e60b7bfacd6fa	no	6
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9	Non Patent Literature	ThumbsPlus_Manual_Supported_File_Types_Feb_11_1998_21238110.PDF	12669516 277f7af53fd52366bd0a428c3170b02e55fe8ca6	no	9
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Information:					
10	Non Patent Literature	ThumbsPlus_Manual_Release_Notes_Version_310_Release_Notes_1997_21238109pt1.pdf	11757537 7d2942e867b80c15988fc732a258ad6cbc2a8e24	no	9
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11	Non Patent Literature	ThumbsPlus_Manual_Release_Notes_Version_310_Release_Notes_1997_21238109pt2.pdf	15205499 ad8e526d2eea0f70808a201edeec84245c977d9e	no	10
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12	Non Patent Literature	Shinnick_J_Hitachi_MPEG_Cam_Makes_Moves_TidBITS_Publishing_Inc_Mar_23_199_21238080.PDF	68309 a6790953c7f45c237edb76f18634a7263b3c4577	no	4
Warnings:					
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13	Non Patent Literature	Secretarys_Office_of_Hitachi_Ltd_Hitachi_Introduces_Worlds_First_MPEG_Camera__21238057.PDF	116628 6c861fbbd1005ffb3d43f370ae5e383d4aafd1ad	no	4
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Information:					
14	Non Patent Literature	Proceedings_of_1997_IEEE_International_Symposium_on_Consumer_Electronics__pp_1-8_21238030.PDF	1233232 48f0d63aa482a58c954434fef62c300c15604528	no	8
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15	Non Patent Literature	Kinugasa_T_et_al_A_Video_PrePost-Processing_LSI_for_Video_Capture_IEEE_Transa_21238016.PDF	730347 cdff29ab2d23768c13b159294f4cd5e65cd92ff0	no	5
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16	Non Patent Literature	Slocombe_M_Sony_Cybershot_DCS-F55E_Review_Internet_Magazine_Jun_1999_21238084.PDF	110387 f7e33e47c7fe3c6cef9778897f876a75ccf83d69	no	2
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18	Non Patent Literature	Digital_Still_Camera_Image_File_Format_Standard_version_21_Japan_Electronic_Indu_21237961.PDF	1048605 5f0e51f06edf7c578a7dc3ca9073bb5669de5e4a	no	172
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19	Non Patent Literature	Hitachi_Ltd_Hitachi_Home_Electronics_America_Inc_Announces_Compatibility_of_21238000.PDF	89853 b58132d9055ad91844e4d7042db23c5f29e1aef5	no	2
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20	Non Patent Literature	Kodak_Professional_DCS_300_Series_Digital_Cameras_Users_Guide_1-1_-_F-1_21238020.PDF	4344560 b5cebfafed0901c2b87abe73e636cc713832ac83	no	256
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21	Non Patent Literature	Aliftiras_G_Receiver_Implementations_for_a_CDMA_Cellular_System_pp_1-121_Ju_21237894.PDF	1373765 be6edc69de38f2f3c268a8b64eac7a1434ebcbe5	no	121
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Information:					
22	Non Patent Literature	Kurashige_T_et_al_Development_of_MPEG_Camera_1997_IEEE_International_Symposiu_21238024.PDF	637169 b5f4b85a8a9395c126a1248713d6386c07e6903	no	4
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Information:					

23	Other Reference-Patent/App/Search documents	Claim_Construction_Order_in_Maxell_Ltd_v_Apple_Inc_Case_No_5-19-cv-00036_21216922.PDF	674769 0349a56e040d8ce0f1188471b795141e0d7569ac	no	57
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25	Non Patent Literature	CohenHarveyARetrievalandBrowsingofImagesUsingImageThumbnails.pdf	1164088 4ddf6a4b5f6e328e7da230a55ab4d693a5424eb3	no	9
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Document Description: Information Disclosure Statement filed

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37 CFR 1.501
INFORMATION DISCLOSURE CITATION IN A PATENT

(Sheet 1 of 19)

Docket Number (Optional)	Patent Number
009379.00002\US	8,339,493
Applicant	
Issue Date	Art Unit
December 25, 2012	3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	3,486,128	12-23-1969	US Department of Army	330	285	02-07-1968
	4,131,919	12-26-1978	Lloyd et al.	386	225	05-20-1977
	4,434,435	02-28-1984	Fujimoto	348	277	11-18-1981
	4,541,010	09-10-1985	Alston	348	283	06-17-1983
	4,591,900	05-27-1986	Heeb et al.	348	277	12-12-1983
	4,691,253	09-01-1987	Silver	386	200	05-13-1985
	4,750,041	06-07-1988	Vogel et al.	348	220.1	09-10-1987
	4,766,580	08-23-1988	Go et al.	369	21	09-30-1985
	4,788,672	11-29-1988	Toyooka et al.	369	30.09	07-22-1986
	4,811,421	03-07-1989	Havel et al.	455	69	03-12-1987
	4,827,462	05-02-1989	Flannagan et al.	369	30.09	03-26-1987
	4,855,724	08-08-1989	Yang	345	88	03-23-1987

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	1998/028843	07-02-1998	World Intellectual Property Organization (WIPO)			√	
	1998/057491	12-17-1998	World Intellectual Property Organization (WIPO)				√
	0840503	05-06-1998	European Patent Office				√
	0587954	03-23-1994	European Patent Office				√
	H60136481	05-17-1994	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Digital Still Camera, DSC-F55-F55E Instructional Manual, (1999).
		MPEGCAM MP-EG1A, Instruction Manual, Hitachi (1997).
		D. Grotta and S. W. Grotta, "Digital Cameras, the Digital Chameleon," PC Magazine, Vol. 16, No. 13, July 1997 ("PCMag July 1997").

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 2 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	4,901,307	02-13-1990	Gilhousen et al.	370	320	10-17-1986
	4,907,183	03-06-1990	Tanaka	713	340	03-24-1988
	4,910,599	03-20-1990	Hashimoto	348	240.2	08-01-1989
	4,958,915	09-25-1990	Okada et al.	345	97	02-13-1989
	4,963,981	10-16-1990	Todaka et al.	348	240.2	06-21-1989
	4,991,004	02-05-1991	Hayashi et al.	358	527	02-03-1989
	4,992,753	02-12-1991	Jenson et al.	330	129	10-02-1989
	5,018,017	05-21-1991	Sasaki et al.	348	231.3	12-08-1989
	5,054,052	10-01-1991	Nonami	455	574	07-06-1989
	5,056,109	10-08-1991	Gilhousen et al.	370	342	11-07-1989
	5,060,074	10-22-1991	Kinugasa et al.	348	208.6	10-10-1990
	5,083,266	01-21-1992	Watanabe	713	601	12-24-1987

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	H03117985	05-20-1991	Japan			√	
	H04092592	03-25-1992	Japan			√	
	H09298755	11-18-1997	Japan			√	
	H10210367	08-07-1998	Japan			√	
	2000-295531	10-20-2000	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Apple QuickTake 200, Getting Started With the QuickTake 200 Camera, QuickTake 200 User's Manual, (1997).
		J. Ozer, "Digital Video Cameras," PC Magazine Vol. 18 No. 7 (April 6, 1999).
		JVC Digital Camcorder GR-DVL9600 GR-DVL9500, User's Manual, Victor Company of Japan, Ltd., (1999).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
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37 CFR 1.501
INFORMATION DISCLOSURE CITATION IN A PATENT

(Sheet 3 of 19)

Docket Number (Optional)	Patent Number
009379.00002\US	8,339,493
Applicant	
Issue Date	Art Unit
December 25, 2012	3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,101,173	03-31-1992	DiPiazza et al.	330	136	11-28-1990
	5,124,963	06-23-1992	Ando	369	30.09	01-07-1991
	5,128,629	07-07-1992	Trinh	330	129	04-22-1991
	5,148,418	09-15-1992	Tsurushima	369	30.23	01-30-1992
	5,173,709	12-22-1992	Lauro et al.	342	443	06-03-1991
	5,177,720	01-05-1993	Kondo	369	30.04	02-06-1990
	5,193,223	03-09-1993	Walczak et al.	455	115.1	07-27-1992
	5,222,104	06-22-1993	Medendorp	375	308	12-30-1991
	5,245,297	09-14-1993	Claydon et al.	330	129	03-02-1992
	5,264,939	11-23-1993	Chang	348	322	05-29-1992
	5,267,262	11-30-1993	Wheatley, III	455	522	10-08-1991
	5,287,192	02-15-1994	Iizuka	348	311	07-15-1992

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	H09275351	10-21-1997	Japan			√	
	H06060158	03-04-1994	Japan			√	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Belfor, R. A. **F.**, et al., Subsampling of Digital Image Sequences using Motion Information, Motion Analysis and Image Sequence Processing, (1993).
		Sony Consumer Electronics Guide: DCR-TRV900 - More Specifications, Sony Corporation, https://web.archive.org/web/19990424085854/http://www.sel.sony.com/SEL/consumer/ss5/office/camcorder/digitalvideoproducts/dcr-trv900_specs.shtml, (April 24, 1999).
		Sony Consumer Electronics Guide: DCR-TRV900, Sony Corporation, https://web.archive.org/web/19990128112515/http://www.sel.sony.com:80/SEL/consumer/ss5/office/camcorder/digitalvideoproducts/dcr-trv900.shtml, (January 28, 1999).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 4 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,287,555	02-15-1994	Wilson et al.	455	115.1	07-22-1991
	5,230,056	07-20-1993	Hoshina	713	340	08-06-1991
	5,283,651	02-01-1994	Ishizuka	348	704	08-01-1991
	5,319,449	06-07-1994	Saito et al.	348	223.1	04-16-1992
	5,321,849	06-14-1994	Lemson	455	67.11	05-22-1991
	5,337,006	08-09-1994	Miyazaki	330	130	07-20-1992
	5,396,290	03-07-1995	Kannegundla et al.	348	312	03-19-1993
	5,383,223	01-17-1995	Inokuchi	375	297	06-04-1993
	5,390,338	02-14-1995	Bodin et al.	455	69	04-11-1994
	5,402,173	03-28-1995	Noguchi et al.	348	322	02-22-1994
	5,402,182	03-28-1995	Sugiura	348	655	07-15-1991
	5,420,632	05-30-1995	Yamagiwa	348	240.3	01-19-1994

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Sony Digital Still Camera, MVC-FD83/FD88 User's Manual, Sony Corporation, (1999).
		Sony Digital Video Recorder, DCR-TRV900 User Manual, Sony Corporation, (1998).
		Kinugasa, Toshiro, et al., Electronic Image Stabilizer for Video Camera Use, IEEE Transactions on Consumer Electronics, Vol. 36, No. 3, (August 1990).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,423,081	06-06-1995	Thiele et al.	455	116	08-16-1993
	5,434,625	07-18-1995	Willis	348	564	10-26-1992
	5,438,365	08-01-1995	Yamashita et al.	348	297	11-16-1994
	5,440,343	08-08-1995	Parulski et al.	348	316	02-28-1994
	5,448,292	09-05-1995	Matsui et al.	348	224.1	05-18-1994
	5,450,129	09-12-1995	Matoba et al.	348	294	01-24-1994
	5,452,473	09-19-1995	Weiland et al.	455	88	02-28-1994
	5,470,233	11-28-1995	Fruchterman et al.	434	112	03-17-1994
	5,485,486	01-16-1996	Gilhousen et al.	370	335	03-23-1994
	5,493,335	02-20-1996	Parulski et al.	348	231.6	06-30-1993
	5,497,191	03-05-1996	Yoo et al.	348	208.6	12-07-1994
	5,497,192	03-05-1996	Ishizuka	348	208.13	02-28-1995

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Using the QuickTake 200 AC Adapter, published by Apple Inc., (1997).
		Adachi, F., et al., Wideband DS-CDMA for Next-Generation Mobile Communications Systems, IEEE Communications Magazine, (Sep. 1998).
		Published advertisement from The Courier-News (Bridgewater, New Jersey) newspaper dated Feb. 17, 1999.

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,502,484	03-26-1996	Okada	348	208.6	07-14-1995
	5,517,239	05-14-1996	Nakayama	348	222.1	08-12-1993
	5,521,636	05-28-1996	Nakayama et al.	348	222.1	06-01-1995
	5,543,789	08-06-1996	Behr et al.	340	995.12	06-24-1994
	5,548,616	08-20-1996	Mucke et al.	375	295	09-09-1994
	5,552,989	09-03-1996	Bertrand	701	516	04-28-1994
	5,559,471	09-24-1996	Black	330	277	12-21-1994
	5,559,778	09-24-1996	Inokuchi et al.	369	53.24	12-28-1994
	5,568,187	10-22-1996	Okino	348	224.1	03-07-1995
	5,574,747	11-12-1996	Lomp	375	144	01-04-1995
	5,592,382	01-07-1997	Colley	701	467	03-10-1995
	5,592,575	01-07-1997	Nakazato	382	312	06-08-1993

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Sasama, J., et al., Multimedia Information Systems Applying MPEGCAM, Hitachi Review, Vol. 48, No. 1, pp. 44-46, (1999).
		FlashPix format and Architecture White Paper, Eastman Kodak Company, Rochester, NY., pp. 1-27, (Jun. 17, 1996).
		Published advertisement from The Indianapolis News (Indianapolis, Indiana) dated Sep. 4, 1998.

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,603,106	02-11-1997	Toda	455	126	07-11-1995
	5,604,730	02-18-1997	Tiedemann, Jr.	370	252	07-25-1994
	5,608,707	03-04-1997	Ogawa et al.	369	84	01-31-1996
	5,617,060	04-01-1997	Wilson et al.	330	129	04-13-1995
	5,627,857	05-06-1997	Wilson	375	219	09-15-1995
	5,638,132	06-10-1997	Hokari et al.	348	556	12-12-1994
	5,642,378	06-24-1997	Denheyer et al.	375	216	11-17-1994
	5,657,082	08-12-1997	Harada et al.	348	262	12-19-1995
	5,666,160	09-09-1997	Hwang	348	240.2	06-03-1996
	5,666,531	09-09-1997	Martin	1	1	04-07-1995
	5,668,597	09-16-1997	Parulski et al.	348	350	12-30-1994
	5,684,532	11-04-1997	Ely	348	240.99	10-06-1995

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Cheng, Fu-Sheng, A New Approach to Dynamic Range Enhancement, (Oct. 16, 1994).
		Abidi, Asad A., Direct-Conversion Radio Transceivers for Digital Communications, IEEE Journal of Solid-State Circuits, Vol. 30, No. 12, (Dec. 1995).
		Published advertisement from The Indianapolis News (Indianapolis, Indiana) dated Sep. 12, 1998.

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,689,815	11-18-1997	Yamazaki et al.	455	69	05-04-1995
	5,701,157	12-23-1997	Kato et al.	348	240.99	07-09-1993
	5,710,981	01-20-1998	Kim et al.	455	69	05-23-1995
	5,734,424	03-31-1998	Sasaki	348	222.1	09-23-1994
	5,734,427	03-31-1998	Hayashi	348	333.11	05-16-1995
	5,752,171	05-12-1998	Akiya	455	126	05-22-1996
	5,774,797	06-30-1998	Kawano et al.	455	127.2	09-22-1995
	5,781,150	07-14-1998	Norris	342	357.34	10-13-1995
	5,790,477	08-04-1998	Hauke	368	10	06-09-1997
	5,793,923	08-11-1998	Sawanobori	386	225	09-19-1996
	5,818,182	10-06-1998	Viswanadham et al.	318	116	12-30-1994
	5,832,373	11-03-1998	Nakanishi et al.	455	126	12-03-1996

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Digital Camera Coolpix 900 Reference Manual, Nikon, pp. 1-79., (1998).
		Lowe, Henry J., et al., Using Agent-Based Technology to Create a Cost Effective, Integrated Multimedia View of the Electronic Medical Record, Amia, Inc., University of Pittsburgh, Pittsburgh, PA, (1995).
		Excerpts from the JVC America Website, URL: https://web.archive.org/19990117003015/http://jvc-america.com:80/digital_camcorders/digital_camcorders.html.

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	5,903,309	05-11-1999	Anderson	348	333.02	09-19-1996
	5,959,670	09-28-1999	Tamura et al.	348	364	04-16-1997
	5,966,122	10-12-1999	Itoh	715	838	03-10-1997
	5,966,171	10-12-1999	Hieda	348	240.2	06-25-1997
	5,982,298	11-09-1999	Lappenbusch et al.	340	905	11-14-1996
	5,986,698	11-16-1999	Nobuoka	348	208.3	02-19-1997
	6,002,429	12-14-1999	Ochi et al.	348	220.1	05-23-1996
	6,005,613	12-21-1999	Endsley et al.	348	231.6	09-12-1996
	6,020,920	02-01-2000	Anderson	348	222.1	06-10-1997
	6,031,999	02-29-2000	Ogawa	396	303	07-25-1997
	6,049,704	04-11-2000	Peckham et al.	455	232.1	12-10-1997
	6,078,824	06-20-2000	Sogo	455	562.1	08-15-1997

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Published advertisement from The Daily Sentinel (Grand Junction, Colorado) newspaper dated Sunday, Jun. 13, 1999.
		Published review from the Iowa City Press (Iowa City, Iowa) newspaper dated Jan. 12, 1999.
		Cohen, H. A., Access and Retrieval from Image Databases Using Image Thumbnails, International Symposium on Signal Processing and its Applications, (Aug. 25-30, 1996).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6,091,686	07-18-2000	Caffarelli et al.	369	53.24	09-09-1996
	6,122,007	09-19-2000	Ishibashi	348	231.6	03-10-1997
	6,125,326	09-26-2000	Ohmura et al.	701	454	09-19-1997
	6,130,710	10-10-2000	Yasuda	348	220.1	05-22-1995
	6,181,375	01-30-2001	Mitsui et al.	348	240.99	12-19-1996
	6,208,377	03-27-2001	Morofuji et al.	348	208.8	08-04-1997
	6,262,763	07-17-2001	Totsuka et al.	348	135	07-01-1999
	6,226,449	05-01-2001	Inoue et al.	386	225	04-17-1997
	6,266,614	07-24-2001	Alumbaugh	701	468	04-20-1998
	6,230,162	05-08-2001	Kumar et al.	382	240	06-20-1998
	6,236,863	05-22-2001	Waldroup et al.	455	522	03-17-1998
	6,288,743	09-11-2001	Lathrop	348	231.9	10-20-1997

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		CNET News Staff, Short take: MPEG camera now works with MAC, CBS Interactive Inc., (Jul. 30, 1997).
		Hitachi, Ltd., Hitachi Home Electronics (America), Inc. Announces Compatibility of Mpeg Digital Video Camera with Microsoft Directshow, Press Release, (Oct. 6, 1997).
		Published advertisement from Popular Photography magazine dated Oct. 1999.

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6,292,218	09-18-2001	Parulski et al.	348	220.1	07-16-1997
	6,317,141	11-13-2001	Pavley et al.	715	732	12-31-1998
	6,320,600	11-20-2001	Smith et al.	715	723	12-15-1998
	6,321,158	11-20-2001	DeLorme et al.	701	426	08-31-1998
	6,334,050	12-25-2001	Skarby	455	126	06-12-1998
	6,335,746	01-01-2002	Enokida et al.	715	839	07-23-1997
	6,411,646	06-25-2002	Walley et al.	375	146	06-30-1998
	6,434,130	08-13-2002	Soininen et al.	370	331	08-19-1998
	6,445,412	09-03-2002	Shiohara	348	333.05	04-14-1998
	6,512,858	01-28-2003	Lyon et al.	382	305	07-21-1998
	6,529,236	03-04-2003	Watanabe	348	230.1	09-12-1997
	6,545,687	04-08-2003	Scott et al.	345	629	01-05-1998

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Adobe Photoshop Version 5.0 User Guide, pp. 1-390, (1998).
		Asada, K. et al., Development of Low Power MPEG1/JPEG Encode/Decode IC, IEEE Transactions on Consumer Electronics, Vol. 43, No. 3, (Jun. 1997).
		Hamilton, E., JPEG File Interchange Format Version 1.02, (Sep. 1, 1992).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6,559,888	05-06-2003	Doron	348	240.1	03-19-1999
	6,564,070	05-13-2003	Nagamine et al.	455	556.1	09-22-1997
	6,567,119	05-20-2003	Parulski et al.	348	207.2	03-26-1998
	6,580,457	06-17-2003	Armstrong et al.	348	317	11-03-1998
	6,683,649	01-27-2004	Anderson	348	333.05	12-31-1998
	6,693,667	02-17-2004	Doron	348	240.99	01-29-1999
	6,700,607	03-02-2004	Misawa	348	230.1	06-04-1999
	6,701,063	03-02-2004	Komoda et al.	386	241	08-04-1999
	6,727,942	04-27-2004	Miyano	348	223.1	09-07-1999
	6,728,476	04-27-2004	Haseno	386	241	06-04-1998
	6,734,424	05-11-2004	Lennon et al.	250	288	05-16-2002
	6,734,909	05-11-2004	Terane et al.	348	333.05	10-26-1999

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Kodak, Kodak DC215 Zoom Digital Camera User's Guide, pp. 1-78, (1999).
		EE | Times, Hitachi Develops Prototype MPEG Camera, (Nov. 15, 1996).
		Japan Electronic Industry Development Association, Design Rule for Camera File System, version 1.0, pp. 1-47, (Dec. 1998).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6,750,903	06-15-2004	Miyatake et al.	348	218.1	02-25-1999
	6,754,440	06-22-2004	Takahashi et al.	386	353	07-10-2002
	6,757,013	06-29-2004	Matsuzaka	348	240.1	07-08-1997
	6,781,634	08-24-2004	Shiozaki et al.	348	374	09-08-1998
	6,798,448	09-28-2004	Motono et al.	348	222.1	07-20-1999
	6,856,760	02-15-2005	Takahashi et al.	386	224	07-10-2002
	6,876,387	04-05-2005	Lee	348	240.2	12-27-1999
	6,882,366	04-19-2005	Kijima et al.	348	294	01-20-1998
	6,885,399	04-26-2005	Kawashiri	348	273	06-07-2000
	6,937,273	08-30-2005	Loui	348	220.1	06-29-2000
	6,937,277	08-30-2005	Hattori et al.	348	304	04-16-1999
	6,970,191	11-29-2005	Sase et al.	348	220.1	07-20-1999

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Sony DCS-**F**55/**F**55E Service Manual Ver. 1.1, (Jul. 1999).
		Kim, S. et al., Development of Mobile Station in the CDMA Mobile System, Vol. 19, No. 3., pp. 202-227, (Oct. 3, 1997).
		Shin, S. et al., The CDMA Mobile System Architecture, Vol. 19, No. 3., pp. 98-115, (Oct. 3, 1997).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	7,352,391	04-01-2008	Hatakeyama	348	223.1	04-30-1997
	7,519,268	04-14-2009	Juen et al.	386	329	04-28-2003
	8,059,177	11-15-2011	Nakano et al.	348	294	09-12-2003
	8,704,768	04-22-2014	Juen et al.	345	158	11-13-2012
	8,736,729	05-27-2014	Nakano et al.	348	294	11-20-2012
	9,100,604	08-04-2015	Nakano et al.	1	1	04-29-2014
	9,544,517	01-10-2017	Nakano et al.	1	1	03-18-2015
	2001/0043276	11-22-2001	UENO	348	322	07-30-1997
	2002/0054218	05-09-2002	KOBAYASHI et al.	348	220.1	10-24-1997
	2002/0000998	01-03-2002	SCOTT et al.	345	667	01-05-1998
	2002/0118291	08-29-2002	Ishigami et al.	348	311	01-22-2002

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Salmasi, A. et al., On the System Design Aspects of Code Division Multiple Access (CDMA) Applied to Digital Cellular and Personal Communications Networks, IEEE (1991).
		Sony MVC-FD91 Service Manual Ver. 1.0, (Oct. 1998).
		ThumbsPlus Manual, Supported File Types, Feb. 11, (1998).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		ThumbsPlus Manual, Release Notes, Version 3.10, Release Notes, (1997).
		Shinnick, J., Hitachi MPEG Cam Makes Moves, TidBITS Publishing Inc., (Mar. 23, 1998).
		Secretary's Office of Hitachi, Ltd., Hitachi Introduces World's First MPEG Camera in Japan, Press Release, (Jan. 27, 1997).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 16 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Proceedings of 1997 IEEE International Symposium on Consumer Electronics, pp. 1-8, (Dec. 2-4, 1997).
		Kinugasa, T. et al., A Video Pre/Post-Processing LSI for Video Capture, IEEE Transactions on Consumer Electronics, pp. 776-780, Vol. 42, No. 3., (Aug. 1996).
		Slocombe, M., Sony Cybershot DCS-F55E Review, Internet Magazine, (Jun. 1999).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 17 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
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	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Takahashi, M. et al., A Low-Power MPEG-2 Codec LSI for Consumer Cameras, International Conference on Consumer Electronics, Jun. 28, pp. 501-506, (1999).
		Digital Still Camera Image File Format Standard version 2.1, Japan Electronic Industry Development Association (JEIDA), (Jun. 12, 1998).
		Cohen, Harvey A., Retrieval and Browsing of Images Using Image Thumbnails, Journal of Visual Computing and Image Representation, Vol. 8, No. 2, (Jun. 1997).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 18 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

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	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Hitachi's Multimedia Solutions, Hitachi Review, Vol. 46, No. 5, (Oct. 1997).
		Kodak Professional DCS 300 Series Digital Cameras User's Guide, 1-1 - F-1.
		Aliftiras, G., Receiver Implementations for a CDMA Cellular System, pp. 1-121, (Jul. 1996).

EXAMINER	DATE CONSIDERED

Doc Code: IDS
Document Description: Information Disclosure Statement filed

PTO/SB/42 (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
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37 CFR 1.501 INFORMATION DISCLOSURE CITATION IN A PATENT (Sheet 19 of 19)	Docket Number (Optional) 009379.00002\US	Patent Number 8,339,493
	Applicant	
	Issue Date December 25, 2012	Art Unit 3992

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	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		Kurashige, T. et al., Development of MPEG Camera, 1997 IEEE International Symposium on Consumer Electronics, (1997).
		Claim Construction Order in Maxell, Ltd. v. Apple Inc., Case No. 5-19-cv-00036 [EDTX]
		Claim Construction Order in Maxell, Ltd. v. ZTE Corporation et al., Case No. 5-16-cv-00179 [EDTX]

EXAMINER	DATE CONSIDERED

Electronic Acknowledgement Receipt

EFS ID:	42735923
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	17-MAY-2021
Filing Date:	10-DEC-2020
Time Stamp:	12:03:03
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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30	Non Patent Literature	Sony_Digital_Still_Camera_MVC-FD83FD88_Users_Manual_Sony_Corporation_1999_21238100.PDF	878765 b55ff7908866247068a877b9d80db570f77aa4fa	no	132
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48	Non Patent Literature	CNET_News_Staff_Short_take_MPEG_camera_now_works_with_MAC_CBS_Interactive_Inc__21237904.PDF	442574 25cc607adcb2111f695755a1012cd5ada465dbf9	no	2
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49	Non Patent Literature	Hitachis_Multimedia_Solutions_Hitachi_Review_Vol_46_No_5_Oct_1997_21238002.PDF	8024646 590d933b7c7ab15efd95e7f4a8a3c2c6234a0fed	no	54
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55	Non Patent Literature	EE_Times_Hitachi_Develops_Prototype_MPEG_Camera_Nov_15_1996_21237975.PDF	139482 10fadb0a7c0ca6fd775e35f1d25b797bdc987d4f	no	2
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56	Non Patent Literature	Japan_Electronic_Industry_Development_Association_Design_Rule_for_Camera_File_Sys_21238008.PDF	419204 833cbf5ac8ff84c6bdb1a556ec32fc538215b1c7	no	47
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Espacenet

Bibliographic data: WO9828843 (A1) — 1998-07-02

METHOD FOR REGULATING POWER WITHOUT ANALOG CONTROL LOOP AND RELATED DEVICE

Inventor(s): HERMELIN JEAN DI; BRUNET JEAN [FR] ± (HERMELIN, JEAN +DI, ; BRUNET, JEAN)

Applicant(s): THOMSON CSF [FR]; ROULLEAU ANNICK & HF [FR]; HERMELIN VALERIE & HF [FR]; HERMELIN CHRISTINE & HF [FR]; HERMELIN NORBERT & HM [FR]; BRUNET JEAN [FR] ± (THOMSON-CSF, ; ROULLEAU, ANNICK +HF, ; HERMELIN, VALERIE +HF, ; HERMELIN, CHRISTINE +HF, ; HERMELIN, NORBERT +HM, ; BRUNET, JEAN)

Classification: - international: ***H03G3/30;*** (IPC1-7): H03G3/30
- cooperative: **H03G3/3042 (EP)**

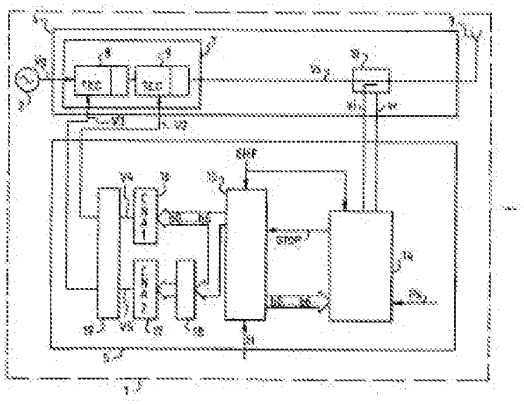
Application number: WO1997FR02315 19971216 Global Dossier

Priority number(s): FR19960015742 19961220

Also published as: DE69720702 (T2) EP0886914 (A1) EP0886914 (B1) ES2197382 (T3) FR2757716 (A1) more

Abstract of WO9828843 (A1)

The invention concerns methods and devices for regulating power and formatting a high frequency signal transmitted by a portable radio. The device is made up of a power line (4) controlled by a formatting and regulating device (5) and connected to a radio antenna (3) by a directional waveguide coupler (10). The method consists in measuring a power level transmitted by the power line (4) and then in gradually increasing amplification gain of the power line (4) to increase the transmitted power



up to a predetermined power value (Ps). The method consists then in maintaining the amplification gain at the resulting value when the transmitted power has reached the predetermined power and finally in reducing the gain to zero at the end of the broadcast. The invention is particularly applicable to radio broadcast systems such as portable radios.

PCT ORGANISATION MONDIALE DE LA PROPRIETE INTELLECTUELLE
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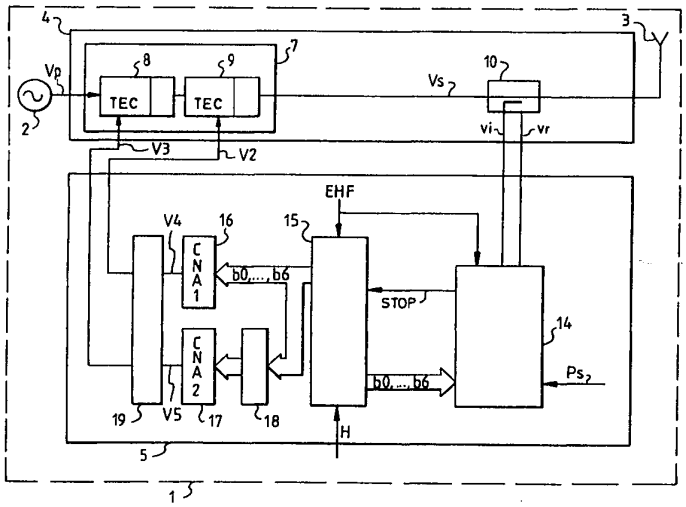
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(54) Title: METHOD FOR REGULATING POWER WITHOUT ANALOG CONTROL LOOP AND RELATED DEVICE

(54) Titre: PROCEDE DE REGULATION DE PUISSANCE SANS BOUCLE D'ASSERVISSEMENT ANALOGIQUE ET DISPOSITIF ASSOCIE

(57) Abstract

The invention concerns methods and devices for regulating power and formatting a high frequency signal transmitted by a portable radio. The device is made up of a power line (4) controlled by a formatting and regulating device (5) and connected to a radio antenna (3) by a directional waveguide coupler (10). The method consists in measuring a power level transmitted by the power line (4) and then in gradually increasing amplification gain of the power line (4) to increase the transmitted power up to a predetermined power value (Ps). The method consists then in maintaining the amplification gain at the resulting value when the transmitted power has reached the predetermined power and finally in reducing the gain to zero at the end of the broadcast. The invention is particularly applicable to radio broadcast systems such as portable radios.



(57) Abrégé

L'invention concerne les procédés et dispositifs de régulation de puissance et de mise en forme d'un signal haute fréquence émis par une radio portable. Le dispositif est composé d'une chaîne de puissance (4) contrôlée par un dispositif de mise en forme et de régulation (5) et couplée à une antenne radio (3) par un coupleur directionnel (10). Le procédé consiste à mesurer un niveau de puissance émise par la chaîne de puissance (4) puis à augmenter progressivement un gain d'amplification de la chaîne de puissance (4) pour augmenter la puissance émise jusqu'à une valeur de puissance déterminée (Ps). Le procédé consiste ensuite à maintenir le gain d'amplification à la valeur obtenue lorsque la puissance émise a atteint la puissance déterminée puis finalement à ramener le gain à zéro en fin d'émission. Application, en particulier, à des systèmes de transmission radio tels que des radios portables.

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PROCEDE DE REGULATION DE PUISSANCE SANS BOUCLE D'ASSERVISSEMENT ANALOGIQUE ET DISPOSITIF ASSOCIE.

La présente invention concerne un procédé et un dispositif de régulation de puissance et de mise en forme sans boucle d'asservissement analogique d'un signal émis par un émetteur radio.

Elle permet notamment la régulation et la mise en forme d'un signal Haute Fréquence, noté HF, avant transmission par une antenne d'une radio portable.

Dans les différents types de transmission radio, dont l'évasion de fréquence (EVF) est un cas particulier, il est nécessaire de maîtriser différents paramètres de l'onde émise :

- la montée en puissance qui doit être mise en forme afin de limiter la largeur et l'amplitude du spectre parasite généré,
- la durée de cette mise en forme de façon à garantir une onde parfaitement stabilisée dès les premiers bits d'information à transmettre,
- la maîtrise de l'amplitude de l'onde émise,
- la descente en puissance qui doit aussi être maîtrisée en forme et en temps pour des raisons identiques à la montée.

Il est connu pour réaliser une régulation de puissance et une mise en forme d'un signal émis par une chaîne d'émission d'un appareil de communication radio des dispositifs mettant en œuvre des procédés d'asservissement de gain dont un synoptique est représenté sur la figure 1. La chaîne d'émission 1, représentée à l'intérieur d'une ligne fermée en pointillé, comprend un générateur de fréquences 2 couplé à une antenne radio 3 par une chaîne de puissance 4 contrôlée par un dispositif de mise en forme et de régulation 5. La chaîne de puissance 4 comprend en entrée un atténuateur variable 6 suivi d'un bloc d'amplification 7 formé d'un premier amplificateur 8 en série avec un deuxième amplificateur 9, couplé à l'antenne radio 3 par un coupleur directionnel 10. Le dispositif de mise en forme et de régulation 5 comprend un dispositif de blocage 11 qui, à partir d'un signal d'entrée EHF, génère un signal de contrôle du premier amplificateur 8. Le dispositif de mise en forme et de régulation 5 comprend aussi une boucle d'asservissement 12 connectée en entrée au coupleur directionnel 10 et à un dispositif de génération de consigne 13 et connecté

en sortie à l'atténuateur variable 6 et au deuxième amplificateur 9. Selon cette disposition, le procédé mis en œuvre se déroule suivant la description qui suit. Un signal pilote Vp généré par le générateur de fréquences 2 est mis en forme et amplifié, sous la forme d'un signal Vs, par la chaîne de puissance 4 contrôlée par le dispositif de mise en forme et de régulation 5. Le coupleur directionnel 10 délivre en permanence une information de tension incidente vi et une information de tension réfléchie vr. L'information de tension incidente vi est une mesure de la puissance émise en sortie du bloc d'amplification 7 à destination de l'antenne radio 3 et l'information de tension réfléchie vr est une mesure de la puissance reçue sur l'antenne radio 3 due à la présence d'un brouilleur non représenté. L'information de tension incidente vi et l'information de tension réfléchie vr sont comparées à une consigne Vc, générée par le dispositif de génération de consigne 13, par la boucle d'asservissement 12. La consigne Vc, réalisée par un filtrage du signal de commande EHF représentant l'enveloppe du signal à émettre, définit le niveau de régulation de la chaîne de puissance 4. En fonction de ce niveau de régulation, la boucle d'asservissement 12 ajuste le niveau du signal de sortie Vs de la chaîne de puissance 4 en contrôlant l'atténuateur variable 6 par une commande d'atténuation V1 et en contrôlant le deuxième amplificateur 9 par une commande de gain V2. Durant les intervalles de temps où il n'y a pas d'émission, le signal de commande EHF est à zéro et le dispositif de blocage 11 bloque le premier amplificateur 8 par une commande de blocage V3.

Un tel procédé a pour avantage d'effectuer une analyse de l'onde émise durant toute la durée d'émission assurant un asservissement permanent de la régulation de puissance. Par contre, un tel procédé présente certains inconvénients dont les plus importants sont le risque d'accrochage lié à la présence d'une boucle d'asservissement et le risque d'étouffement en présence d'un brouilleur à proximité. Par ailleurs, le dispositif mettant en œuvre le procédé présente une certaine rigidité due à une réalisation toute analogique et sa réalisation doit tenir compte des contraintes liées à la taille des composants analogiques.

Le but de l'invention est de pallier les inconvénients précités.

A cet effet, l'invention a pour objet un procédé de régulation de puissance et de mise en forme d'un signal transmis par une antenne radio

d'un émetteur radio, en présence ou non d'un signal de brouillage reçu par l'antenne radio, après amplification, par une chaîne de puissance comprenant au moins un premier et un deuxième transistor du type à effet de champ équipé d'une grille, d'un signal pilote généré par un générateur de fréquence caractérisé en ce qu'il consiste :

- à interdire toute émission en bloquant le premier transistor en dehors des périodes d'émission définies par un signal extérieur,
- à autoriser une émission en débloquant le premier transistor au moyen d'une commande d'autorisation à émettre,
- à amplifier progressivement en début d'émission pendant un temps déterminé le signal pilote en commandant l'état de conduction du deuxième transistor par l'évolution suivant une première loi déterminée d'une commande de gain appliquée sur la grille du deuxième transistor jusqu'à ce que le signal transmis ait atteint un niveau de puissance déterminé correspondant à un gain d'amplification donné de la chaîne de puissance,
- à maintenir le gain d'amplification donné durant l'émission en suspendant l'évolution du niveau de la commande de gain pendant l'émission,
- à diminuer progressivement en fin d'émission le niveau de puissance du signal transmis en commandant l'état de conduction du deuxième transistor par l'évolution suivant une deuxième loi déterminée de la commande de gain,
- à bloquer à nouveau le premier transistor en fin d'émission.

Elle a également pour objet un dispositif pour la mise en œuvre du procédé.

L'invention a principalement pour avantages qu'elle réalise une régulation de puissance et une mise en forme sans boucle d'asservissement analogique et qu'elle supprime le risque d'étouffement en présence d'un brouilleur à proximité. Elle a aussi pour avantage de pouvoir être adaptée facilement à différents appareils du fait de boîtiers numériques programmables qui remplacent un certain nombre de composants analogiques. L'utilisation des boîtiers numériques permet aussi de réduire le nombre de composants et l'encombrement du dispositif.

L'invention sera bien comprise et ses avantages et autres caractéristiques ressortiront lors de la description suivante présentée à titre d'illustration non limitative et faite en regard des figures annexées qui représentent :

- la figure 1, un synoptique d'une chaîne d'émission selon un dispositif connu,
- la figure 2, un synoptique d'une chaîne d'émission d'un dispositif selon l'invention, et
- la figure 3, des chronogrammes de différents signaux du dispositif.

Sur les différentes figures, les éléments homologues sont représentés avec une même référence.

Le procédé selon l'invention consiste à mesurer une puissance émise par un amplificateur d'un émetteur radio et à augmenter progressivement le niveau d'une commande de gain d'amplification tant que la puissance émise mesurée ne répond pas aux conditions d'exploitation de l'émetteur radio. Les conditions d'exploitation, pré-programmées lors de la fabrication du dispositif mettant en œuvre le procédé ou sélectionnées par un opérateur, consistent essentiellement en un niveau de puissance émise pour une fréquence donnée du signal émis. Une fois les conditions d'exploitation remplies, le niveau de la commande de gain est maintenu constant pendant la durée d'émission pour assurer une puissance émise constante. En fin d'émission, le niveau de la commande de gain est diminué progressivement de manière à ramener la puissance émise à zéro sans variation brutale du signal émis. La commande de gain résulte de la mise en forme des sorties d'un compteur assurant des temps de montée et de descente de la commande de gain maîtrisables. La commande de gain contrôle le gain d'amplification en commandant la tension appliquée sur la grille de transistors du type à effet de champ notés TEC, ou FET suivant l'appellation anglo-saxonne ; ces transistors du type TEC sont les éléments essentiels de l'amplificateur de l'émetteur radio. Le procédé selon l'invention consiste aussi à détecter la présence d'un brouilleur à proximité de l'antenne radio afin de modifier les conditions d'exploitation de l'émetteur radio.

La compréhension du procédé sera complète après la description suivante d'un dispositif mettant en œuvre le procédé.

La figure 2 représente un synoptique d'une chaîne d'émission d'un dispositif selon l'invention. La chaîne d'émission 1, représentée à l'intérieur d'une ligne fermée en pointillé, comprend un générateur de fréquences 2 couplé à une antenne radio 3 par une chaîne de puissance 4 contrôlée par un dispositif de mise en forme et de régulation 5. La chaîne de puissance 4 comprend en entrée un bloc d'amplification 7 formé d'un premier amplificateur 8 en série avec un deuxième amplificateur 9 couplé à l'antenne radio 3 par un coupleur directionnel 10. Le dispositif de mise en forme et de régulation 5 comprend un dispositif de contrôle de niveau 14 connecté en entrée au coupleur directionnel 10 par une information de tension incidente vi et une information de tension réfléchie vr et connecté à un dispositif de comptage 15, en entrée par un bus de bits b0, ..., b6 et en sortie par un signal de contrôle STOP. Le dispositif de comptage 15 est connecté à un premier convertisseur numérique analogique 16 par un bus de bits b0, ..., b6 et est couplé à un deuxième convertisseur numérique analogique 17 par l'intermédiaire d'un circuit de combinaison 18. Le dispositif de mise en forme et de régulation 5 comprend aussi un dispositif sommateur 19 intercalé entre le premier convertisseur numérique analogique 16 et le deuxième amplificateur 9 et entre le deuxième convertisseur numérique analogique 17 et le premier amplificateur 8. Le premier amplificateur 8 et le deuxième amplificateur 9 sont chacun réalisés avec au moins un transistor du type TEC polarisé par un circuit de polarisation. Une première sortie du dispositif sommateur 19 dénommée commande d'autorisation à émettre V3, contrôle le point de polarisation du premier amplificateur 8. Une deuxième sortie du dispositif sommateur 19, dénommée commande de gain V2, contrôle le point de polarisation du deuxième amplificateur 9. Selon cette disposition, le générateur de fréquences 2 génère un signal pilote Vp à une fréquence déterminée fonction de la fréquence du signal à transmettre.

La mise en forme et la régulation de puissance du signal transmis par l'antenne radio 3 sont illustrées par la figure 3 qui représente des chronogrammes de différents signaux du dispositif. Ces chronogrammes correspondent à un cas général de fonctionnement du dispositif qui se déroule suivant la description suivante. Un signal enveloppe EHF résultant par exemple d'une action d'un opérateur qui aura choisi d'émettre un signal

pendant une durée T à un niveau de puissance Ps, passe d'un état inactif à un état actif à un instant t0. Ce changement d'état entraîne un passage à l'état inactif du signal de contrôle STOP généré par le dispositif de contrôle de niveau 14 et un positionnement du dispositif de comptage 15 en mode de comptage à partir de la valeur zéro. Ainsi, le dispositif de comptage 15 compte à partir de zéro au rythme d'une horloge H générée par un oscillateur non représenté et une valeur de comptage est codée sur le bus de bits b0, ..., b6. La valeur de comptage, codée par le bus de bits b0, ..., b6 est convertie sous forme analogique par le premier convertisseur numérique analogique 16 et le deuxième convertisseur numérique analogique 17. La sortie V4 du premier convertisseur numérique analogique 16 et la sortie V5 du deuxième convertisseur numérique analogique 17 ont l'allure d'une rampe. La sortie V5 du deuxième convertisseur numérique analogique 17 suit la même rampe que la sortie V4 du premier convertisseur numérique analogique 16. Mais la rampe correspondant à la sortie V5 du deuxième convertisseur numérique analogique 17 démarre seulement après le passage à 1 du septième bit b6 qui est combiné avec chacun des autres bits b0 à b5 dans le circuit de combinaison 18. Le résultat de la combinaison de chacun des bits b0 à b5 avec le septième bit b6 est transmis au deuxième convertisseur numérique analogique 17. La sortie V4 du premier convertisseur numérique analogique 16 et la sortie V5 du deuxième convertisseur numérique analogique 17 sont combinées par le dispositif sommateur 19 pour générer la commande d'autorisation à émettre V3 et la commande de gain V2. La disposition et la combinaison des deux convertisseurs numériques analogiques, 16 et 17, permettent d'augmenter la dynamique de la commande de gain V2 sans augmenter le nombre de bits en sortie du dispositif de comptage 15. La commande d'autorisation à émettre V3 contrôle l'état du premier amplificateur 8 en imposant un niveau déterminé de tension sur la grille du transistor du type TEC du premier amplificateur 8. Si le premier amplificateur 8 comporte plusieurs transistors du type TEC, la commande d'autorisation à émettre V3 est appliqué préférentiellement à tous les transistors du type TEC du premier amplificateur 8. Ainsi, entre les temps t0 et t5, la commande d'autorisation à émettre V3 est à un état actif, le premier amplificateur 8 fonctionne suivant un état dit saturé et le gain de tension du premier amplificateur 8 est fixe et

fonction du circuit de polarisation du transistor du type TEC du premier amplificateur 8. Lorsque la commande d'autorisation à émettre V3 est à un état inactif, avant le temps t0 et après le temps t5, le premier amplificateur 8 fonctionne suivant un état dit bloqué ; dans cet état le gain de tension du premier amplificateur 8 est nul, l'émission d'un signal est interdite. La commande de gain V2 résulte d'une addition du signal de sortie V4 du premier convertisseur numérique analogique 16 avec le signal de sortie V5 du deuxième convertisseur numérique analogique 17. La commande de gain V2 contrôle le gain de tension du deuxième amplificateur 9 en imposant un niveau de tension variable sur la grille du transistor du type TEC du deuxième amplificateur 9. Ainsi, la mise en conduction du deuxième amplificateur 9 est progressive entre les temps t0 et t2, le gain de tension du deuxième amplificateur 9 varie entre les temps t0 et t2. Au temps t1, le septième bit b6 passe d'un état inactif à un état actif, par conséquent la pente de la rampe que suit la commande de gain V2 est multipliée par deux. Au temps t2, le niveau de puissance mesuré P par la première information vi, a atteint le seuil Ps de puissance désirée. Le dispositif de contrôle de niveau 14 positionne le signal de contrôle STOP à un état actif pour stopper le comptage du dispositif de comptage 15. Au temps t2, le dispositif de comptage 15 a compté jusqu'à une valeur déterminée N à laquelle correspond un niveau déterminé V2s de la commande de gain V2. A partir du temps t2, le dispositif de comptage 15 suspend le comptage à cette valeur N tant que le signal de contrôle STOP est à un état actif. Au temps t3, le signal enveloppe EHF passe à un état inactif signifiant la fin d'émission. Entre les temps t2 et t3, le dispositif de comptage 15 reste en attente à la valeur N codée sur les bits b0 à b6. Dans ces conditions, la commande de gain V2 conserve la même valeur V2s qu'il avait au temps t2 et ceci pendant un intervalle de temps compris entre les temps t2 et t3. Ainsi, le niveau de puissance mesuré P au temps t2 par la première information vi reste constant pendant l'intervalle de temps compris entre les temps t2 et t3. Au temps t3, le changement d'état du signal enveloppe EHF, d'un état actif à un état inactif, entraîne le passage à un état inactif du signal de contrôle STOP et le passage en mode décomptage du dispositif de comptage 15. Entre les temps t3 et t5, le dispositif de comptage 15 décompte au rythme de l'horloge H. Au temps t4 le septième bit b6 passe d'un état actif à un état inactif, par

conséquent la pente de la rampe que suit la commande de gain V2 est divisée par deux. Au temps t5, le dispositif de comptage 15 a décompté jusqu'à zéro. Le dispositif de contrôle de niveau 14 détecte le passage à zéro en décodant le bus de bits b0, ..., b6. Après détection du passage à zéro, il positionne le signal de contrôle STOP à un état actif pour bloquer le dispositif de comptage 15 à la valeur zéro et maintenir ainsi simultanément la commande d'autorisation à émettre V3 et la commande de gain V2 à un niveau déterminé pour bloquer le premier amplificateur 8 et le deuxième amplificateur 9 jusqu'à l'émission suivante.

Le choix de la fréquence de l'horloge H est fonction des temps de montée et de descente désirés du signal émis, ainsi plus les temps de montée et de descente sont petits pour une dynamique donnée de la commande de gain V2 plus la fréquence de l'horloge H est grande. Le choix du nombre de bits nécessaires pour coder la dynamique maximale de la commande de gain V2 est effectué en fonction du pas de régulation voulu. Ainsi, plus le pas de régulation est petit, plus la puissance émise est proche du seuil Ps de puissance désiré plus le nombre de bits de codage est grand.

Dans le but de sécuriser le dispositif selon l'invention, un temps limite TL de montée en puissance est programmé initialement dans le dispositif de contrôle de niveau 14. Ce temps TL borne l'intervalle de temps compris entre les temps t0 et t2. Ainsi, le temps TL est le temps maximum alloué à la chaîne de puissance 4 pour atteindre le gain d'amplification nécessaire pour émettre un signal ayant la puissance Ps désirée. Toujours dans le but de sécuriser le dispositif selon l'invention, un niveau maximal de puissance émise autorisé est déterminé et programmé dans le dispositif de contrôle de niveau 14. Le niveau maximal de puissance émise autorisé est programmé sous le forme d'une valeur M de comptage du dispositif de comptage 15 à laquelle correspond un niveau de la commande de gain V2 dont la valeur permet d'obtenir ce niveau maximal de puissance émise. Ainsi seule cette valeur M est programmée initialement dans le dispositif de contrôle de niveau 14 pour limiter la puissance émise. Une évolution intéressante du dispositif selon l'invention consiste à programmer un niveau maximal de puissance émise pour chaque fréquence du spectre d'émission.

En plus du fonctionnement général, différents cas particuliers de fonctionnement peuvent se produire.

Un premier cas particulier de fonctionnement se produit quand, à la fin de l'intervalle de temps défini par le temps limite TL, le niveau de puissance émise mesuré P par la première information vi est toujours inférieur au niveau de puissance désiré Ps. Dans ce cas, le comptage du dispositif de comptage 15 est stoppé au temps TL à une valeur N atteinte et l'émission se poursuit comme dans le cas général en remplaçant sur les chronogrammes de la figure 3 le temps t2 par le temps TL.

Un deuxième cas particulier se produit quand il existe un brouilleur proche. Dans ce cas, pendant les instants où l'émission est interdite, avant le temps t0 ou après le temps t5, la valeur de puissance mesurée par la deuxième information vr correspond à la puissance d'un signal reçu sur l'antenne émis par une source qualifiée de brouilleur. La détection d'un brouilleur a lieu quand la deuxième information vr dépasse un seuil déterminé. Dans ces conditions, le niveau de puissance mesuré par la première information vi pendant les instants d'émission risque d'être erroné car entaché de la puissance du signal reçu sur l'antenne dû à la présence d'un brouilleur. Dans ce cas, après détection d'un brouilleur le dispositif de contrôle de niveau 14 ne tient pas compte de la première information vi mais tient compte d'une valeur de comptage programmée initialement dans le dispositif de contrôle de niveau 14 et il autorise le comptage du dispositif de comptage 15 jusqu'à ce que ce dernier ait atteint la valeur de comptage programmée. Dans ces conditions, le niveau de puissance émise est garanti en présence du brouilleur. Il n'y a pas d'étouffement du signal émis.

Dans une variante au procédé, le dispositif de comptage 15 est réalisé avec un boîtier programmable programmé pour générer un signal numérique de forme sinusoïdale ou de forme exponentielle et plus généralement, il est programmé pour générer toute forme décrite par un programme implanté dans le boîtier programmable.

Ainsi, le gain d'amplification de la chaîne de puissance 4 suit, en fonction du choix de l'opérateur ou en fonction des conditions d'exploitation (par exemple le dispositif de comptage 15 est configuré automatiquement en fonction d'une forme d'onde émise choisie par l'opérateur), une courbe ayant l'allure d'un créneau dont les flans sont une rampe ou un bout de sinusoïde ou un bout d'exponentielle par exemple.

Dans une autre variante au procédé, la commande d'autorisation à émettre V3 est le résultat de la superposition d'une rampe à une valeur constante de tension (négative dans le cas où le transistor du type TEC utilisé est bloqué avec une tension négative sur la grille, la source étant à la masse). Dans ces conditions, le déblocage et le blocage du signal HF émis est effectué, sans changement brusque, par le premier amplificateur 8.

REVENDICATIONS

1. Procédé de régulation de puissance et de mise en forme d'un signal transmis par une antenne radio (3) d'un émetteur radio, en présence ou non d'un signal de brouillage reçu par l'antenne radio (3), après amplification, par une chaîne de puissance (4) comprenant au moins un premier et un deuxième transistor du type à effet de champ équipé d'une grille, d'un signal pilote (V_p) généré par un générateur de fréquence (2) caractérisé en ce qu'il consiste :

- à interdire toute émission en bloquant le premier transistor en dehors des périodes d'émission définies par un signal extérieur (EHF),
- à autoriser une émission en débloquant le premier transistor au moyen d'une commande d'autorisation à émettre (V3),
- à amplifier progressivement en début d'émission pendant un temps déterminé le signal pilote (V_p) en commandant l'état de conduction du deuxième transistor par l'évolution suivant une première loi déterminée d'une commande de gain (V2) appliquée sur la grille du deuxième transistor jusqu'à ce que le signal transmis ait atteint un niveau de puissance déterminé correspondant à un gain d'amplification donné de la chaîne de puissance (4),
- à maintenir le gain d'amplification donné durant l'émission en suspendant l'évolution du niveau de la commande de gain (V2) pendant l'émission,
- à diminuer progressivement en fin d'émission le niveau de puissance du signal transmis en commandant l'état de conduction du deuxième transistor par l'évolution suivant une deuxième loi déterminée de la commande de gain (V2),
- à bloquer à nouveau le premier transistor en fin d'émission.

2. Procédé selon la revendication 1, caractérisé en ce que pour sécuriser le procédé d'une part le niveau de puissance transmis augmente en début d'émission pendant un temps déterminé qui est limité et d'autre part le niveau de puissance du signal transmis est limité.

3. Procédé selon l'une quelconque des revendications 1 et 2, caractérisé en ce qu'il consiste à mesurer un signal de brouillage (vr) reçu par l'antenne radio (3) pendant des intervalles de temps où il n'y a pas d'émission pour détecter un dépassement d'un seuil déterminé de brouillage de manière à augmenter le gain d'amplification de la chaîne de puissance (4) jusqu'à atteindre une puissance émise dont la valeur est initialement programmée.

4. Dispositif de régulation de puissance et de mise en forme d'un signal transmis par une antenne radio (3) d'un émetteur radio comprenant une chaîne de puissance (4) contrôlée par l'intermédiaire d'une commande d'autorisation à émettre (V3) et d'une commande de gain (V2) générées par un dispositif de mise en forme et de régulation (5) comprenant un dispositif de comptage (15) pour la mise en œuvre du procédé selon l'une quelconque des revendications 1 à 3 caractérisé en ce que la chaîne de puissance (4) comprend au moins un premier et un deuxième transistor du type à effet de champ équipé d'une grille commandée soit par la commande d'autorisation à émettre (V3), soit par la commande de gain (V2), les deux transistors étant destinés à amplifier et mettre en forme le signal transmis pendant des périodes d'émission définies par un signal extérieur (EHF), ce signal extérieur (EHF) déclenchant le comptage du dispositif de comptage (15) en début d'émission et le décomptage du dispositif de comptage (15) en fin d'émission, et en ce que l'évolution de la commande de gain (V2) peut être suspendue par une mise en attente du dispositif de comptage (15) déclenchée en fonction de critères déterminés.

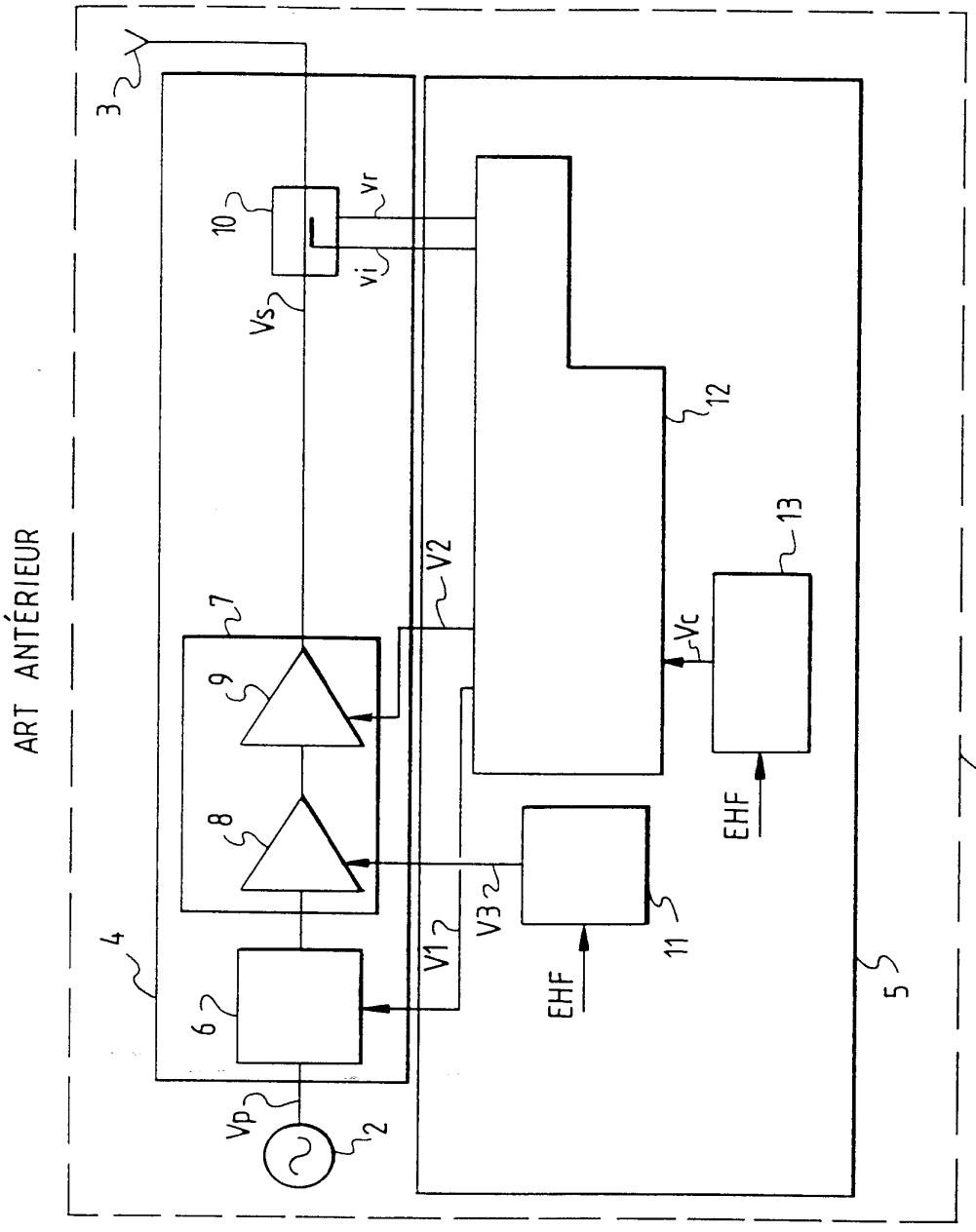

ART ANTÉRIEUR
3
10
Vr
Vi
Vs
12
13
V2
Vc
7
9
8
4
6
V1
V3
EHF
11
EHF
5
1
Vp
2

FIG.1

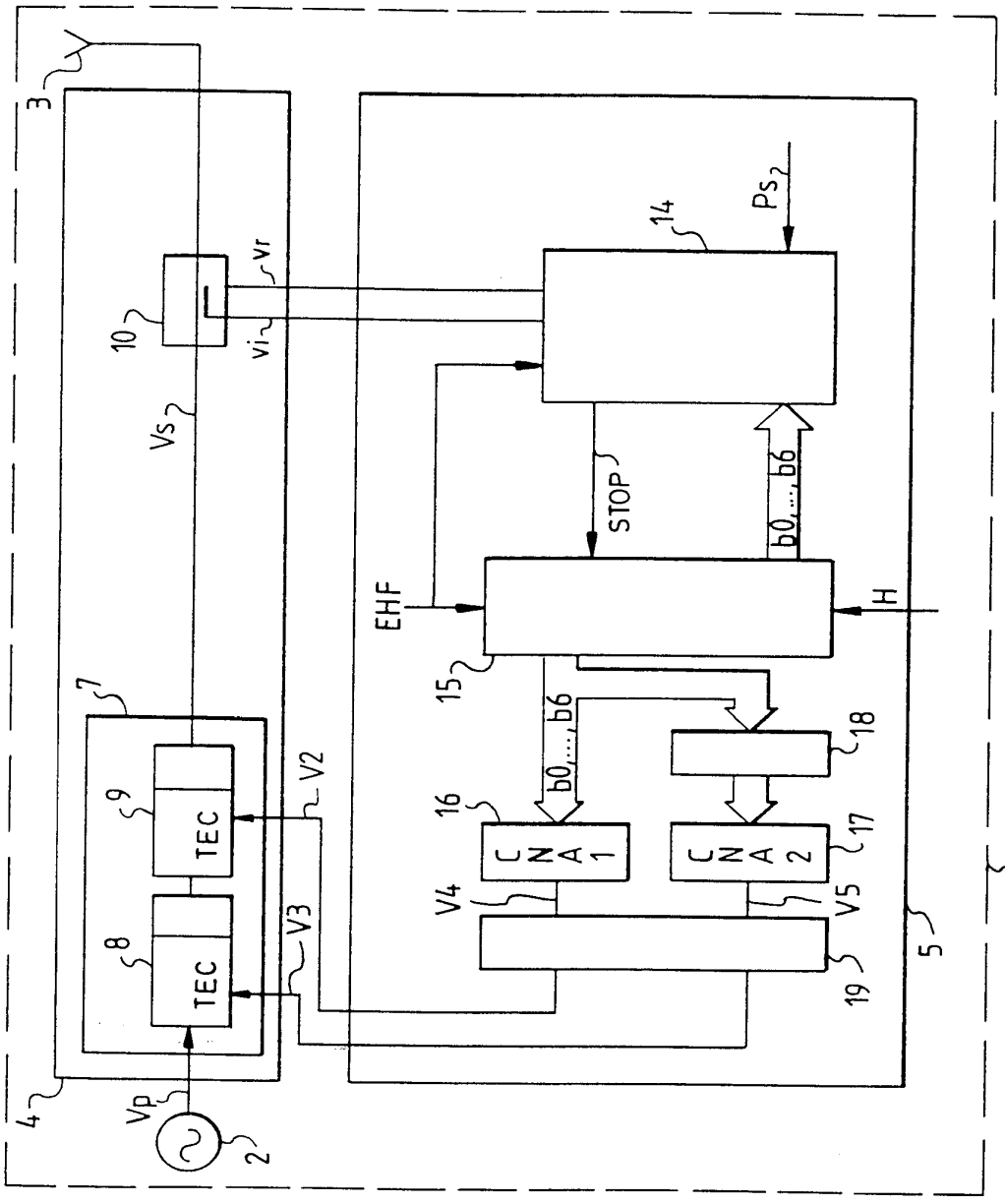

3
14
Ps2
10
Vr
Vi
Vs
STOP
b0,...,b6
EHF
H
15
7
9
TEC
V2
8
TEC
V3
16
b0,...,b6
18
CNA 1
CNA 2
17
V4
V5
19
5
1
4
Vp
2

FIG.2

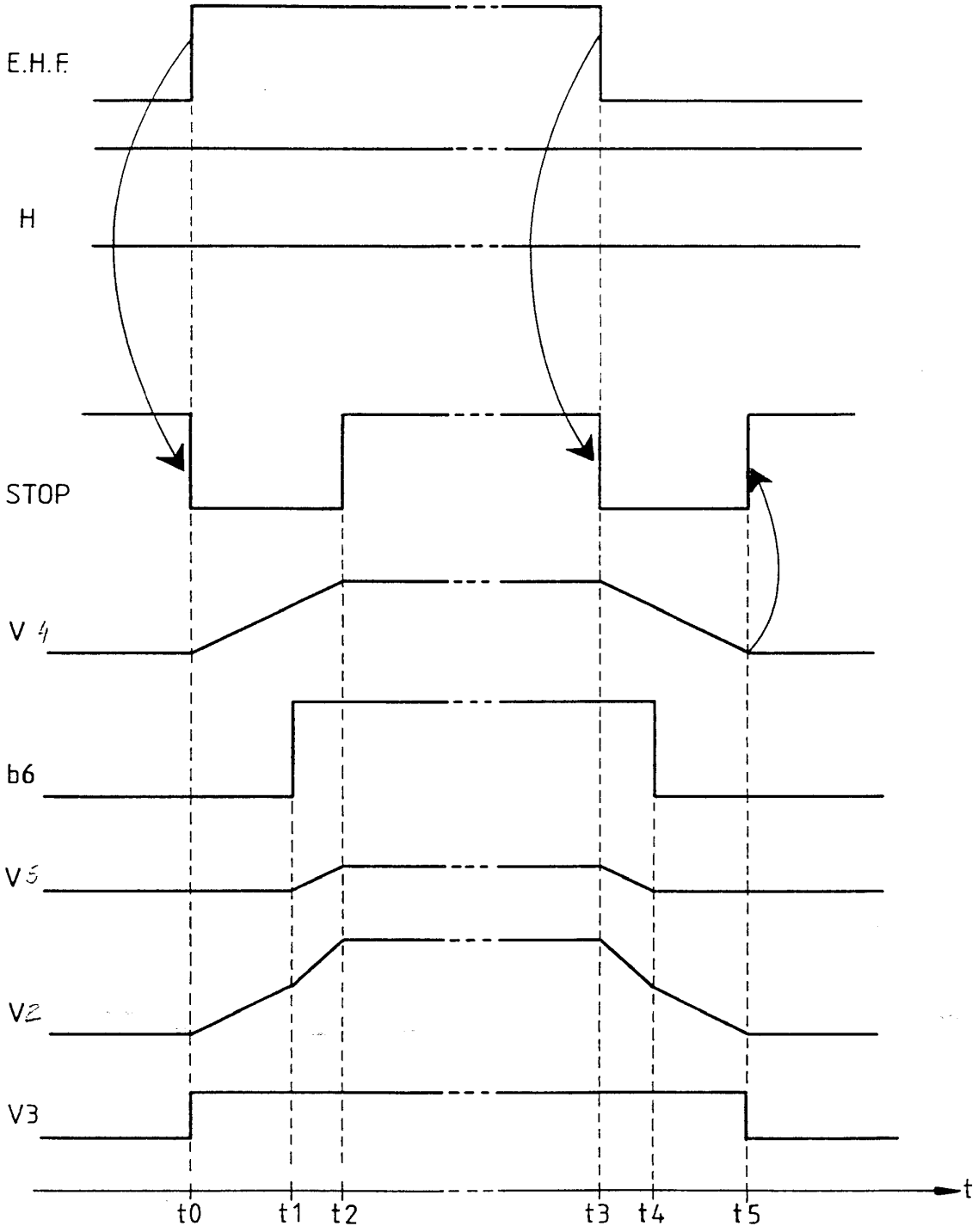


FIG.3

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/FR 97/02315

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H03G3/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H03G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 337 006 A (MIYAZAKI SHINICHI) 9 August 1994 see the whole document	1,2,4
A	EP 0 688 108 A (MITSUBISHI ELECTRIC CORP) 20 December 1995 see the whole document	1,2,4
A	EP 0 654 899 A (THOMSON CSF) 24 May 1995 see the whole document	1

[ ] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
9 April 1998	22/04/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Blaas, D-L

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter nal Application No
PCT/FR 97/02315

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5337006 A	09-08-94	AU 648916 B	05-05-94
		AU 2041592 A	21-01-93
		CA 2074115 A,C	20-01-93
		DE 69218314 D	24-04-97
		DE 69218314 T	14-08-97
		EP 0523718 A	20-01-93
		JP 5191180 A	30-07-93
		KR 9600351 B	05-01-96
EP 0688108 A	20-12-95	JP 8008768 A	12-01-96
		US 5566363 A	15-10-96
EP 0654899 A	24-05-95	FR 2712751 A	24-05-95

Form PCT/ISA/210 (patent family annex) (July 1992)

RAPPORT DE RECHERCHE INTERNATIONALE

Dem Internationale No
PCT/FR 97/02315

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
CIB 6 H03G3/30

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
CIB 6 H03G

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie °	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	US 5 337 006 A (MIYAZAKI SHINICHI) 9 août 1994 voir le document en entier	1,2,4
A	EP 0 688 108 A (MITSUBISHI ELECTRIC CORP) 20 décembre 1995 voir le document en entier	1,2,4
A	EP 0 654 899 A (THOMSON CSF) 24 mai 1995 voir le document en entier	1

☐ Voir la suite du cadre C pour la fin de la liste des documents

☒ Les documents de familles de brevets sont indiqués en annexe

° Catégories spéciales de documents cités:

"A" document définissant l'état général de la technique, non considéré comme particulièrement pertinent

"E" document antérieur, mais publié à la date de dépôt international ou après cette date

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"&" document qui fait partie de la même famille de brevets

1

Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
9 avril 1998	22/04/1998

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Blaas, D-L

Formulaire PCT/ISA/210 (deuxième feuille) (juillet 1992)

RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs . membres de familles de brevets

Dem Internationale No
PCT/FR 97/02315

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
US 5337006 A	09-08-94	AU 648916 B	05-05-94
		AU 2041592 A	21-01-93
		CA 2074115 A,C	20-01-93
		DE 69218314 D	24-04-97
		DE 69218314 T	14-08-97
		EP 0523718 A	20-01-93
		JP 5191180 A	30-07-93
		KR 9600351 B	05-01-96
EP 0688108 A	20-12-95	JP 8008768 A	12-01-96
		US 5566363 A	15-10-96
EP 0654899 A	24-05-95	FR 2712751 A	24-05-95

Formulaire PCT/ISA/210 (annexe familles de brevets) (juillet 1992)

Espacenet

Bibliographic data: WO9828843 (A1) — 1998-07-02

METHOD FOR REGULATING POWER WITHOUT ANALOG CONTROL LOOP AND RELATED DEVICE

Inventor(s): HERMELIN JEAN DI; BRUNET JEAN [FR] ± (HERMELIN, JEAN +DI, ; BRUNET, JEAN)

Applicant(s): THOMSON CSF [FR]; ROULLEAU ANNICK & HF [FR]; HERMELIN VALERIE & HF [FR]; HERMELIN CHRISTINE & HF [FR]; HERMELIN NORBERT & HM [FR]; BRUNET JEAN [FR] ± (THOMSON-CSF, ; ROULLEAU, ANNICK +HF, ; HERMELIN, VALERIE +HF, ; HERMELIN, CHRISTINE +HF, ; HERMELIN, NORBERT +HM, ; BRUNET, JEAN)

Classification: - international: ***H03G3/30;*** (IPC1-7): H03G3/30
- cooperative: **H03G3/3042 (EP)**

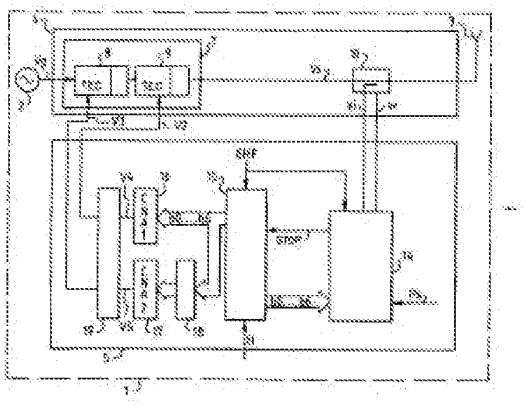
Application number: WO1997FR02315 19971216 Global Dossier

Priority number(s): FR19960015742 19961220

Also published as: DE69720702 (T2) EP0886914 (A1) EP0886914 (B1) ES2197382 (T3) FR2757716 (A1) more

Abstract of WO9828843 (A1)

The invention concerns methods and devices for regulating power and formatting a high frequency signal transmitted by a portable radio. The device is made up of a power line (4) controlled by a formatting and regulating device (5) and connected to a radio antenna (3) by a directional waveguide coupler (10). The method consists in measuring a power level transmitted by the power line (4) and then in gradually increasing amplification gain of the power line (4) to increase the transmitted power



up to a predetermined power value (Ps). The method consists then in maintaining the amplification gain at the resulting value when the transmitted power has reached the predetermined power and finally in reducing the gain to zero at the end of the broadcast. The invention is particularly applicable to radio broadcast systems such as portable radios.

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DESCRIPTION WO9828843A1

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<Desc / Clms Page number 1>

POWER REGULATION PROCESS WITHOUT ANALOGUE CONTROL LOOP AND ASSOCIATED DEVICE.

The present invention relates to a method and a device for power regulation and shaping without an analog servo-loop of a signal transmitted by a radio transmitter.

It allows in particular the regulation and shaping of a High Frequency signal, denoted HF, before transmission by an antenna of a portable radio.

In the different types of radio transmission, of which frequency evasion (EVF) is a particular case, it is necessary to control various parameters of the transmitted wave: the rise in power which must be shaped in order to limit the width and amplitude of the parasitic spectrum generated, -the duration of this shaping so as to guarantee a perfectly stabilized wave from the first bits of information to be transmitted, -control of the background amplitude emitted, -the descent in power which must also be controlled in form and in time for reasons identical to the rise.

It is known to carry out a power regulation and a shaping of a signal emitted by a transmission chain of a radio communication device of devices implementing gain control methods, a block diagram of which is shown on figure 1.

The transmission chain 1, represented inside a closed dotted line, comprises a frequency generator 2 coupled to a radio antenna 3 by a power chain 4 controlled by a shaping and regulation device 5 . The power chain 4 comprises at input a variable attenuator 6 followed by an amplification block 7 formed by a first amplifier 8 in series with a second amplifier 9, coupled to the radio antenna 3 by a directional coupler 10. The shaping and regulation device 5 comprises a blocking device 11 which, from an input signal EHF, generates a control signal for the first amplifier 8. The shaping and regulation device 5 also comprises a servo-control loop 12 connected at the input to the directional coupler 10 and to a setpoint generation device 13 and connected.

<Desc / Clms Page number 2>

output to the variable attenuator 6 and to the second amplifier 9. According to this arrangement, the method implemented is routed according to the description which follows. A pilot signal Vp generated by the frequency generator 2 is shaped and amplified, in the form of a signal Vs, by the power chain 4 controlled by the shaping and regulation device 5.

The directional coupler 10 continuously delivers incident voltage information vi and reflected voltage information vr. The incident voltage information vi is a measurement of the power emitted at the output of the amplification unit 7 intended for the radio antenna 3 and the refied voltage information vr is a measurement of the power received on the radio antenna. 3 due to the presence of a jammer not shown. The incident voltage information vi and the reflected voltage information vr are compared with a setpoint Vc, generated by the setpoint generation device 13, by the control loop 12. The setpoint Vc, produced by filtering the control signal EHF representing the envelope of the signal to be transmitted, defines the level of regulation of the power chain 4. Depending on this level of regulation, the servo loop 12 adjusts the level of the output signal Vs of the power chain 4 by

controlling the variable attenuator 6 by an attenuation command V1 and by controlling the second amplifier 9 by a gain control V2.

During the time intervals when there is no transmission, the control signal EHF is at zero and the blocking device 11 blocks the first amplifier 8 by a blocking command V3.

Such a method has the advantage of carrying out an analysis of the wave emitted during the entire transmission period ensuring permanent slaving of the power regulation. On the other hand, such a method has certain drawbacks, the most important of which are the risk of catching due to the presence of a control loop and the risk of suffocation in the presence of a nearby jammer. Furthermore, the device implementing the method exhibits a certain rigidity due to an entirely analogical embodiment and its implementation must take account of the constraints linked to the size of the analog components.

The aim of the invention is to overcome the aforementioned drawbacks.

To this end, the subject of the invention is a method for regulating the power and shaping a signal transmitted by a radio antenna.

<Desc / Clms Page number 3>

of a radio transmitter, in the presence or absence of a jamming signal received by the radio antenna, after amplification, by a power chain comprising at least a first and a second transistor of the field effect type equipped with a gate, of a pilot signal generated by a frequency generator characterized in that it consists in: prohibiting any emission by blocking the first transistor outside the emission periods defined by an external signal, -allowing emission in unblocking the first transistor by means of an authorization command to be emitted, to gradually amplify at the start of transmission for a determined time the pilot signal by controlling the conduction state of the second transistor by the evolution according to a first law determined of a gain control applied to the gate of the second transistor until the transmitted signal has reached a determined power level corresponding to a given amplification gain of the power chain e, -to maintain the amplification gain given during the transmission by suspending the evolution of the level of the gain control during the transmission, -to gradually decrease at the end of transmission the power level of the transmitted signal by controlling !

'conduction state of the second transistor by the evolution according to a second determined law of the gain control, -to block the first transistor again at the end of transmission.

It also relates to a device for implementing the method.

The main advantages of the invention are that it achieves power regulation and shaping without an analog servo loop and that it eliminates the risk of suffocation in the presence of a nearby jammer. It also has the advantage of being able to be easily adapted to different devices due to programmable digital boxes which replace a certain number of analog components. The use of digital boxes also makes it possible to reduce the number of components and the size of the device.

<Desc / Clms Page number 4>

The invention will be well understood and its advantages and other characteristics will emerge from the following description presented by way of nonlimiting illustration and given with reference to the appended figures which represent: FIG. 1, a block diagram of a transmission chain according to a known device, FIG. 2, a block diagram of a transmission chain of a device according to the invention, and FIG. 3, timing diagrams of various signals of the device.

In the various figures, the corresponding elements are represented with the same reference.

The method according to the invention consists in measuring a power emitted by an amplifier of a radio transmitter and gradually increasing the level of an amplification gain control as long as the measured emitted power does not meet the operating conditions of the radio transmitter. The operating conditions, pre-programmed during the manufacture of the device implementing the method or selected by an operator, consist essentially of a power level emitted for a given frequency of the signal emitted. Once the operating conditions are met, the level of the gain control is kept constant for the duration of transmission to ensure constant transmitted power. At the end of transmission, the level of the gain control is gradually reduced so as to bring the transmitted power to zero without abrupt variation of the transmitted signal. The gain control results from the shaping of the outputs of a counter ensuring rise and fall times of the gain control that can be controlled.

The gain control controls the amplification gain by controlling the voltage applied to the gate of field effect type transistors denoted TEC, or FET according to the English name; these TEC type transistors are the essential elements of the radio transmitter amplifier. The method according to the invention also consists in detecting the presence of a jammer near the radio antenna in order to modify the operating conditions of the radio transmitter.

The understanding of the method will be complete after the following description of a device implementing the method.

<Desc / Clms Page number 5>

FIG. 2 represents a block diagram of a transmission chain of a device according to the invention. The transmission chain 1, represented inside a closed dotted line, comprises a frequency generator 2 coupled to a radio antenna 3 by a power chain 4 controlled by a shaping and regulation device 5 . The power chain 4 comprises at input an amplification block 7 formed by a first amplifier 8 in series with a second amplifier 9 coupled to the radio antenna 3 by a directional coupler 10. The shaping and regulation device 5 comprises a level control device 14 connected at the input to the directional coupler 10 by an incident voltage information item vi and a reflected voltage information vr and connected to a counting device 15, at the input by a bO, ..., b6 bit bus and at output by a STOP control signal. The counting device 15 is connected to a first digital to analog converter 16 by a bit bus bO, ..., b6 and is coupled to a second digital to analog converter 17 via a combination circuit 18.

The shaping and regulation device 5 also comprises a summing device 19 interposed between the first digital-to-analog converter 16 and the second amplifier 9 and between the second digital-to-analog converter 17 and the first amplifier 8. The first amplifier 8 and the second amplifier 9 are each made with at least one TEC type transistor biased by a bias circuit. A first output of the summing device 19 called the authorization command to transmit V3, controls the point of polarization of the first amplifier 8. A second output of the summing device 19, called gain control V2, controls the point of polarization of the second amplifier 9. According to this arrangement, the frequency generator 2 generates a pilot signal Vp at a frequency determined as a function of the frequency of the signal to be transmitted.

The shaping and power regulation of the signal transmitted by the radio antenna 3 are illustrated in FIG. 3 which represents timing diagrams of various signals of the device. These chronograms correspond to a general case of operation of the device which takes place according to the following description. An EHF envelope signal resulting, for example, from an action by an operator who has chosen to send a signal

<Desc / Clms Page number 6>

for a period T at a power level Ps, passes from an inactive state to an active state at an instant t0. This change of state causes a change to! the inactive state of the STOP control signal generated by the level control device 14 and positioning of the counting device 15 in counting mode from the zero value. Thus, the counting device 15 counts from zero at the rate of a clock H generated by an oscillator not shown and a count value is coded on the bit bus b0, ..., b6. The count value, encoded by the bit bus bO, ..., b6 is converted into analog form by the first digital to analog converter 16 and the second digital to analog converter 17. The output V4 of the first digital to analog converter 16 and the output V5 of the second digital to analog converter 17 have the appearance of a ramp. The output V5 of the second digital to analog converter 17 follows the same ramp as the output V4 of the first digital to analog converter 16.

But the ramp corresponding to the output V5 of the second digital to analog converter 17 starts only after the passage to 1 of the seventh bit b6 which is combined with each of the other bits b0 to b5 in the combination circuit 18. The result of the combination of each of the bits b0 to b5 with the seventh bit b6 is transmitted to the second digital to analog converter 17. The output V4 of the first digital to analog converter 16 and the output V5 of the second digital to analog converter 17 are combined by the summing device 19 to generate the authorization command to transmit V3 and the gain command V2. The arrangement and the combination of the two digital to analog converters, 16 and 17, make it possible to increase the dynamics of the gain control V2 without increasing the number of bits at the output of the counting device 15. The authorization to transmit command V3 controls the state of the first amplifier 8 by imposing a determined voltage level on the gate of the TEC type transistor of the first amplifier 8.

If the first amplifier 8 comprises several TEC type transistors, the authorization command to transmit V3 is applied preferentially to all the TEC type transistors of the first amplifier 8. Thus, between times t0 and t5, the authorization command to transmit V3 is in an active state, the first amplifier 8 operates according to a so-called saturated state and the voltage gain of the first amplifier 8 is fixed and

<Desc / Clms Page number 7>

function of the bias circuit of the TEC type transistor of the first amplifier 8. When the authorization command to transmit V3 is in an inactive state, before time t0 and after time t5, the first amplifier 8 operates according to a so-called blocked state; in this state the voltage gain of the first amplifier 8 is zero, transmission of a signal is prohibited. The gain control V2 results from an addition of the output signal V4 from the first digital to analog converter 16 with the output signal V5 from the second digital to analog converter 17. The gain control V2 controls the voltage gain of the second amplifier 9 by imposing a variable voltage level on the gate of the TEC type transistor of the second amplifier 9. Thus, the conduction of the second amplifier 9 is progressive between the times t0 and t2, the voltage gain of the second amplifier 9 varies between the times t0 and t2. At time t1, the

seventh bit b6 changes from an inactive state to an active state, consequently the slope of the ramp which follows the gain control V2 is multiplied by two.

At time t2, the power level P measured by the first information item vi, has reached the desired power threshold Ps. The level control device 14 sets the STOP control signal to an active state to stop the counting of the counting device 15. At time t2, the counting device 15 has counted up to a determined value N to which corresponds a determined level V2s of the gain control V2. From time t2, the counting device 15 suspends counting at this value N as long as the STOP control signal is in an active state. At time t3, the envelope signal EHF goes to an inactive state signifying the end of transmission.

Between times t2 and t3, the counting device 15 remains on standby for the value N encoded on bits b0 to b6. Under these conditions, the gain control V2 keeps the same value V2s as it had at time t2 and this for a time interval between times t2 and t3. Thus, the power level P measured at time t2 by the first information item vi remains constant during the time interval between times t2 and t3. At time t3, the change of state of the envelope signal EHF, from an active state to an inactive state, causes the STOP control signal to switch to an inactive state and the counting device 15 to switch to counting mode. Between times t3 and t5, the counting device 15 counts down at the rate of the clock H. At time t4 the seventh bit b6 goes from an active state to an inactive state, for example.

<Desc / Clms Page number 8>

consequently the slope of the ramp which follows the gain control V2 is divided by two. At time t5, the counting device 15 has counted down to zero. The level control device 14 detects the zero crossing by decoding the bit bus b0, ..., b6. After detection of the zero crossing, it positions the STOP control signal in an active state to block the counting device 15 at the zero value and thus simultaneously maintain the authorization command to send V3 and the gain command V2 at a level determined to block the first amplifier 8 and the second amplifier 9 until the next transmission.

The choice of the frequency of the clock H is a function of the desired rise and fall times of the transmitted signal, thus the smaller the rise and fall times are for a given dynamic of the gain control V2 the higher the frequency of l. 'H clock is large. The choice of the number of bits necessary to code the maximum dynamic range of the gain control V2 is made as a function of the desired regulation step.

Thus, the smaller the regulation step, the closer the transmitted power is to the desired power threshold Ps, the greater the number of coding bits.

In order to secure the device according to the invention, a time limit TL for increasing power is initially programmed in the level control device 14. This time TL limits the time interval between the times t0 and t2. Thus, the time TL is the maximum time allocated to the power chain 4 to reach the amplification gain necessary to transmit a signal having the desired power Ps. Still with the aim of securing the device according to the invention, a maximum authorized level of transmitted power is determined and programmed in the level control device 14. The maximum authorized emitted power level is programmed in the form of a counting value M of the counting device 15 to which corresponds a level of the gain control V2, the value of which makes it possible to obtain this maximum emitted power level. Thus only this value M is initially programmed in the level control device 14 to limit the power transmitted.

An interesting development of the device according to the invention consists in programming a maximum level of transmitted power for each frequency of the transmission spectrum.

In addition to general operation, various special cases of operation may occur.

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A first particular case of operation occurs when, at the end of the time interval defined by the time limit TL, the emitted power level measured P by the first information item vi is always lower than the desired power level Ps. In this case, the counting of the counting device 15 is stopped at the time TL at a value N reached and the transmission continues as in the general case, replacing the time t2 in the timing diagrams of FIG. 3 by the time TL.

A second special case occurs when there is a nearby jammer. In this case, during the instants when transmission is prohibited, before time t0 or after time t5, the power value measured by the second item of information vr corresponds to the power of a signal received on the antenna transmitted by a source classified as interfering. The detection of a jammer takes place when the second information vr exceeds a determined threshold. Under these conditions, the power level measured by the first information item vi during the transmission instants risks being erroneous because it is tainted by the power of the signal received on the antenna due to the presence of a jammer. In this case, after detection of a jammer, the level control device 14 does not take into account the first information item vi but takes account of a counting value initially programmed in the level control device 14 and it authorizes the counting. counting device 15 until the latter has reached the programmed counting value.

Under these conditions, the emitted power level is guaranteed in the presence of the jammer. There is no suppression of the transmitted signal.

In a variant to the method, the counting device 15 is produced with a programmable box programmed to generate a digital signal of sinusoidal or exponential shape and more generally, it is programmed to generate any shape described by a program implanted in the programmable box. .

Thus, the amplification gain of the power chain 4 follows, as a function of the choice of the operator or as a function of the operating conditions (for example the counting device 15 is automatically configured as a function of a form of emitted wave chosen by the operator), a curve having the appearance of a slot whose blanks are a ramp or a sinusoidal end or an exponential end for example.

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In another variant of the method, the authorization command to emit V3 is the result of the superposition of a ramp at a constant voltage value (negative in the case where the TEC type transistor used is blocked with a negative voltage on the grid, the source being earthed). Under these conditions, the unblocking and the blocking of the transmitted HF signal is carried out, without abrupt change, by the first amplifier 8.

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CLAIMS WO9828843A1

CLAIMS

1.

Process for regulating the power and shaping a signal transmitted by a radio antenna (3) of a radio transmitter, in the presence or absence of a jamming signal received by the radio antenna (3), after amplification , by a power chain (4) comprising at least a first and a second transistor of the field effect type equipped with a gate, of a pilot signal (Vp) generated by a frequency generator (2) characterized in that that it consists: -to prohibit any emission by blocking the first transistor outside the emission periods defined by an external signal (EHF), -to authorize an emission by unblocking the first transistor by means of an authorization command to emit (V3), -to amplify progressively at the start of emission for a determined time the pilot signal (Vp) by controlling the conduction state of the second transistor by the evolution according to a first determined law of a gain control (V2) applied to the gate of the second transistor up to c e that the transmitted signal has reached a determined power level corresponding to a given amplification gain of the power chain (4), -to maintain the given amplification gain during transmission by suspending the evolution of the level of gain control (V2) during transmission, -to decrease gradually at the end of transmission the power level of the transmitted signal by controlling!

'conduction state of the second transistor by the evolution according to a second determined law of the gain control (V2), -to block the first transistor again at the end of transmission. 2. Method according to claim 1, characterized in that in order to secure the method on the one hand the transmitted power level increases at the start of transmission for a determined time which is limited and on the other hand the power level of the transmitted signal is limited . <Desc / Clms Page number 12>

3.

Method according to either one of Claims 1 and 2, characterized in that it consists in measuring a scrambling signal (vr) received by the radio antenna (3) during time intervals where there is no 'transmission to detect an overshoot of a determined interference threshold so as to increase the amplification gain of the power chain (4) until a transmitted power is reached, the value of which is initially programmed.

4.

Device for regulating the power and shaping a signal transmitted by a radio antenna (3) of a radio transmitter comprising a power chain (4) controlled by means of an authorization command to be transmitted (V3) and a gain control (V2) generated by a shaping and regulation device (5) comprising a counting device (15) for implementing the method according to any one of claims 1 to 3 characterized in that the power chain (4) comprises at least a first and a second transistor of the field effect type equipped with a gate controlled either by the authorization command to be transmitted (V3), or by the command gain (V2), the two transistors being intended to amplify and shape the transmitted signal during transmission periods defined by an external signal (EHF), this external signal (EHF) triggering the counting of the counting device (15) at the start of transmission and the

counting device stage (15) at the end of transmission, and in that the evolution of the gain control (V2) can be suspended by placing the counting device (15) on standby triggered as a function of determined criteria.

Espacenet

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A METHOD AND SYSTEM FOR SPECULATIVE DECOMPRESSION OF COMPRESSED IMAGE DATA IN AN IMAGE CAPTURE UNIT

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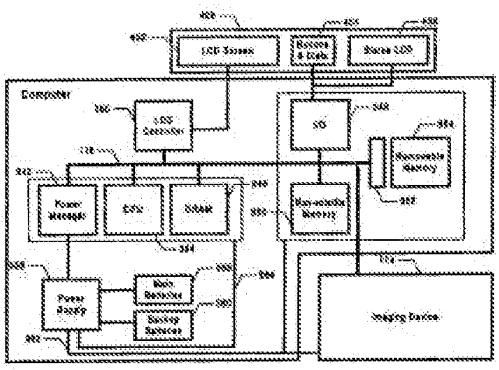
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Abstract of WO9857491 (A1)

A method and system (110) is disclosed for accelerating a user interface on a display of an image capture unit. The image capture unit (114) includes a plurality of images files for providing a plurality of images. In the first aspect, the method and system (110) comprises selecting an image based upon a scrolling method and providing a predetermined number of speculation buffer. The method and system (110) includes organizing the predetermined number of speculation buffers based upon the selected images so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method. In second aspect, the image capture unit (114) operates in a plurality of modes. The image

capture unit (114) also includes a plurality of input buffers which are utilizing one of the plurality of modes and are unutilized on at least one of the other of the plurality of modes. The method and system (110) in accordance with this aspect comprises reallocating the input buffers as speculation buffers and providing image data from the image files to the speculation buffers when the image capture unit (110) is in the at least one of the plurality of modes.



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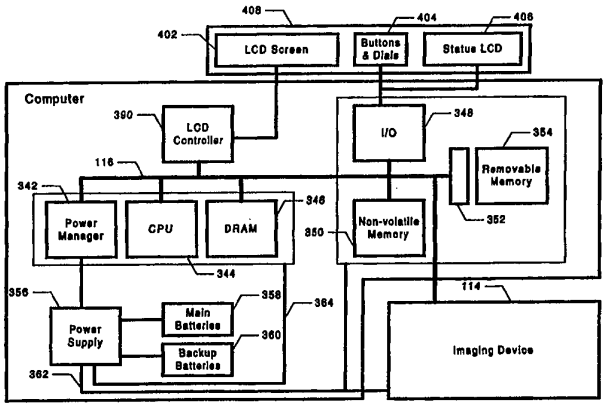
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(57) Abstract

A method and system (110) is disclosed for accelerating a user interface on a display of an image capture unit. The image capture unit (114) includes a plurality of images files for providing a plurality of images. In the first aspect, the method and system (110) comprises selecting an image based upon a scrolling method and providing a predetermined number of speculation buffer. The method and system (110) includes organizing the predetermined number of speculation buffers based upon the selected images so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method. In second aspect, the image capture unit (114) operates in a plurality of modes. The image capture unit (114) also includes a plurality of input buffers which are utilizing one of the plurality of modes and are unutilized on at least one of the other of the plurality of modes. The method and system (110) in accordance with this aspect comprises reallocating the input buffers as speculation buffers and providing image data from the image files to the speculation buffers when the image capture unit (110) is in the at least one of the plurality of modes.

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A METHOD AND SYSTEM FOR SPECULATIVE DECOMPRESSION OF COMPRESSED IMAGE DATA IN AN IMAGE CAPTURE UNIT

CROSS-REFERENCE TO RELATED APPLICATIONS

The present invention is related to the following co-pending U.S. Patent Applications: Serial No. _____ entitled "A Method And System For Generating An Enhanced Image File In An Image Capture Unit"; Serial No. _____ entitled "A Method And System For Accelerating A User Interface of An Image Capture Unit During Review Mode"; and Serial No. _____ entitled "A Method And System For Accelerating A User Interface of an Image Capture Unit During Play Mode," which are assigned to the assignee of the present application and filed on the same date as the present application.

FIELD OF THE INVENTION

The present invention relates generally to an image capture unit and more particularly to a method and system for accelerating a user interface in such a unit.

BACKGROUND OF THE INVENTION

Modern digital cameras for taking pictures of scenes and the like typically include an imaging device which is controlled by a computer running a single threaded process. When an image is captured, the imaging device is exposed to light and generates raw image data representing the image. The raw image data is typically stored in a single image buffer where it is then processed and compressed by the processor. Many types of compression schemes are used to compress the image data, with the joint photographic expert group (JPEG) standard being the most popular. After the processor processes and compresses the raw image data into JPEG image files, the processor stores the JPEG image files into an internal memory or on an external memory card.

Some digital cameras are also equipped with a liquid-crystal display (LCD) or other type of display screen on the back of the camera. Through the use of the LCD, the processor can cause digital camera to operate in one of two modes, record and play, although some cameras only have a record mode. In record mode, the LCD is used as a viewfinder in which the user may view an object or scene before taking a picture. In play mode, the LCD is used a playback screen for allowing the user to review previously

captured images either individually or in arrays of four, nine, or sixteen images.

Besides the LCD, digital camera user interfaces also include a number of buttons or switches for setting the camera into one of the two modes and for navigating between images in play mode. For example, most digital cameras include two buttons labeled "-" and "+" that enable a user to navigate or scroll through captured images. For example, if the user is reviewing images individually, meaning that single images are displayed full-sized in the LCD, pressing one of navigation buttons causes the currently displayed image to be replaced by the next image.

To display a captured image in play mode, the processor must first access the JPEG image file corresponding to the captured image from memory, decompress the image data sixteen horizontal lines at time, and then send the decompressed data to the LCD. When the user presses the navigation button to see the next image, the user sees the next image slowly replace the previously displayed image from top to bottom. Due to the amount of processing involved, the display of the entire image may take several seconds in some cameras. Not only is the image decompression time slow, but conventional digital cameras also do not allow other camera operations while the JPEG image is being decompressed, which means that the user cannot abort the decompression process. Thus, if the user decides halfway through reviewing a current image that another image is preferred, the camera will not recognize the next action until the current image is fully displayed.

Accordingly, a user interface of this type appears to the user as being slow and non-responsive when attempting to access multiple images on a digital camera. Speed of access to these images has become increasingly important as these types of cameras have become more widely available.

There is a need, therefore, to provide images on a display device which allows the user to review multiple captured images, while simultaneously providing a display and a readout for a particular image in an efficient and straightforward manner. It is similarly important to be able to rapidly identify a recognizable representation of the image. Finally, the system and method should be more responsive to the user than previously known systems. For example, in a plurality of captured images, it would be useful to quickly identify two or more particular images quickly, with a minimum of effort. It is

also important to provide more efficient ways to quickly navigate through a series of images. The system should be implementable in a simple and cost effective fashion and should be easily handled by a user. The present invention addresses such a need.

SUMMARY OF THE INVENTION

A method and system is disclosed for accelerating a user interface on a display of an image capture unit. The image capture unit includes a plurality of image files for providing a plurality of images. In a first aspect, the method and system comprises selecting an image based upon a scrolling method and providing a predetermined number of speculation buffers. The method and system includes organizing the predetermined number of speculation buffers based upon the selected image so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method.

In a second embodiment, the image capture unit operates in a plurality of modes The image capture unit also includes a plurality of input buffers which are utilized in one of the plurality of modes and are unutilized on at least one of the other of the plurality of modes. The method and system in accordance with this aspect comprises reallocating the input buffers as speculation buffers and providing image data from the image files to the speculation buffers when the image capture unit is in the at least one of the plurality of modes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a digital camera that operates in accordance with the present invention.

FIG. 2 is a block diagram of one preferred embodiment for the imaging device of FIG. 1.

FIG. 3 is a block diagram of one preferred embodiment for the computer of FIG. 1.

FIG. 4A is a memory map showing the preferred embodiment of the Dynamic Random-Access-Memory (DRAM).

FIG. 4B is a block diagram illustrating the contents of one of the input buffers and the contents of the frame buffer.

FIGS. 5A and 5B are diagrams depicting the back and top view, respectively, of a digital camera.

FIG. 6 is a block diagram illustrating an enhanced format of still image file in accordance with the present invention.

FIG. 7 is a block diagram illustrating the image file generation process, which begins when the camera is in capture mode and the user presses the shutter button to capture an image.

FIG. 8 is a diagram illustrating the operation and appearance of the accelerated user interface during review mode in accordance with a preferred embodiment of the present invention.

FIG. 9 is a flow chart illustrating the process of accelerating the user interface of the digital camera when in review mode.

FIG. 10 is a diagram illustrating the operation and appearance of the accelerated user interface during play mode in accordance with a preferred embodiment of the present invention.

FIG. 11A is a flow chart illustrating the process of accelerating the user interface of the digital camera when in play mode.

FIGS. 11B, 11C, and 11D illustrate an example of a screennail displayed on an LCD screen and then updated with a higher-resolution image as the higher-resolution image is decompressed in accordance with the present invention.

FIG. 12 is a memory map of the DRAM illustrating the reallocation of the input buffers as speculation buffers in accordance with the present invention.

FIG. 13 is flow chart depicting the speculative decompression process in a preferred embodiment of the present invention.

FIGS. 14A and 14B are block diagrams illustrating the buffer organization that is assigned to images in response to automatic and manual scrolling methods, respectively.

FIG. 15 is a flow chart illustrating the process of accelerating the user interface of play mode using the speculative decompression process.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a method and system for accelerating the review and navigation through a series of images on an image capture unit. The following

description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Although the present invention will be described in the context of a digital camera, various modifications to the preferred embodiment will be readily apparent to those skilled in the art and the generic principles herein may be applied to other embodiments. That is, any image capture device which displays images, icons and/or other items, could incorporate the features described hereinbelow and that device would be within the spirit and scope of the present invention. Thus, the present invention is not intended to be limited to the embodiment shown but is to be accorded the widest scope consistent with the principles and features described herein.

The present invention is a method and system for accelerating a graphical user interface of an image capture unit using expanded image files that allow for the rapid display of captured images.

Referring now to FIG. 1, a block diagram of a digital camera 110 is shown for use in accordance with the present invention. Camera 110 preferably comprises an imaging device 114, a system bus 116 and a computer 118. Imaging device 114 is optically coupled to an object 112 and electrically coupled via system bus 116 to computer 118. Once a photographer has focused imaging device 114 on object 112 and, using a capture button or some other means, instructed camera 110 to capture an image of object 112, computer 118 commands imaging device 114 via system bus 116 to capture raw image data representing object 112. The captured raw image data is transferred over system bus 116 to computer 118 which performs various image processing functions on the image data before storing it in its internal memory. System bus 116 also passes various status and control signals between imaging device 114 and computer 118.

Referring now to FIG. 2, a block diagram of one preferred embodiment of imaging device 114 is shown. Imaging device 114 typically comprises a lens 220 having an iris, a filter 222, an image sensor 224, a timing generator 226, an analog signal processor (ASP) 228, an analog-to-digital (A/D) converter 230, an interface 232, and one or more motors 234.

In operation, imaging device 114 captures an image of object 112 via reflected light impacting image sensor 224 along optical path 236. Image sensor 224, which is

typically a charged coupled device (CCD), responsively generates a set of raw image data in CCD format representing the captured image 112. The raw image data is then routed through ASP 228, A/D converter 230 and interface 232. Interface 232 has outputs for controlling ASP 228, motors 234 and timing generator 226. From interface 232, the raw image data passes over system bus 116 to computer 118.

Referring now to FIG. 3, a block diagram of one preferred embodiment for computer 118 is shown. System bus 116 provides connection paths between imaging device 114, an optional power manager 342, central processing unit (CPU) 344, dynamic random-access memory (DRAM) 346, input/output interface (I/O) 348, non-volatile memory 350, and buffers/connector 352. Removable memory 354 connects to system bus 116 via buffers/connector 352. Alternately, camera 110 may be implemented without removable memory 354 or buffers/connector 352.

Power manager 342 communicates via line 366 with power supply 356 and coordinates power management operations for camera 110. CPU 344 typically includes a conventional processor device for controlling the operation of camera 110. In the preferred embodiment, CPU 344 is capable of concurrently running multiple software routines to control the various processes of camera 110 within a multithreaded environment. DRAM 346 is a contiguous block of dynamic memory which may be selectively allocated to various storage functions. LCD controller 390 accesses DRAM 346 and transfers processed image data to LCD screen 402 for display.

I/O 348 is an interface device allowing communications to and from computer 118. For example, I/O 348 permits an external host computer (not shown) to connect to and communicate with computer 118. I/O 348 also interfaces with a plurality of buttons and/or dials 404, and an optional status LCD 406, which in addition to the LCD screen 402, are the hardware elements of the camera's user interface 408.

Non-volatile memory 350, which may typically comprise a conventional read-only memory or flash memory, stores a set of computer-readable program instructions to control the operation of camera 110. Removable memory 354 serves as an additional image data storage area and is preferably a non-volatile device, readily removable and replaceable by a camera 110 user via buffers/connector 352. Thus, a user who possesses several removable memories 354 may replace a full removable memory 354 with an empty removable memory 354 to effectively expand the picture-taking

capacity of camera 110. In the preferred embodiment of the present invention, removable memory 354 is typically implemented using a flash disk. Power supply 356 supplies operating power to the various components of camera 110. In the preferred embodiment, power supply 356 provides operating power to a main power bus 362 and also to a secondary power bus 364. The main power bus 362 provides power to imaging device 114, I/O 348, non-volatile memory 350 and removable memory 354. The secondary power bus 364 provides power to power manager 342, CPU 344 and DRAM 346.

Power supply 356 is connected to main batteries 358 and also to backup batteries 360. In the preferred embodiment, a camera 110 user may also connect power supply 356 to an external power source. During normal operation of power supply 356, the main batteries 358 provide operating power to power supply 356 which then provides the operating power to camera 110 via both main power bus 362 and secondary power bus 364. During a power failure mode in which the main batteries 358 have failed (when their output voltage has fallen below a minimum operational voltage level) the backup batteries 360 provide operating power to power supply 356 which then provides the operating power only to the secondary power bus 364 of camera 110.

Referring now to FIG. 4A, a memory map showing one embodiment of dynamic random-access-memory (DRAM) 346 is shown. In the preferred embodiment, DRAM 346 includes RAM disk 532, a system area 534, and working memory 530.

RAM disk 532 is a memory area used for storing raw and compressed image data and typically is organized in a "sectored" format similar to that of conventional hard disk drives. In the preferred embodiment, RAM disk 532 uses a well-known and standardized file system to permit external host computer systems, via I/O 348, to readily recognize and access the data stored on RAM disk 532. System area 534 typically stores data regarding system errors (for example, why a system shutdown occurred) for use by CPU 344 upon a restart of computer 118.

Working memory 530 includes various stacks, data structures and variables used by CPU 344 while executing the software routines used within computer 118. Working memory 530 also includes several input buffers 538 for temporarily storing sets of raw image data received from imaging device 114, and a frame buffer 536 for storing data for display on the LCD screen 402. In a preferred embodiment, each input buffer 538 and

the frame buffer 536 are split into two separate buffers, called ping-pong buffers (shown by the dashed lines), to improve the display speed of the digital camera and to prevent the tearing of the image in the display 402.

Referring now to FIG. 4B, the contents of one of the input buffers 538 and the contents of the frame buffer 536 are illustrated. As shown, each input buffer 538 includes an input buffer A and an input buffer B, and the frame buffer 536 includes a frame buffer A and a frame buffer B. The input buffers A and B alternate between an input cycle and a processing cycle. During the input cycle, the input buffers 538 are filled with raw image data from the image device 114, and during the processing cycle, CPU 344 processes the raw data and transmits the processed data to the frame buffers 536.

Referring now to FIG. 7, in a preferred embodiment, the processing is performed by a live view generation process 612, which is stored in non-volatile memory 350 and executed on CPU 344. However, the image processing can also be implemented using hardware. During the execution of the live view generation process 612, the CPU 344 takes the raw image data from the input buffers 538, typically in CCD format, and performs color space conversion on the data. The conversion process performs gamma correction and converts the raw CCD data into either a RGB or YCC color format which is compatible with the LCD screen 402. (RGB is an abbreviation for Red, Green, Blue, and YCC is an abbreviation for Luminance, Chrominance-red and Chrominance- blue). After converting the data to YCC, the YCC image data is stored in the frame buffer 536. The LCD controller 390 then transfers the processed image data from the frame buffers to the LCD screen 402 for display.

The resolution of the LCD screen 402 may vary; however, the LCD screen resolution is usually much less than the resolution of the image data that's produced by imaging device 114 when the user captures an image at full resolution. Typically, the resolution of LCD is ¼ the video resolution of a full resolution image. The size of the input buffers 538 may also vary, but in a preferred embodiment, two of the input buffers 538 are required to contain a full resolution image. One input buffer 538 can therefore contain one image captured at ½ resolution. Since the LCD is capable of displaying images at ¼ resolution, the images generated during the live view process are also ¼

resolution and are therefore be stored in one-half, or in one of the ping-pong buffers of an input buffer 538.

Referring again to FIG. 4B, the ping-pong buffers are utilized during live view mode as follows. While input buffer A is filled with image data, the data from input buffer B is processed and transmitted to frame buffer B. At the same time, previously processed data in frame buffer A is output to the LCD screen 402 for display. While input buffer B is filled with image data, the data from input buffer A is processed and transmitted to frame buffer A. At the same time, previously processed data in frame buffer B is output to the LCD screen 402 for display.

FIGS. 5A and 5B are diagrams depicting the preferred hardware components of the camera's 110 user interface 408. FIG. 5A is back view of the camera 110 showing the LCD screen 402, a four-way navigation control button 409, an overlay button 412, a menu button 414, and a set of programmable soft keys 416. FIG. 5B is a top view of the camera 110 showing a shutter button 418, and a mode dial 420. The camera may optionally include status LCD 406, status LCD scroll and select buttons 422 and 424, a sound record button 426, and zoom-in, zoom-out buttons 426a and 426b.

Accordingly, the user interface 408 of the digital camera can be accelerated when accessing captured images through a combination of various features of the present invention. The features include multiple operating modes for the digital camera, the use of multiple thumbnail images for supporting the rapid display of images by eliminating the need to decompress image data in certain operating modes, and speculative decompression of compressed image data for supporting the rapid display of full-sized images in other operating modes. The use of thumbnails and speculative decompression enables the images to be reviewed and navigated more rapidly via representations which can be displayed quickly. Through the present invention the interaction rate and responsiveness to the user is increased significantly over conventional navigation systems.

As stated above, in one aspect of the present invention, the digital camera is provided with several different operating modes for supporting various camera functions. Although the digital camera includes multiple operating mode, the modes relevant to this description are capture (record), review, and play mode. In capture mode, the camera 100 supports the actions of preparing to capture an image, and capturing an

image through the use of either the LCD screen 402 alone or the status LCD 406 with the aid of an optional optical viewfinder (not shown). In review mode, the camera 100 supports the actions of reviewing camera contents, editing and sorting images, and printing and transferring images. In play mode, the camera 100 allows the user to view screen-sized images in the LCD screen 402 in the orientation that the image was captured. Play mode also allows the user to hear recorded sound associated to a displayed image, and to play back sequential groupings of images, which may comprise time lapse, slide show, and burst image images. The user preferably switches between the capture, review, and play modes, using the mode dial 420. When the camera is placed into a particular mode, that mode's default screen appears in the LCD screen 402 in which a set of mode-specific items, such as images, icons, and text, are displayed. Through the use of multiple operating modes, the camera functions and features can be categorized, which allows for faster access to those features and functions than would be possible by nesting all the features in one play mode as in conventional digital cameras.

Another aspect of the present invention that allows for the acceleration of the user interface 408 is the use of multiple thumbnails associated with each captured image, which are smaller, reduced-resolution versions of the higher-resolution compressed image data. In a preferred embodiment of the present invention, two types of thumbnail images are associated with each captured image and are included in the image's data file.

Referring now to FIG. 6, a block diagram of an enhanced format of still image file in accordance with the present invention is shown. The image file 600 includes a header 602, compressed image data 604, a thumbnail image 606, a screennail 608, and an image tag field 610. The image file 600 may also include a sound file (not shown) if a sound clip has been attached to the particular image.

The header 602 includes information identifying the particular image file and the image represented by the image data 604. The image data 604 is the actual data comprising the full-sized captured image in compressed form, preferably in JPEG format. Although the user can typically choose the resolution mode in which images are captured, once an image is processed and compressed, the compressed image data 604 is the high-resolution representation of the image compared to the thumbnail 606 and screennail 608. If the image is captured at a resolution of 640x480 pixels, for example,

then the compressed image data 604 is typically fifty-to-sixty kilobytes in size.

The thumbnail image 606 is a small, uncompressed low-resolution version of the image. In a preferred embodiment, the pixel size of thumbnail image 606 is less than the display size of the LCD screen 402 (e.g., 80x60 pixels), and has a storage size of approximately ten kilobytes.

The screennail image 608 is a medium-resolution version of the image and in a preferred embodiment is also compressed, although compressing the screennail 608 is optional. Unlike the thumbnail image 606, the screennail image 608 is display-sized and fills the visible area of the LCD screen 402 when displayed. In a preferred embodiment, the pixel size of a compressed screennail image 608 is preferably 288X216 and requires approximately fifteen kilobytes to store.

The image tag field 610 includes information, preferably in the form of tags, regarding the image represented by the image data 604. Media type tags, for instance, indicate all the media types associated with the image, such as whether the image is a single image or a panorama image, for example. In certain operating modes, the media type tags are used to select the type of icon that is displayed in the LCD 402 along side the thumbnail image 606. Besides media tags, the image tag field 610 may also include other types of tags for storing additional information regarding the image and/or the camera 110 itself. For example, a tag could be used to indicate the settings of the camera 110 at the time the image was captured, or indicate the identity of the camera manufacturer, for instance. The information in these tags may be accessed through the buttons on the camera interface 400. The additional information may then be displayed either as text in the LCD 402.

The enhanced image file 600 of the present invention is created for each image as the user takes pictures while the camera is in capture mode. The enhanced image file 600 is then used to accelerate the user interface of the digital camera in the review and play mode as follows. When the camera is placed into review mode, the thumbnail images 606 contained in the image files 600 are directly displayed on the LCD 402 as representations of captured images, which eliminates the need to process and decompress the compressed image data 604. And when the camera is placed into play mode, the screennail image 608 contained in the image file 600 is first decompressed and displayed on the LCD 402 and then optionally updated with the higher-resolution compressed

image data 604 as the image data 604 is being decompressed. This feature enables the digital camera to quickly display a full-sized version of the captured image in the LCD 402 without the delay incurred by first decompressing the higher-resolution JPEG image and resizing it to fit on the LCD 402. Whether or not to decompress and display the compressed image data 604 depends on the resolution of the display and the resolution of the screennail images 608, which is explained further below.

Referring now to FIG. 7, a block diagram is shown of the image file generation process, which begins when the camera is in capture mode and the user presses the shutter button 418 to capture an image. As described above, before the user captures an image in capture mode, frames of raw image data are sequentially captured by the imaging device 114 at a reduced resolution suitable for LCD screen 402, and each of the frame of the raw image data are stored in the ping-pong buffers (FIG. 4B) of an input buffer 538. The live view generation process 612 performs gamma correction and color conversion on the raw image data to convert the data into the YCC format of the LCD screen 402, typically YCC 222 format, and then transfers the YCC 222 data for each frame to the frame buffers 536 for display. The raw image data placed into the input buffers 538 is also processed for extracting exposure, focus, and white balance settings.

Once the user presses the shutter button 418 to capture an image, the raw image data is captured by the image device 114 at a resolution set by the user and the raw image data is stored into an appropriate number of input buffers 538.

The raw image data is then used to generate an enhanced image file 600 for the captured image including the compressed image data 604, the thumbnail 606, and the screennail 608, as shown in FIG. 6.

When generating the thumbnail and screennail images 606 and 608, the present invention takes advantage of the fact that the YCC data in the frame buffers 536 has already been processed by the live view generation process 612 and stored at the reduced resolution of the LCD screen 402. Since the thumbnail and screennail images 606 and 608 are also intended to be lower-resolution representations of the captured image, the previously processed YCC data in the frame buffers 536 is used to generate the thumbnail 606 and screennail 608 directly, rather than using the raw image data stored in the input buffers 538.

To generate the screennail image 608, the YCC data in the frame buffers 536 is

converted from YCC 222 format into YCC 422 format and compressed by a conversion and compression process 614. To generate the thumbnail image 606, the YCC data in the frame buffers 536 is converted from the YCC 222 format into YCC 422 format and then resized by a conversion and resizing process 616. During the conversion and resizing process 616, the thumbnail image 606 may be resized by averaging in which a block of pixel values from the YCC 422 data are averaged to represent one pixel value of the thumbnail image 606, and/or by sub-sampling the YCC 422 data in which only a certain number pixels in a block are used to represent one pixel in the thumbnail image 606.

Referring now to FIGS. 4A, 6 and 7, after the thumbnail image 606 and the screennail 608 are generated, they are stored in working memory 530 until the compressed image data 604 is generated. The compressed image data 604 may be generated either before or after the thumbnail and screennail images 606 and 608. However, in a preferred embodiment, the compressed image data 604 is generated after the thumbnail and screennail images 606 and 608 are generated using a background spooling process 618. In an alternative embodiment, the thumbnail image 606 and the screennail 608 may be generated by the background spooling process 618 along with the compressed image data 604.

In another preferred embodiment, the thumbnail image 606 and the screennail 608 may be generated using a two-stage live view generator 612. In the first stage, the live view generator 612 provides images to the frame buffer 536 for display as described above. When the user captures an image, the raw image data from the imaging device is compressed due to higher quality before being stored in the input buffers 538, and the live view generator 612 switches to the second stage. In this stage, the live view generator 612 decompresses the compressed raw image data and processes the data into both YCC 222 data and YCC 422 data. The live view generator 612 may then transfer the YCC 422 data to the frame buffer 536 for display, and generate the thumbnail image 606 and the screennail 608 from the YCC 422 data.

The background spooling process 618 preferably includes RAM spoolers 1 and 2 (620), removable memory spoolers 1 and 2 (624), and an image processing and compression process (IPC) 622. Processes 620, 622 and 624 are preferably implemented as background processes on CPU 344 and may therefore run in parallel with other

processes. As used herein, a spooler is a process that transfers data from one process or device to a second process or device. The primary purpose of the background spooling process 618 is to move data out of the input buffers 538 as fast as possible in order to free the input buffers 538 to capture another image. After the data is moved, the data is processed in the background. This allows the next image to be captured before the previous image is processed and compressed, which increases the capture rate of the digital camera.

In operation, after the user has captured an image, control of the raw image data in the input buffers 538 is transferred to RAM spooler 1 (620) if the RAM disk 532 is not full. If the RAM spooler 1 (620) obtains control of the raw image data, then the RAM spooler 1 (620) transfers the raw image data to the RAM disk 532. Alternatively, if the RAM disk 532 is full, then control of the raw image data is transferred to the IPC 622 where the data is processed and compressed to generate the compressed image data 604 (FIG. 6).

In the case where the raw image data has been transferred to the RAM disk 532, the removable memory spooler 1 (624) may then access the raw image data from the RAM disk 532 and transfer it to the removable memory 354. Once the raw image data is transferred to the removable memory 354, the IPC 622 accesses the raw image data and processes the raw image data to generate the compressed image data 604. Alternatively, if the removable memory 354 is full or is not present, then the removable memory spooler 1 (624) may provide the raw image data directly to the IPC 622 for generation of the compressed image data 604.

After the compressed image data 604 is generated, the IPC 622 may provide the compressed image data 604 to the RAM spooler 2 (620). The compressed image data 604 is then combined with the thumbnail 606 and the screennail 608 to generate the enhanced image data file (FIG. 6), and the RAM spooler 2 (620) transfers the compressed image data file 600 to the RAM disk 532. Once the image data file 600 is written to RAM disk 532, the removable memory spooler 2 (624) may then access the image data file 600 and write the image data file 600 onto the removable memory 354. If the removable memory 354 is not inserted, the image data file 600 remains on the RAM disk 532. It should be noted that in an alternative embodiment, the digital camera may be implemented without a RAM disk 532, in which case the image data would be spooled to

and from the removable memory 354.

The preferred use of the enhanced image data file 600 of the present invention to accelerate the user interface of the review mode and the play mode of the digital camera are described below.

Referring now to FIG. 8, a diagram illustrating the operation and appearance of the accelerated user interface during review mode is shown in accordance with a preferred embodiment of the present invention. Moving the mode dial 420 (FIG. 5B) or other such button to access the review mode enables the user to view all the images in the camera along with specific attributes associated with of each of the images. In a preferred embodiment, the review screen layout displays four small thumbnails 700 at a time and is based on a filmstrip metaphor which allows users to quickly move forward and backward among pictures chronologically according to date and time.

The user may navigate through the series of small thumbnails 700 in the LCD screen 402 using the four-way navigation control button 409. When the user depresses or holds down the left/right buttons 410, the small thumbnails 700 are scrolled-off the LCD screen 402 and replaced by new small thumbnails 700 representing other captured images to provide for fast browsing of the camera contents. A stationary selection arrow line 702 is used as both a navigational aid and to indicate which small thumbnail 700 is the currently selected image. As the user presses the navigation buttons 410 and the small thumbnails 700 scroll across the LCD screen 402, the small thumbnail 700 that is positioned over a selection indication in the selection arrow line 702 is considered the currently selected image. In an alternative embodiment, the selection indication is stationary except when positioned near the beginning and the end of the image list.

In a preferred embodiment, when no captured images are available in the camera, the LCD 702 displays a message indicating this to be the case. When only one image is available, then the small thumbnail 700 representing that image is displayed above the selection indication in the selection arrow line 702. And when there are more than four images in the camera, the selection arrow line 702 displays arrow heads to indicate movement in that direction is possible with the left/right navigation buttons 410.

After a small thumbnail 700 becomes the currently selected image, additional information corresponding to that image is automatically displayed in the LCD screen 402. In a preferred embodiment, the additional information includes a resized thumbnail

704 showing a larger view (120x90 pixels) of the currently selected image, and image information comprising an icon bar 706 and text 708. The icon bar may display several icons indicating the media types associated with the active image, such as whether the image is a still, a time lapse, or a burst image, whether sound is attached to the image, and a category for the image. The displayed text 708 may include a specification of the name or number of the image, and the date and time the image was captured.

Referring now to FIG. 9, a flow chart illustrating the process of accelerating the user interface of the digital camera when in review mode is shown in accordance with the present invention. The process begins once review mode is invoked in step 720. Referring now to FIGS. 3, 6, 8, and 9, after review mode is invoked, each of the thumbnail images 606 to be displayed in the current screen are fetched from the corresponding image data files 600 stored on the removable memory 354 (or a host computer if connected) in step 722.

To further increase the display speed of the user interface, one of the frame buffers 536 shown in FIG. 4B is used as a dedicated draw buffer and the other as a dedicated display buffer in a preferred embodiment of the present invention. When displaying a given review mode screen, all the screen elements are first drawn in the draw buffer and then moved to the display buffer where the data is then output to the LCD 402 for display.

After a thumbnail image 606 is fetched and placed into working memory 530, the thumbnail image 606 is cropped to generate a small thumbnail 700, and the small thumbnail 700 is written into the draw buffer in step 724. In one preferred embodiment, the small thumbnails 700 are generated by cropping the center of thumbnail image 606 to a square size (50x50 pixels) irrespective of image orientation before being displayed. This is done because the small thumbnails 700 are intended to serve as navigational aides rather than accurate representations of their images and the square size reduces the amount of space in the LCD 402 that would be required to support the display of both landscape and portrait thumbnail images. In an alternate embodiment, the thumbnails 700 may be displayed in the LCD 402 in their true orientation and aspect ratio (portrait or landscape). In another embodiment, the thumbnails may also be displayed in landscape format and may be cropped or uncropped to resemble images laid out on a conventional wet film negative.

After all the small thumbnail images 700 are written into the draw buffer, the thumbnail image 606 associated with the currently selected image is resized to generate the larger resized thumbnail 704 and the resized thumbnail 704 is written into the draw buffer in step 726. In a preferred embodiment, the resized thumbnail 704 is generated by multiplying the thumbnail image 606 by a multiplication factor, such as 1.5, which effectively increases the image size by 2.25. Rather than expanding the thumbnail image 606, the resized thumbnail 704 could also be generated by expanding the small thumbnail 700. Since the small thumbnail 700 is cropped to a square size, however, expanding the original thumbnail image 606 provides a better representational view of the selected image as it indicates the true orientation of the image.

After the resized thumbnail 704 is written, additional information regarding to the selected image is written into the draw buffer in step 728. The additional information is displayed by accessing the image tags 610 from the image file 600 corresponding to the selected image. After the draw buffer contains all the necessary screen elements, the contents of the draw buffer are moved to the display buffer and then output to the LCD 402 in step 730.

As the user scrolls through the small thumbnails in the LCD 402 in step 730, then the next thumbnail image 606 to be displayed is fetched from its image data file 600 and placed into working memory 530 as described with reference to step 722 and the process repeats. In one preferred embodiment, if the user holds down the left/right navigation button 410, the resized thumbnail 704 is updated as the selected image changes, and the small thumbnails 700 scroll only as fast as the resized thumbnail 704 can be updated. In another preferred embodiment, the resized thumbnail 704 is not updated with each new selected image, and the small thumbnails 700 rapidly move across the screen at a predefined rate in a smooth scroll, rather than in incremental jumps. In this embodiment, the resized thumbnail 704 is updated once the user releases the left/right navigation button 410 to stop scrolling.

In accordance with the present invention, both small and large thumbnail 700 and 704 are displayed in the review mode using the thumbnail image data 606. Since no JPEG decompression is necessary to display the thumbnails 700 and 704, image display time and responsiveness of the user interface is significantly increased. And since the resized thumbnail 704 is displayed along with the small thumbnails 700, the user can

easily identify a given image while maintaining the ability to scroll through the images.

In alternative embodiments, if the speed of the removable media is a hindrance, then the above process could be implemented by caching a set of thumbnail images 606 into working memory. The process could also be implemented without partitioning the frame buffers 536 into a draw and display buffer, and could be implemented instead by swapping ping-pong buffers. However, it is believed the preferred embodiment will result in performance gains because only elements of the screen that change are redrawn in the draw buffer, while the background and other screen elements that remain constant and are not redrawn, which saves time and frees processing cycles for other tasks.

Referring now to FIG. 10, a diagram illustrating the operation and appearance of the accelerated user interface during play mode is shown in accordance with a preferred embodiment of the present invention. Moving the mode dial 420 (FIG. 5B) or other such button to access the play mode enables the user to view full-sized images and to play-back various media types associated with the images. In a preferred embodiment, the play screen layout displays one full-sized image at a time in the orientation that the image was captured. As in the review mode, the user may chronologically navigate through the full-sized images in the LCD screen 402 using the left/right buttons 410 on four-way navigation control button 409. Users can also play back various media types, such as time lapse, bursts and slide show images according to either default or user defined play back rates.

Referring now to FIG. 11A a flow chart illustrating the process of accelerating the user interface of the digital camera when in play mode is shown in accordance with the present invention. The process begins once play mode is invoked in step 800. Referring now to FIGS. 3, 6, and 10, after play mode is invoked, the screennail image 608 corresponding to the selected image is fetched from the image data file 600 stored on the removable memory 354 (or a host computer if connected) in step 802. The screennail image 608 is then decompressed and displayed in the LCD screen 402 in step 804.

FIG. 11B illustrates an example of a screennail 809 displayed on the LCD screen 402. Because the screennail 809 is only medium-resolution, the image is not quite clear, but is adequate for a user to tell what image it represents. Referring again to FIG. 11A, if the user presses and holds down the left/right buttons 410 in step 806, then a series of screennail images 608 are continually decompressed and displayed in the LCD screen

402 in step 808 until the user releases the button.

After the button is released, whichever image is currently being displayed becomes the selected image, and the compressed image data 604 corresponding to the selected image is fetched from the image file 600 and decompressed and resized to fit the display in step 810. In a preferred embodiment, as the compressed image 604 is being decompressed, the screennail image 608 in the LCD screen 402 is updated with decompressed image block by block in step 812.

FIGS. 11C and 11D illustrate an example of a higher-resolution compressed image 811 replacing the screennail 809 on the LCD screen 402 from top to bottom as the compressed image 604 is decompressed and resized. In an alternative embodiment, the compressed image 604 may be decompressed and resized in its entirety first and then displayed to replace the screennail image 608 in one step.

In another preferred embodiment of the present invention, the play mode user interface may be further accelerated by optionally displaying the compressed image data 604. That is, if the screennail quality is such that its display on the LCD screen 402 is indistinguishable from the display of the compressed image data 604, then there is no reason to spend the time decompressing and displaying the compressed image data 604. Whether or not to display the compressed image data 604 depends on two factors: the resolution of the screennail image 608, which is determined by the compression factor used to compress the screennail 608, and the resolution of the LCD screen 402. If the resolution of the screennail 608 matches or surpasses the resolution of the LCD screen 402, then only the screennail 608 is displayed in play mode. In this case, the camera can be programmed to monitor whether it is attached to a higher resolution device, such as a PC monitor or television, via the camera's video jack. If so, then the compressed image data 608 is also decompressed and displayed on higher resolution device, as in step 812.

Continuing with the FIG. 11A, if the user presses one of the navigation buttons 410 in step 814, then the decompressing process is interrupted (if not yet complete) in step 816 and the next screennail image 608 is decompressed and displayed in step 808. It should also be understood that the process of decompressing the compressed image is also interrupted if the user changes modes.

Accordingly, by displaying screennail images only when the user holds down a navigation button, the user may scroll through full-sized images more quickly than in

conventional digital cameras since decompressing the low resolution screennails is faster than decompressing full-sized compressed images. In addition, since the CPU responds to interrupts caused by position and mode changes, the user may abort the decompression and display of an unwanted compressed image and quickly forward to the next image. That is, since the buttons of the user interface are not frozen while an image is being displayed as in conventional digital cameras, the camera responds to user input immediately and the responsiveness of the digital camera user interface is greatly increased.

In another aspect of the present invention, the compressed screennail image 606 are speculatively decompressed in the review and play modes to further accelerate the user interface of the digital camera. Referring again to FIG. 4A, recall that in the capture mode, the input buffers 538 are used as capture buffers to capture incoming image data. When the camera is placed into review and play modes, however, the input buffers 538 are typically unused. According to the present invention, these unused input buffers 538 are reallocated as working memory 530 when the camera is placed into the review and play modes.

Referring now to FIG. 12, a memory map of the DRAM is shown illustrating the reallocation of the input buffers as speculation buffers in accordance with the present invention. The DRAM 346 is shown as including (N) speculation buffers 850, which are used by a background process to speculatively decompress image data corresponding to images the user may potentially scroll to. By using part of the DRAM 346 as input buffers 358 to capture input data in one mode, and then using that same part of DRAM 346 as speculation buffers 850 to decompress image data in other modes the present invention provides for the multiple use of memory.

During the speculative decompression of the present invention, the speculation buffers 850 are used to decompress screennail images 608 and compressed images 604 in the background during review and play modes. If the user is currently in review mode and switches to play mode, or selects the next image while in play mode, the screennail for the selected image is displayed immediately since it has already been decompressed. As the user begins to scroll from image to image, the screennails that have already been decompressed are similarly displayed. If the user maintains position on the currently selected image long enough, then once all the speculation buffers 850 have been filled

with decompressed screennails, the process begins to replace the screennail images in the speculation buffers 850 by decompressing their respective compressed image data 604. This way when the user switches to play mode or selects the next image while in play mode, the higher-resolution image is instantaneously displayed since it has already been decompressed. When this occurs, the step of displaying the screennail is skipped.

Referring now to FIG. 13, a flow chart depicting the speculative decompression process is shown in a preferred embodiment of the present invention. The process begins when either the review or play modes are invoked in step 900. Once this occurs, it is determined how many speculation buffers 850 are available for use in step 902. Given the number of speculation buffers 850 available, a speculation buffer organization is assigned around the currently selected image based on the scrolling method employed by the user in step 904. For example, the user may automatically advance through the images by holding down the left/right navigation button 410 or by pressing a "play" button in which case the images are advanced at a preset rate. The user may also manually advance through the images by repeatedly pressing either the left or right navigation buttons 410a and 410b. The buffer organization that is assigned in response to the scrolling method predicts which images will be displayed next and determines the order of screennail decompression accordingly.

Referring now to FIG. 14A, the buffer organization that is assigned to the images in response to an automatic scrolling method is shown. Given M speculation buffers 850, the speculation buffers 850 are assigned such that the currently selected image N in a sequence of images is decompressed first. Thereafter, the order of screennail decompression extends from the selected image N to image N+1, image N+2, image N+3, image N+4, and so on. This order ensures that as the user continues to scroll in the same direction, the screennails 608 for the images ahead of the current image will be decompressed ahead of time and may be displayed without delay when they become the selected image.

Referring now to FIG. 14B, the buffer organization that is assigned to the images in response to the manual scrolling method is shown. Given M speculation buffers 850 and a currently selected image N in a sequence of images, the speculation buffers 850 are assigned such that the currently selected image N in a sequence of images is decompressed first. Thereafter, the order of screennail 608 decompression alternates

around the selected image N as follows: image N+1, image N-1, image N+2, image N-2, and so on. By speculatively decompressing the screennails 608 for the images neighboring the selected image, the screennails 608 may be displayed without delay whether the user advances to the next or the previous image.

Referring again to FIG. 13, after the buffer organization is assigned, the process gets (N), the number of the currently selected image, in step 906. It should be noted that at this point it must be determined whether the selected image is the first or last captured image, since speculative decompression cannot occur beyond the first or last image. If in review mode, then after getting (N) the process must also fetch the screennail 608 for the selected image (N) from the image's image data file 600.

After getting (N) in step 906, it is determined whether a screennail update of any of the speculation buffers 850 is required in nearest neighbor order according to the assigned buffer organization in step 908. If an update necessary, then the it is determined whether a speculation buffer 850 is free in step 910. If a speculation buffer 850 is not free, then the speculation buffer 850 used to decompress the screennail for the image farthest away from the current image (N) and opposite to the current direction of scrolling is freed in step 912. The freed speculation buffer 850 is then given to the speculation process in step 914 and is used to decompress the screennail 608 for the image that needs updating in step 916.

Referring again to step 908, if after getting (N) it is determined that a screennail update of the speculation buffers 850 is not required, meaning that all speculation buffers contain a decompressed screennail in accordance with the assigned buffer organization, then it is determined whether a compressed image data update of the speculation buffers 850 is required in step 917. In no compressed image data update of the speculation buffers 850 is required, then all the speculation buffers 850 contain decompressed image data and the process waits until the current image (N) changes in step 906. If a compressed image data update of the speculation buffers 850 is required in step 917, the compressed image data for the image needing updating is decompressed and resized in step 919.

After either the screennail or the compressed image data has been decompressed, it is determined whether review or play mode has been terminated in step 918. If so, the speculative decompression process ends in step 920. If the review or play mode has not

been terminated, then it is determined whether the number of available speculation buffers 850 has changed in step 922. This could occur for example when a previously used input buffer 538 becomes free and is reallocated as a new speculation buffer 850.

If the number of available speculation buffers 850 has changed, then the process continues by determining how many speculation buffers 850 are available for use in step 902. If the number of available speculation buffers 850 has not changed, then it is determined whether the user 's scrolling method has changed in step 924. If the user's scrolling method has changed, then the process continues by assigning a speculation buffer organization accordingly, as described in step 904. If the user 's scrolling method has not changed, then the screennail 608 for the currently selected image is fetched from its image data file 600, as described in step 906 and the process continues.

Referring now to FIG. 15, a flow chart illustrating the process of accelerating the user interface of play mode using the speculative decompression process is shown. As described in FIG. 11A, after play mode is invoked in step 930, the screennail image 608 corresponding to the selected image is fetched in step 932, and decompressed and displayed in step 934. Thereafter the speculation process is invoked in step 936.

If the user presses and holds down the left/right buttons 410 in step 938, then it is determined whether a decompressed screennail or decompressed high-resolution image for the next image is available from the speculation process in step 952. If a decompressed screennail or high-resolution image is available, then it is copied from the speculation buffer 850 to the frame buffer 536 for display in step 956. If a decompressed screennail or high-resolution image is not available in step 952, then the next screennail image 608 is decompressed and displayed in step 954 and the process continues at step 938.

After the navigation button is released in step 938, whichever image is currently being displayed becomes the selected image. It is then determined whether a decompressed high-resolution image is available for the selected image from the speculation process in step 940. If a decompressed high-resolution image is available, then it is copied from the speculation buffer 850 to the frame buffer 536 for display in step 942.

If a decompressed high-resolution image is not available in step 940, then the

compressed image data 604 corresponding to the selected image is fetched from the image file 600 and decompressed and resized to fit the display in step 944. In a preferred embodiment, as the compressed image 604 is being decompressed, the screennail image 608 in the LCD screen 402 is updated with decompressed image block by block in step 946. If the user presses one of the navigation buttons 410 in step 948, then the decompressing process is interrupted (if not yet complete) in step 950. It is then determined whether a decompressed screennail or decompressed high-resolution image for the next image is available from the speculation process in step 952, and the process continues.

Accordingly, by speculatively decompressing the screennail images 608, the captured images can be more quickly accessed and reviewed in play mode, thereby facilitating user interaction.

A method and system for accelerating the user interface of an image capture device has been disclosed. Through the present invention, the user interface is accelerated when accessing captured images through interaction of various features. In a first enhancement, as has been described above, an enhance image file is created for each image that contains a combination of a thumbnail, a screennail, and a full resolution compressed image. Through the use of the enhanced image file, the user interface in review mode is accelerated because the thumbnails can be displayed quickly; and the user may easily recognize images by providing a larger resized thumbnail on the display. In a another enhancement of the present invention, the user interface in play mode is accelerated by displaying the reduced resolution screennail image first and then updating it with higher resolution compressed image so that the user can quickly view an image without waiting for the compressed image to be decompressed. In a further enhancement of the present invention, the input buffers are reallocated to allow for the speculative decompression of such images. In so doing, the images can be navigated more rapidly via representations which can be seen quickly. Through the present invention the interaction rate and responsiveness to the user is increased significantly over conventional digital camera navigation systems.

Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit

and scope of the present invention. For example, the accelerated user interface also applies to cameras having only two modes, but that have multiple navigation screens within the "play mode" Accordingly, many modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the appended claims.

CLAIMS

What is claimed is:

1. A method for accelerating a user interface on a display of an image capture unit, the image capture unit including a plurality of image files for providing a plurality of images, the method comprising the steps of:

selecting an image based upon a scrolling method;

providing a predetermined number of speculation buffers; and

organizing the predetermined number of speculation buffers based upon the selected image so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method.

2. The method of claim 1 in which the scrolling method comprises an automatic scrolling method which advances the selected image at a preset rate.

3. The method of claim 1 in which the scrolling method comprises a manual scrolling method which advances the selected image based upon a repeated user action.

4. The method of claim 2 which further comprises the steps of:

assigning the predetermined number of speculation buffers such that the selected image is decompressed in a first speculation buffer; and

ordering the remaining speculation buffers such that the images that are in sequential order from the selected image are stored in the remaining speculation buffer dependent upon a user interaction.

5. The method of claim 3 which further comprises the steps of:

assigning the predetermined number of speculation buffers such that the selected image is decompressed in a first speculation buffer; and

ordering the remaining speculation buffers such that the images that are neighboring the selected image are stored in the remaining speculation buffers dependent upon a user interaction.

6. A method for accelerating a user interface on a display of an image capture unit, the image capture unit including a plurality of image files for providing a plurality of images, the image capture unit operating in a plurality of modes; the image capture unit including a plurality of input buffers which are utilized in one of the plurality of modes and are unutilized on at least one of the other of the plurality of modes; the method comprising the steps of:

reallocating the input buffers as speculation buffers; and

providing image data from the image files to the speculation buffers when the image capture unit is in the at least one of the plurality of modes.

7. The method of claim 6 wherein the plurality of modes comprise capture, play and review modes.

8. The method of claim 7 wherein the plurality of input buffers are unutilized in the review and play modes.

9. A method for accelerating a user interface on a display of an image capture unit, the image capture unit including a plurality of image files for providing a plurality of images, the image capture unit including controls for allowing an image to be viewed on the display and for allowing navigation between the plurality of images, the image capture unit operating in a plurality of modes, the method comprising the steps of:

providing a low resolution image, medium resolution image and high resolution image within each image file;

allowing the medium resolution image to be viewed on the display in a first mode;

providing a plurality of low resolution images on the display in a second mode;

selecting one of the plurality of low resolution images to be displayed as a resized low resolution image on the display, the resized low resolution image being a larger version of the selected one of the plurality of low resolution images; and

providing for speculative decompression of either the medium resolution or the high resolution images within the image capture unit.

10. The method of claim 9 wherein the speculation decompression providing step further comprises selecting an image based upon a scrolling method;

providing a predetermined number of speculation buffers;

organizing the predetermined number of speculation buffers based upon the selected image so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method.

11. The method of claim 9 wherein the plurality of modes comprise capture, play and review modes.

12. The method of claim 10 wherein the plurality of input buffers are unutilized in the review and play modes.

13. A system for accelerating a user interface on a display of an image capture unit, the image capture unit including a plurality of image files for providing a plurality of images, the system comprising:

means for selecting an image based upon a scrolling method;

means for providing a predetermined number of speculation buffers; and

means for organizing the predetermined number of speculation buffers based upon the selected image so as to assign each of the predetermined number of speculation buffers to store one of the plurality of images in response to the scrolling method.

14. The system of claim 13 in which the scrolling method comprises an automatic scrolling method which advances the selected image at a preset rate.

15. The sytem of claim 13 in which the scrolling method comprises a manual scrolling method which advances the selected image based upon a repeated user action.

16. The system of claim 14 which further comprises:

means for assigning the predetermined number of speculation buffers such that the selected image is decompressed in a first speculation buffer; and

means for ordering the remaining speculation buffers such that the images that are

in sequential order from the selected image are stored in the remaining speculation buffer dependent upon a user interaction.

17. The system of claim 15 which further comprises:

means for assigning the predetermined number of speculation buffers such that the selected image is decompressed in a first speculation buffer; and

means for ordering the remaining speculation buffers such that the images that are neighboring the selected image are stored in the remaining speculation buffers dependent upon a user interaction.

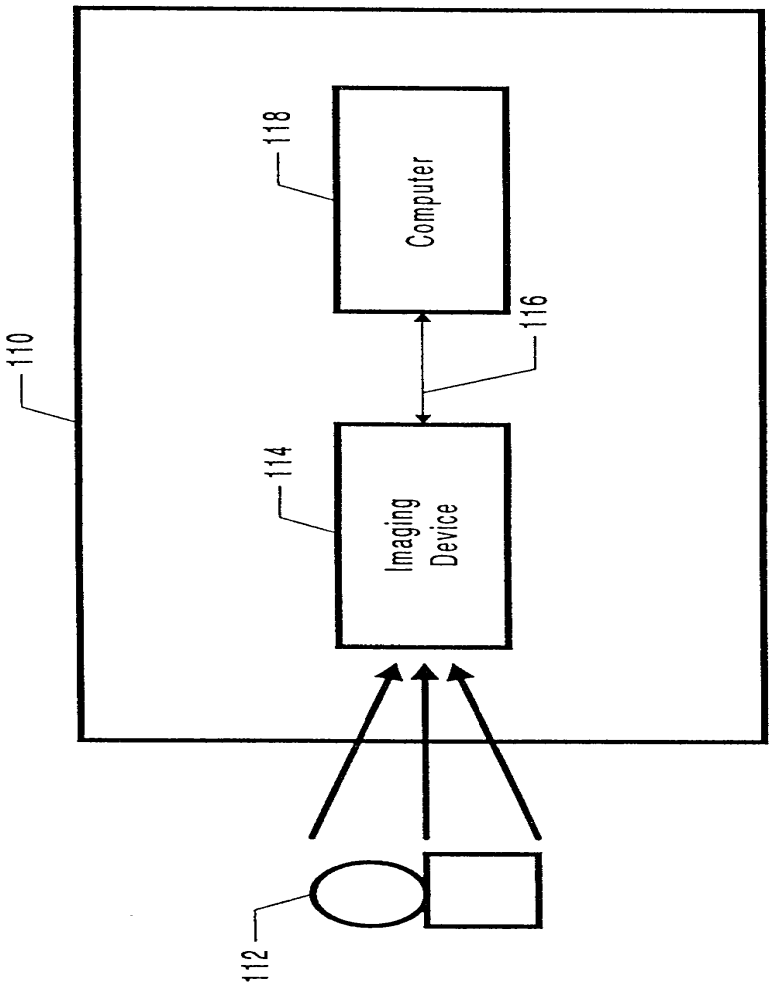


FIG. 1

350

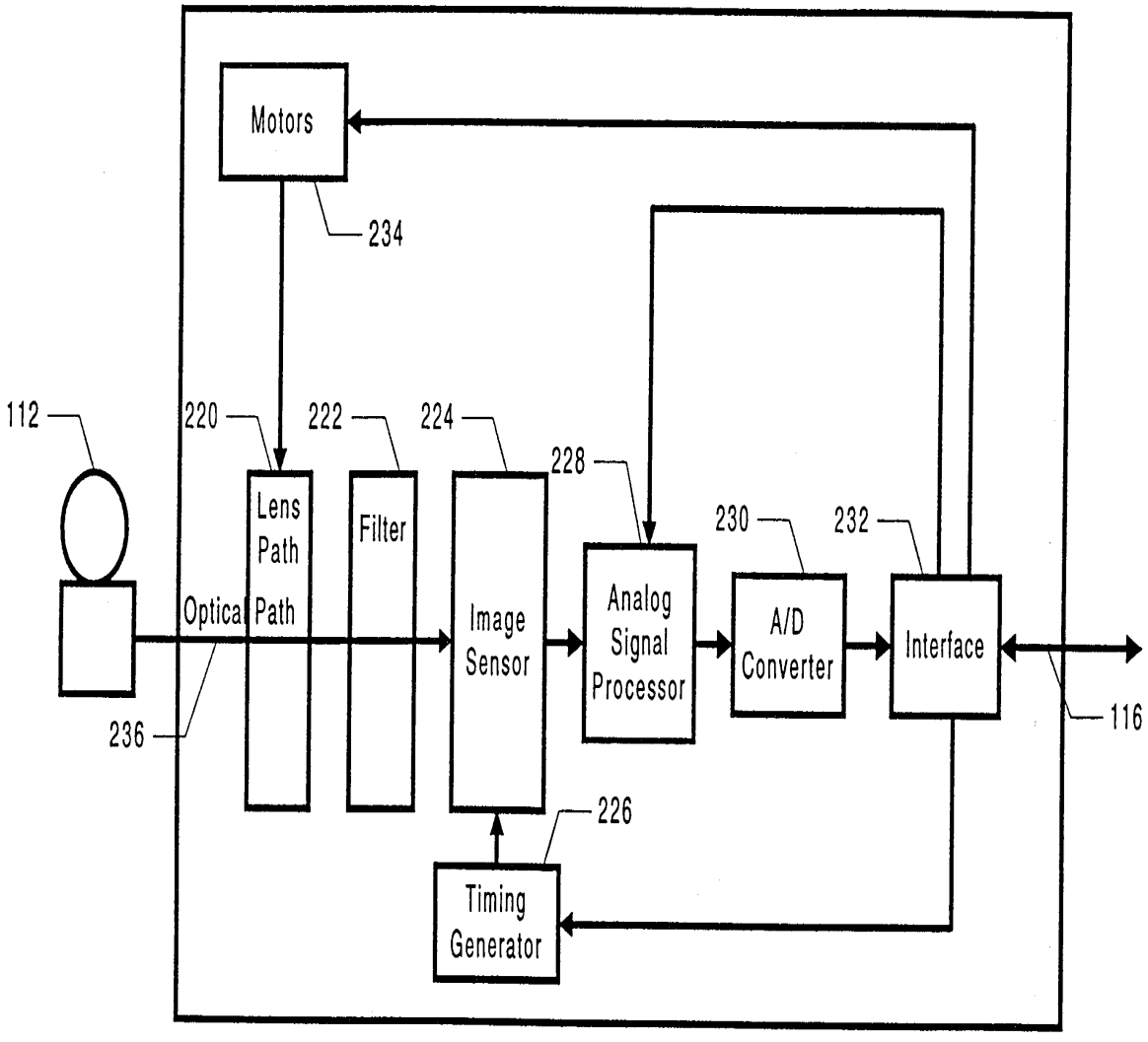
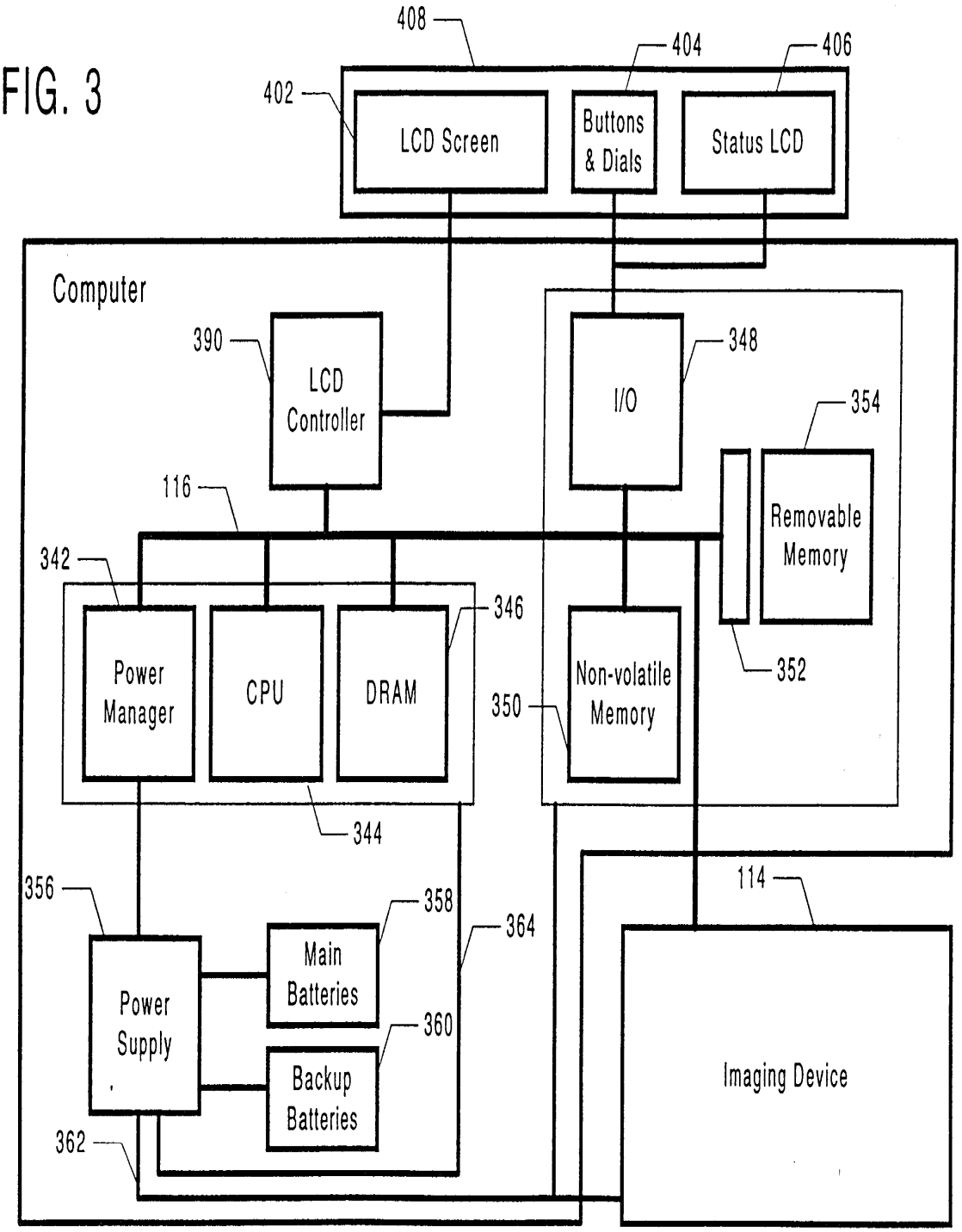

Motors
234
112
220
222
224
228
230
232
Lens Path
Filter
Image Sensor
Analog Signal Processor
A/D Converter
Interface
Optical Path
236
116
226
Timing Generator

FIG. 2

FIG. 3


408
404
406
402
LCD Screen
Buttons & Dials
Status LCD
Computer
390
LCD Controller
348
I/O
354
Removable Memory
116
342
346
Power Manager
CPU
DRAM
Non-volatile Memory
350
352
344
356
358
364
Main Batteries
Power Supply
360
Backup Batteries
362
114
Imaging Device

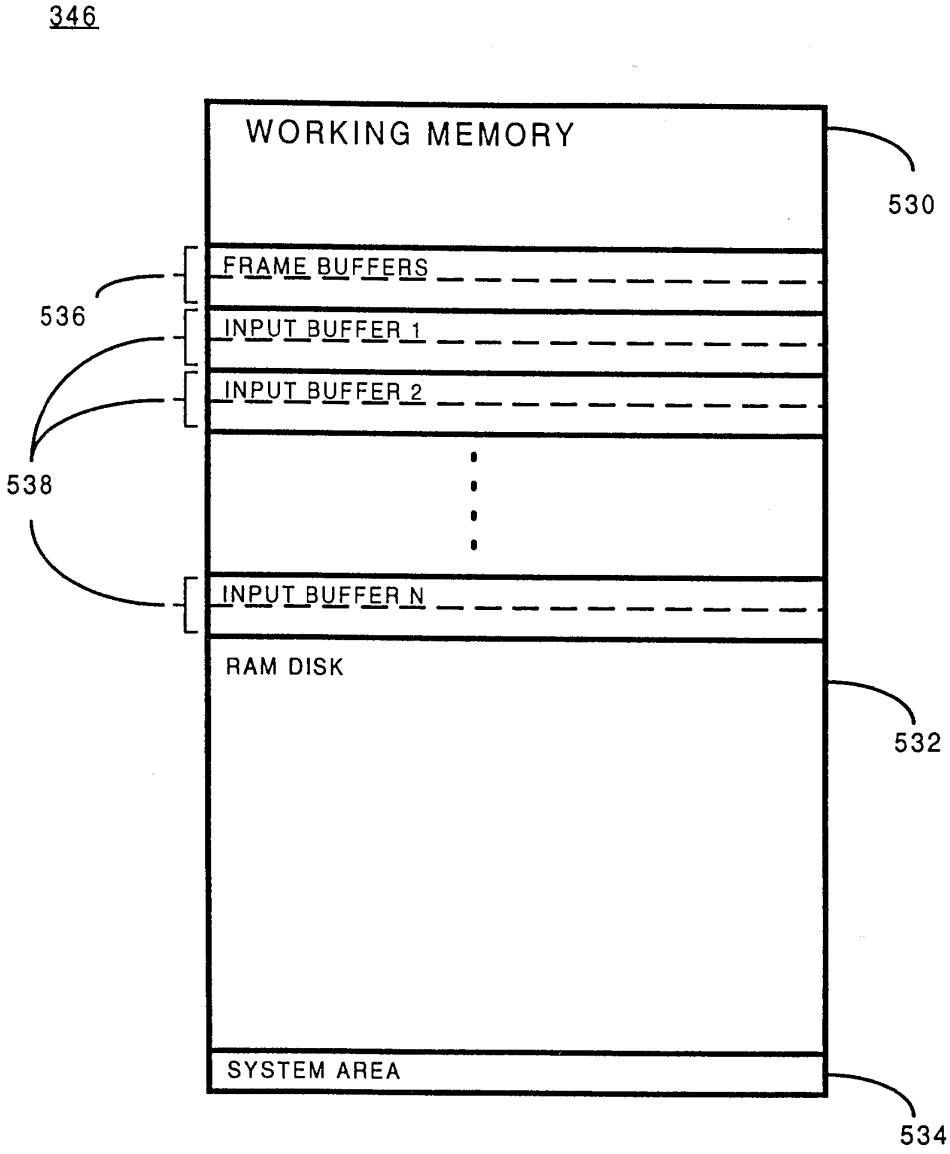

346
WORKING MEMORY
530
FRAME BUFFERS
536
INPUT BUFFER 1
INPUT BUFFER 2
538
INPUT BUFFER N
RAM DISK
532
SYSTEM AREA
534

FIG. 4A

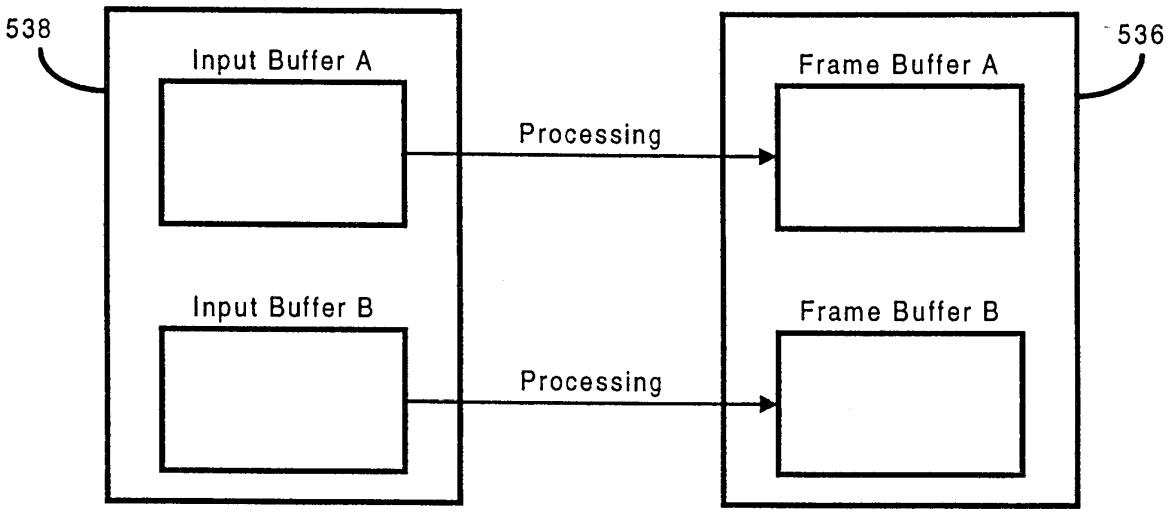

538
Input Buffer A
Input Buffer B
Processing
Processing
536
Frame Buffer A
Frame Buffer B

FIG. 4B

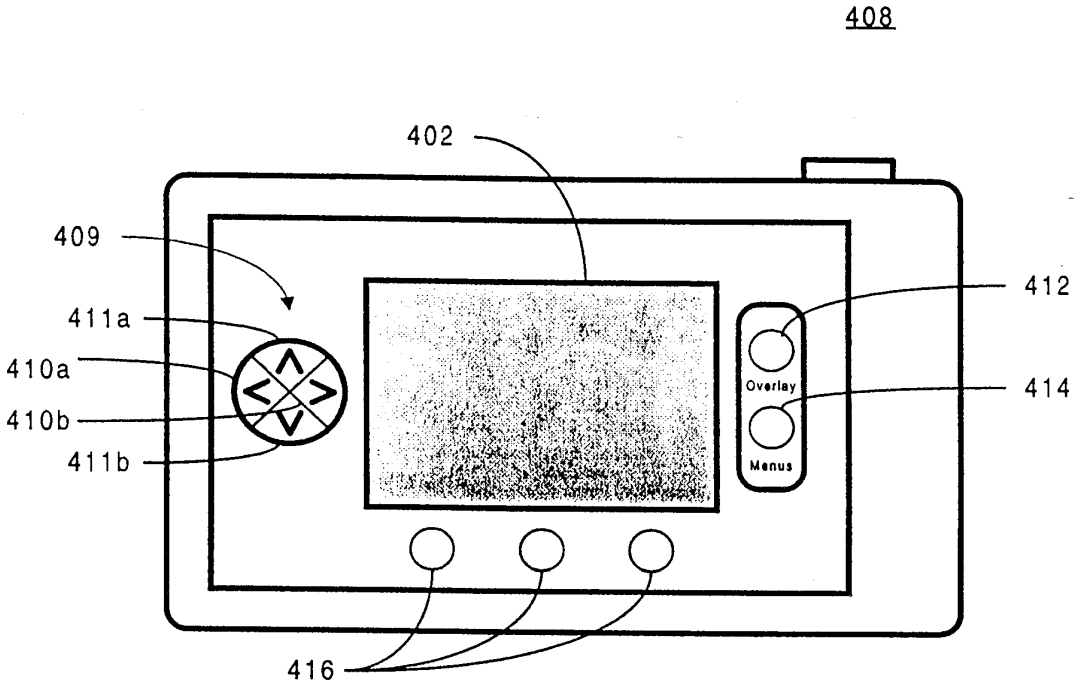

408
402
409
411a
410a
410b
411b
412
414
Overlay
Menus
416

FIG. 5A

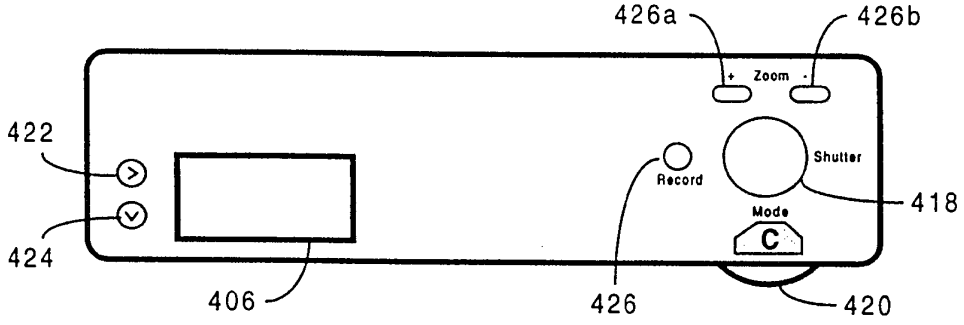

426a
426b
+ Zoom -
422
Record
Shutter
418
Mode
C
424
406
426
420

FIG. 5B

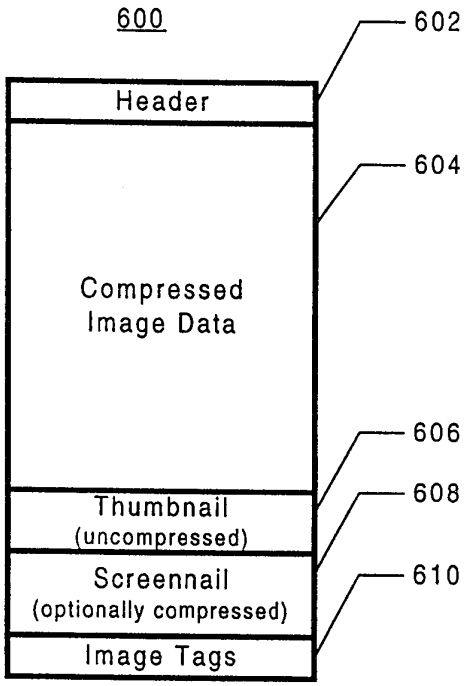

600
602
Header
604
Compressed
Image Data
606
608
Thumbnail
(uncompressed)
Screennail
(optionally compressed)
610
Image Tags

FIG. 6

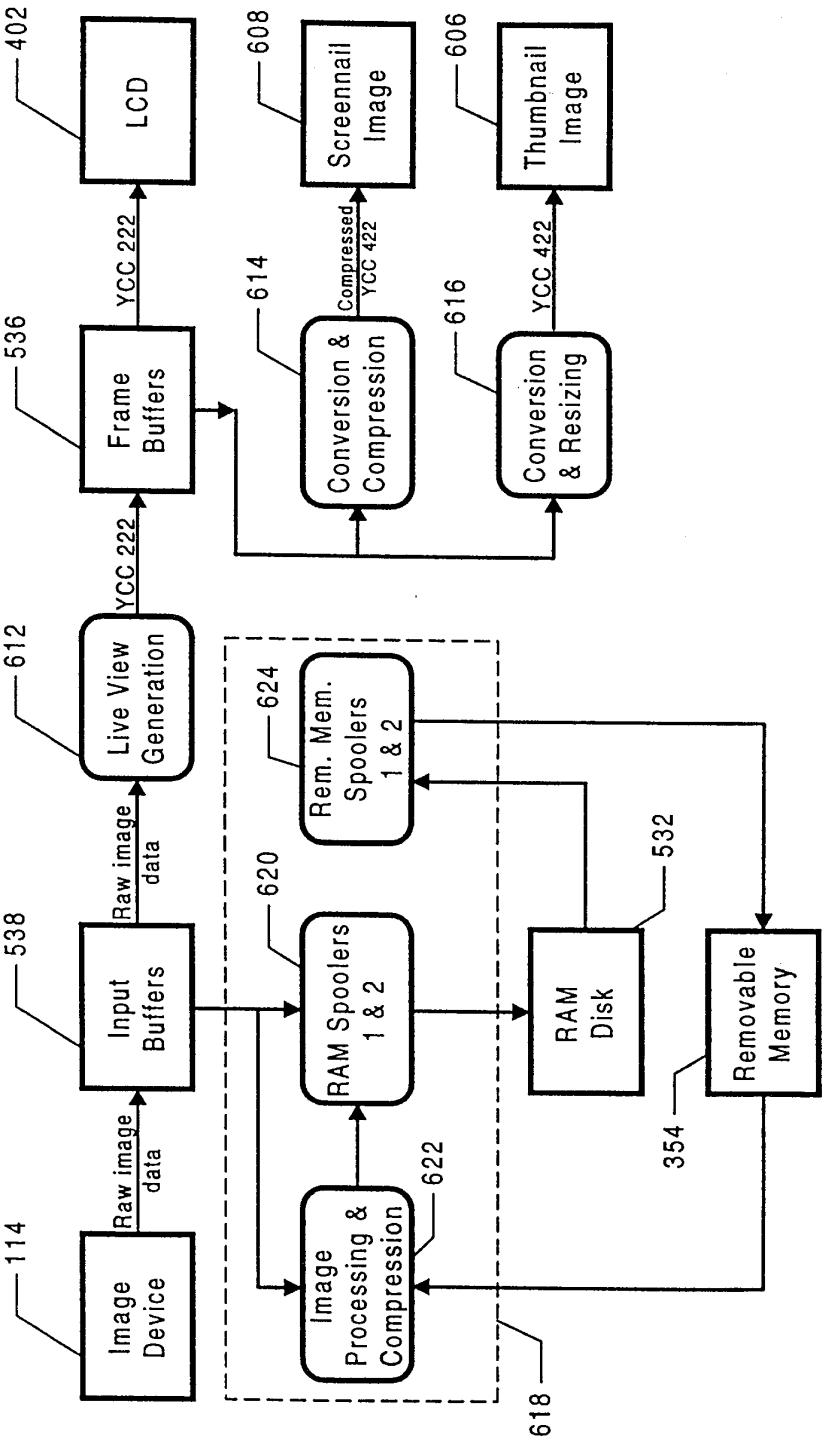

402
LCD
608
Screennail Image
606
Thumbnail Image
536
Frame Buffers
YCC 222
614
Conversion & Compression
Compressed YCC 422
616
Conversion & Resizing
YCC 422
612
Live View Generation
YCC 222
624
Rem. Mem. Spoolers 1 & 2
620
RAM Spoolers 1 & 2
532
RAM Disk
538
Input Buffers
Raw image data
Raw image data
114
Image Device
622
Image Processing & Compression
354
Removable Memory
618

FIG. 7

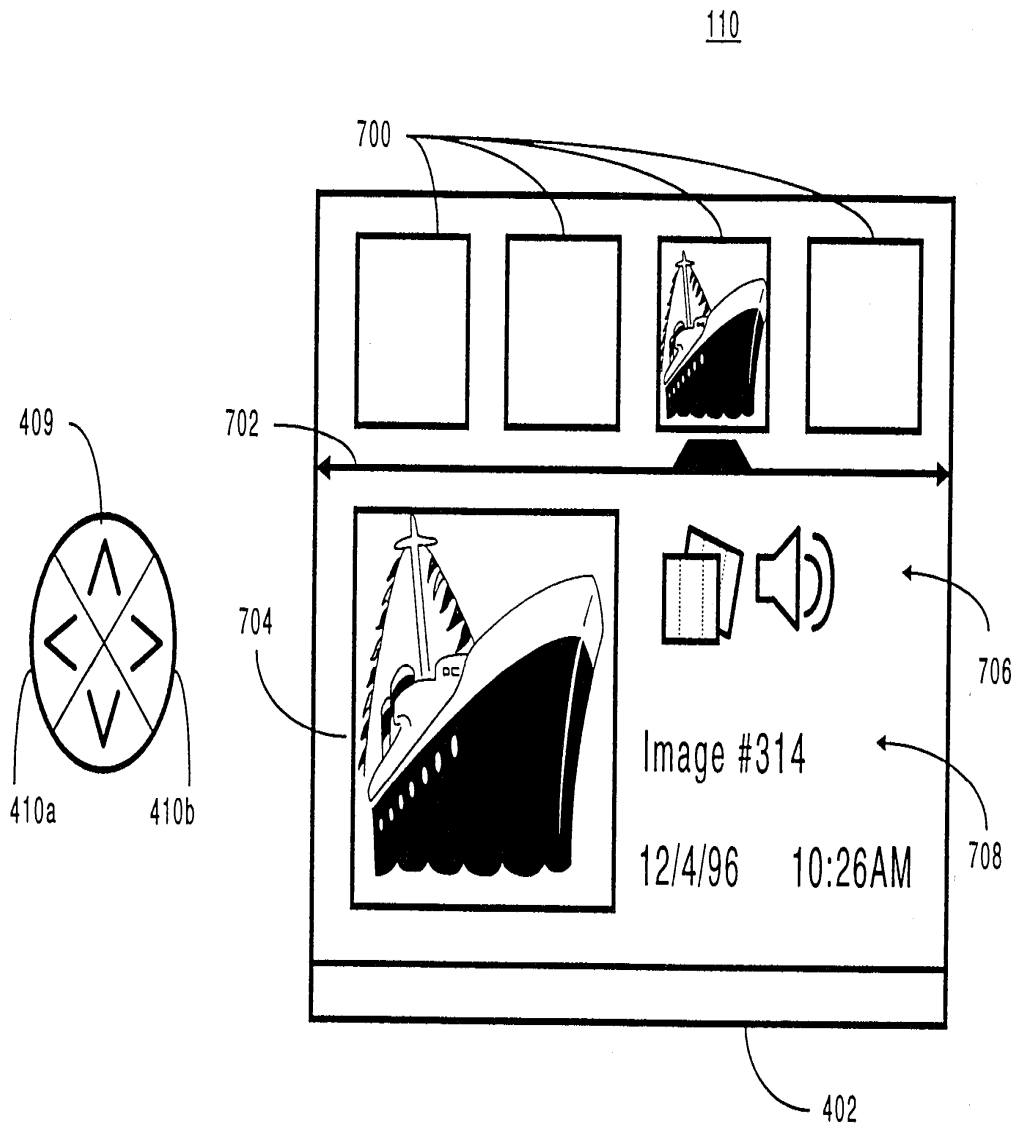

110
700
409
702
704
706
Image #314
12/4/96 10:26AM
708
410a
410b
402

FIG. 8

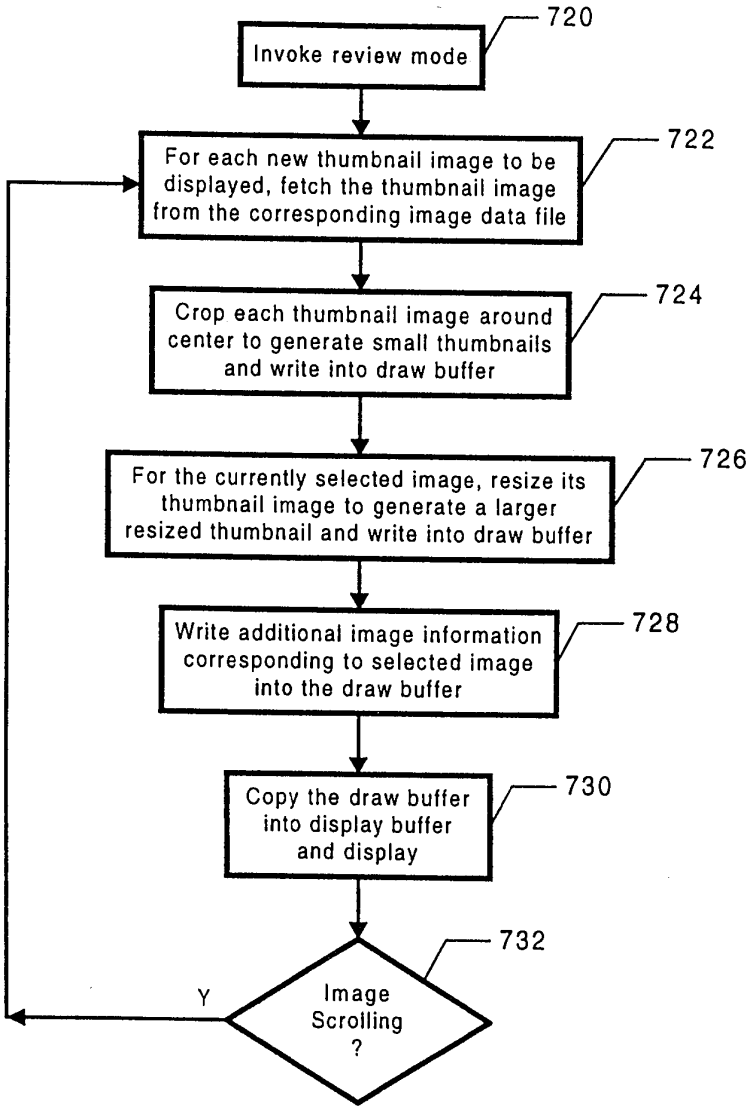

720
Invoke review mode
722
For each new thumbnail image to be displayed, fetch the thumbnail image from the corresponding image data file
724
Crop each thumbnail image around center to generate small thumbnails and write into draw buffer
726
For the currently selected image, resize its thumbnail image to generate a larger resized thumbnail and write into draw buffer
728
Write additional image information corresponding to selected image into the draw buffer
730
Copy the draw buffer into display buffer and display
732
Image Scrolling ?
Y

FIG. 9

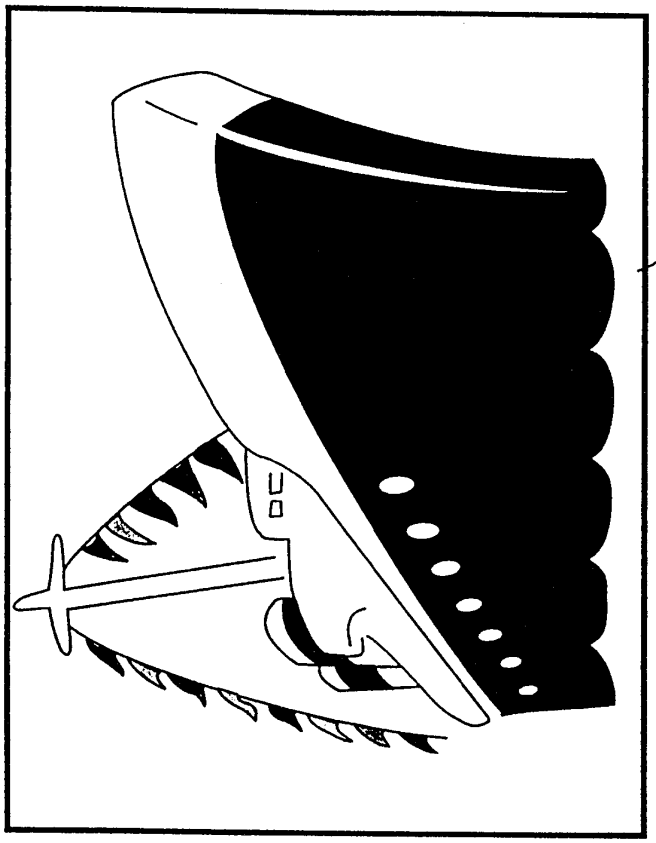
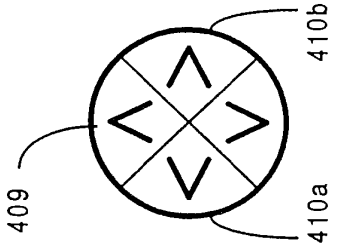


FIG. 10



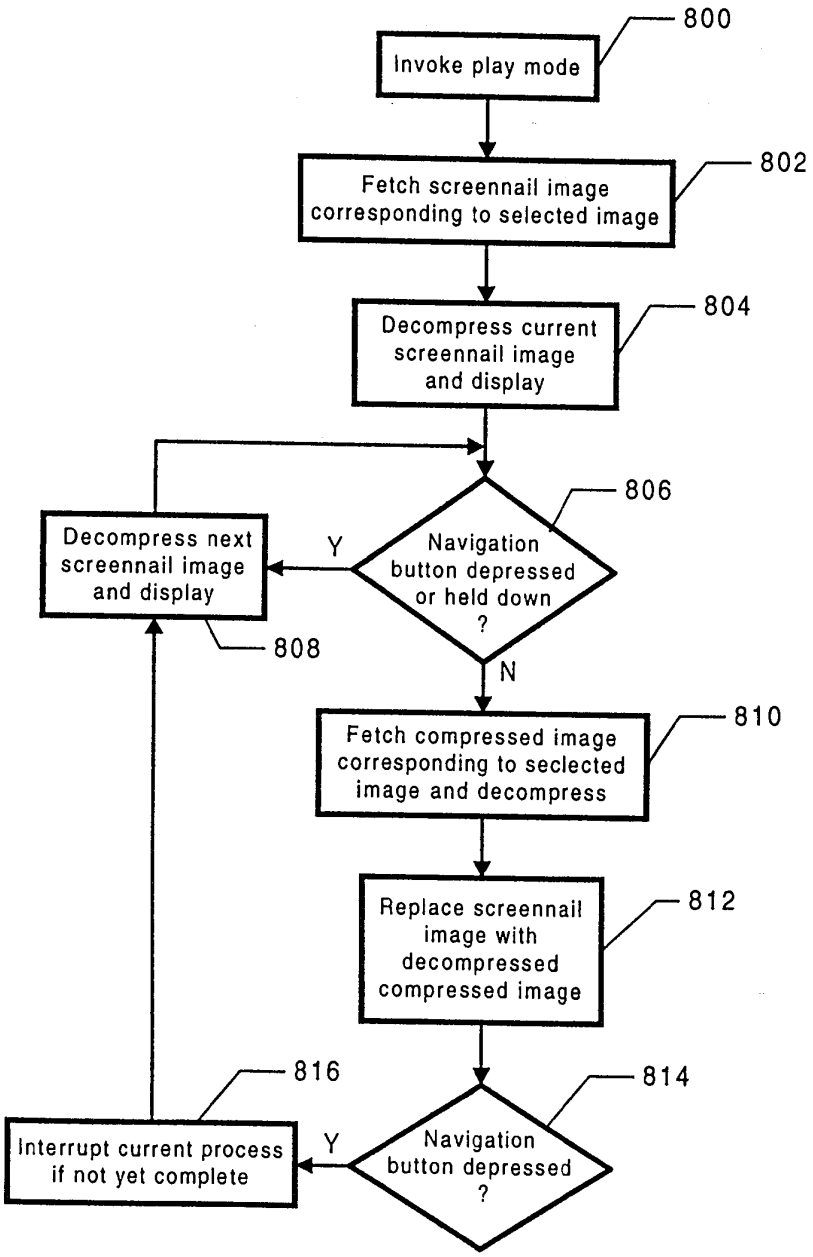

800
Invoke play mode
802
Fetch screennail image corresponding to selected image
804
Decompress current screennail image and display
806
Navigation button depressed or held down ?
Y
Decompress next screennail image and display
808
N
810
Fetch compressed image corresponding to seclected image and decompress
812
Replace screennail image with decompressed compressed image
814
Navigation button depressed ?
Y
816
Interrupt current process if not yet complete

FIG. 11A

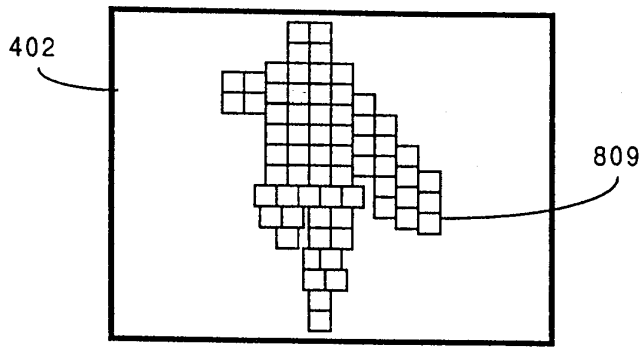


FIG. 11B

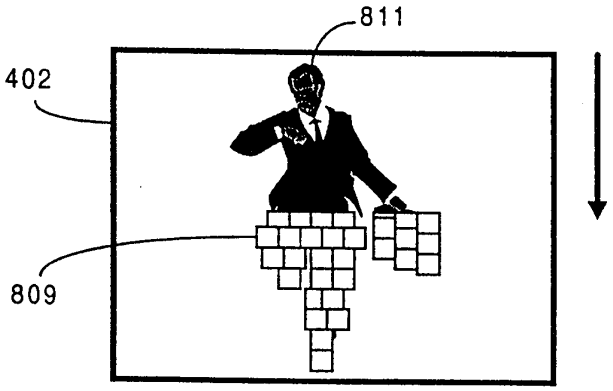


FIG. 11C

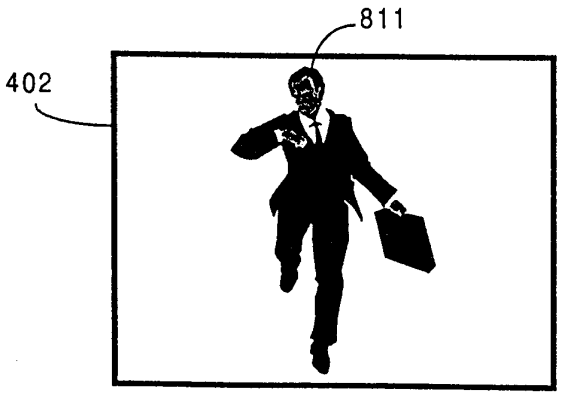


FIG. 11D

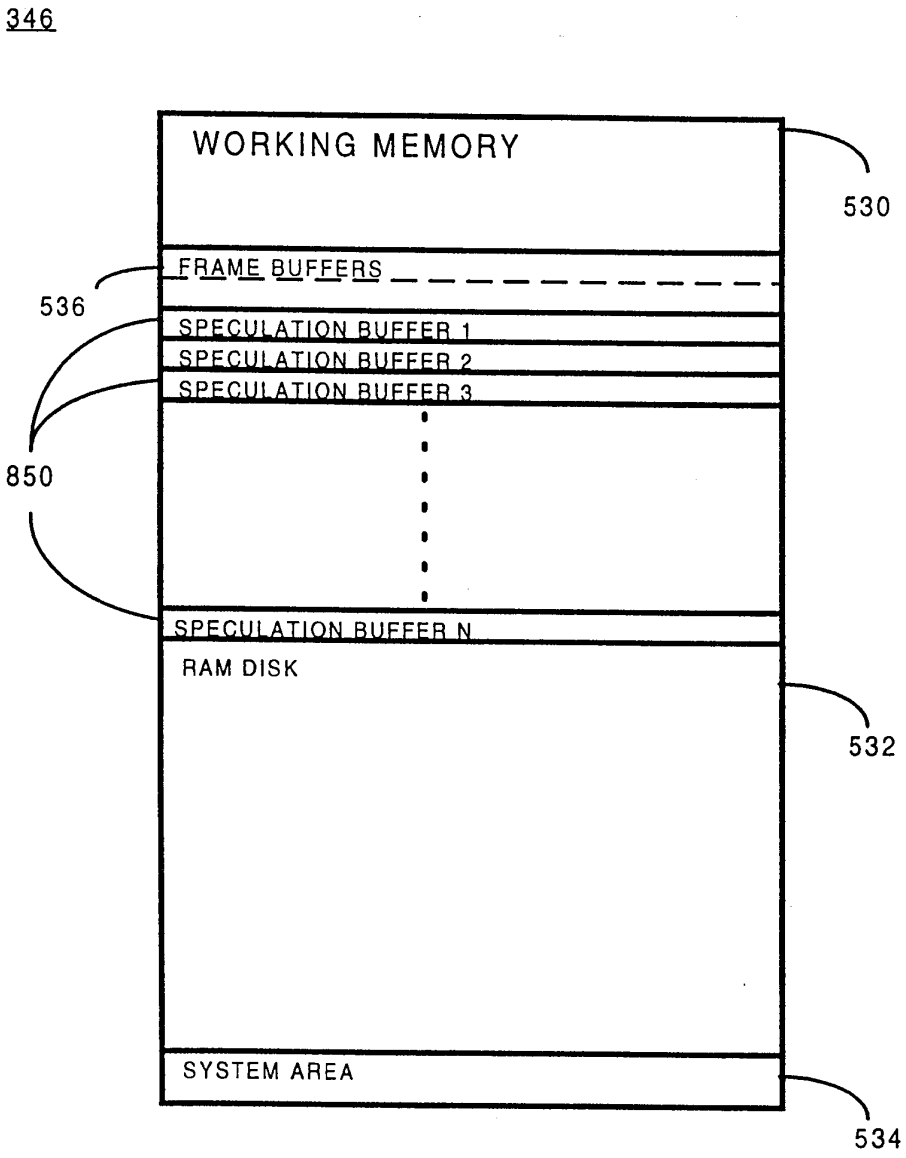

346
WORKING MEMORY
530
FRAME BUFFERS
536
SPECULATION BUFFER 1
SPECULATION BUFFER 2
SPECULATION BUFFER 3
850
SPECULATION BUFFER N
RAM DISK
532
SYSTEM AREA
534

FIG. 12

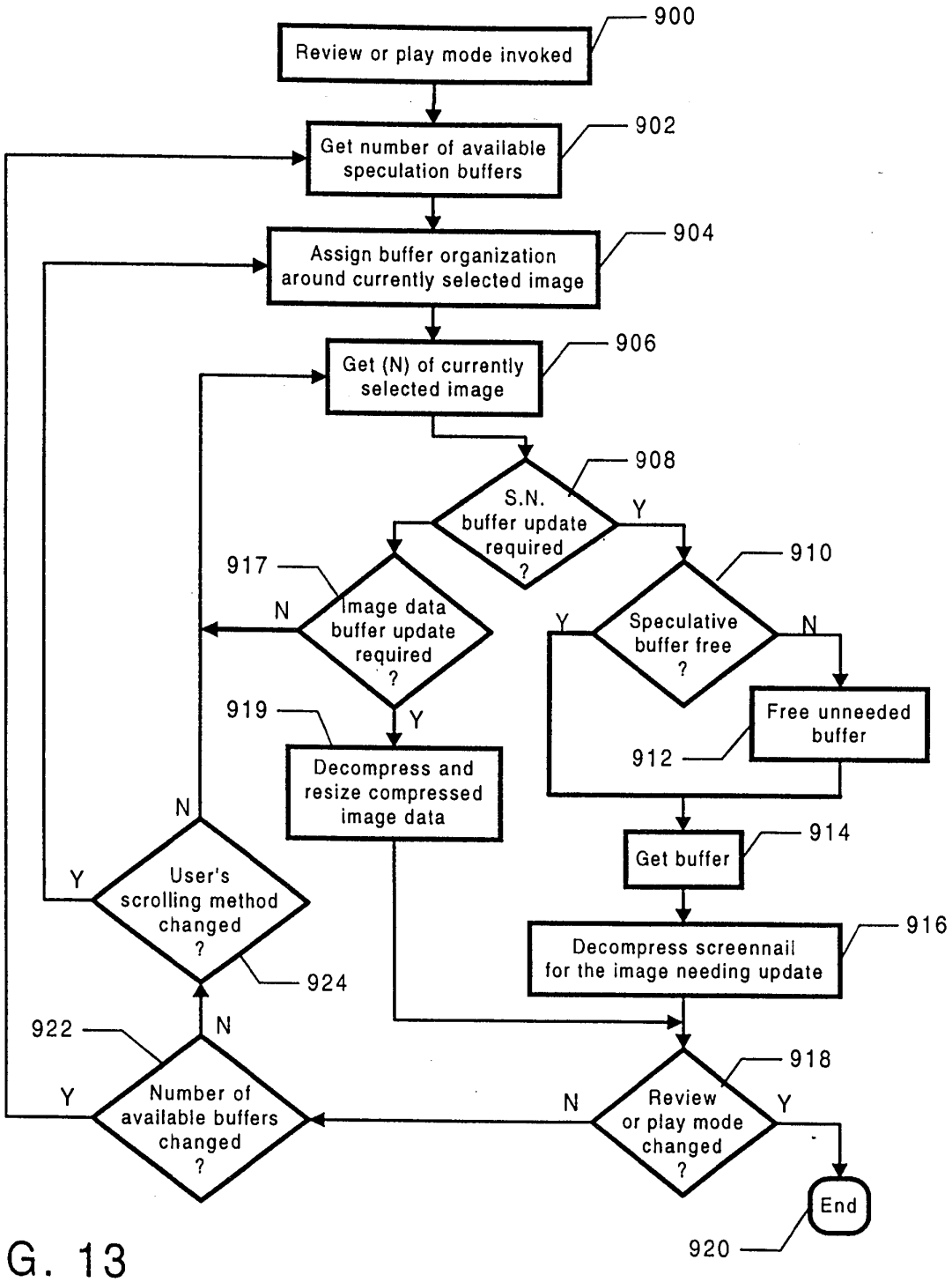

900
Review or play mode invoked
902
Get number of available speculation buffers
904
Assign buffer organization around currently selected image
906
Get (N) of currently selected image
908
S.N. buffer update required ?
Y
N
917
Image data buffer update required ?
N
Y
919
Decompress and resize compressed image data
910
Speculative buffer free ?
Y
N
Free unneeded buffer
912
914
Get buffer
916
Decompress screennail for the image needing update
918
Review or play mode changed ?
N
Y
End
920
922
Number of available buffers changed ?
Y
N
924
User's scrolling method changed ?
Y
N

FIG. 13

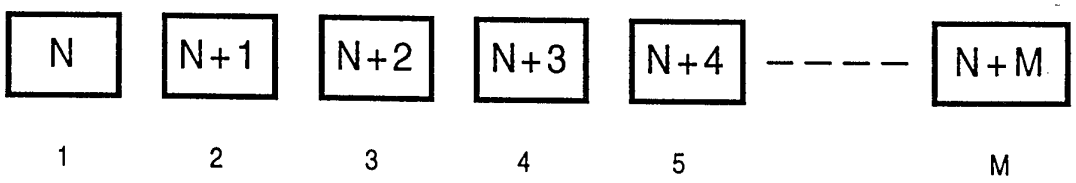


FIG. 14A

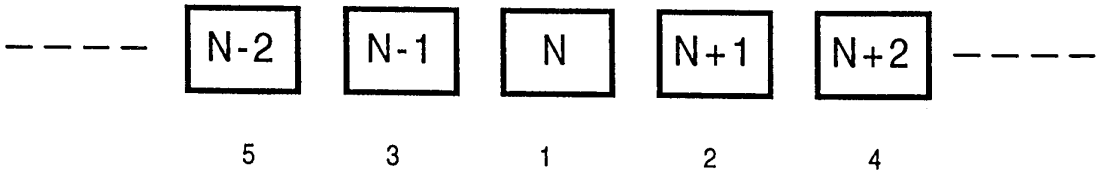


FIG. 14B

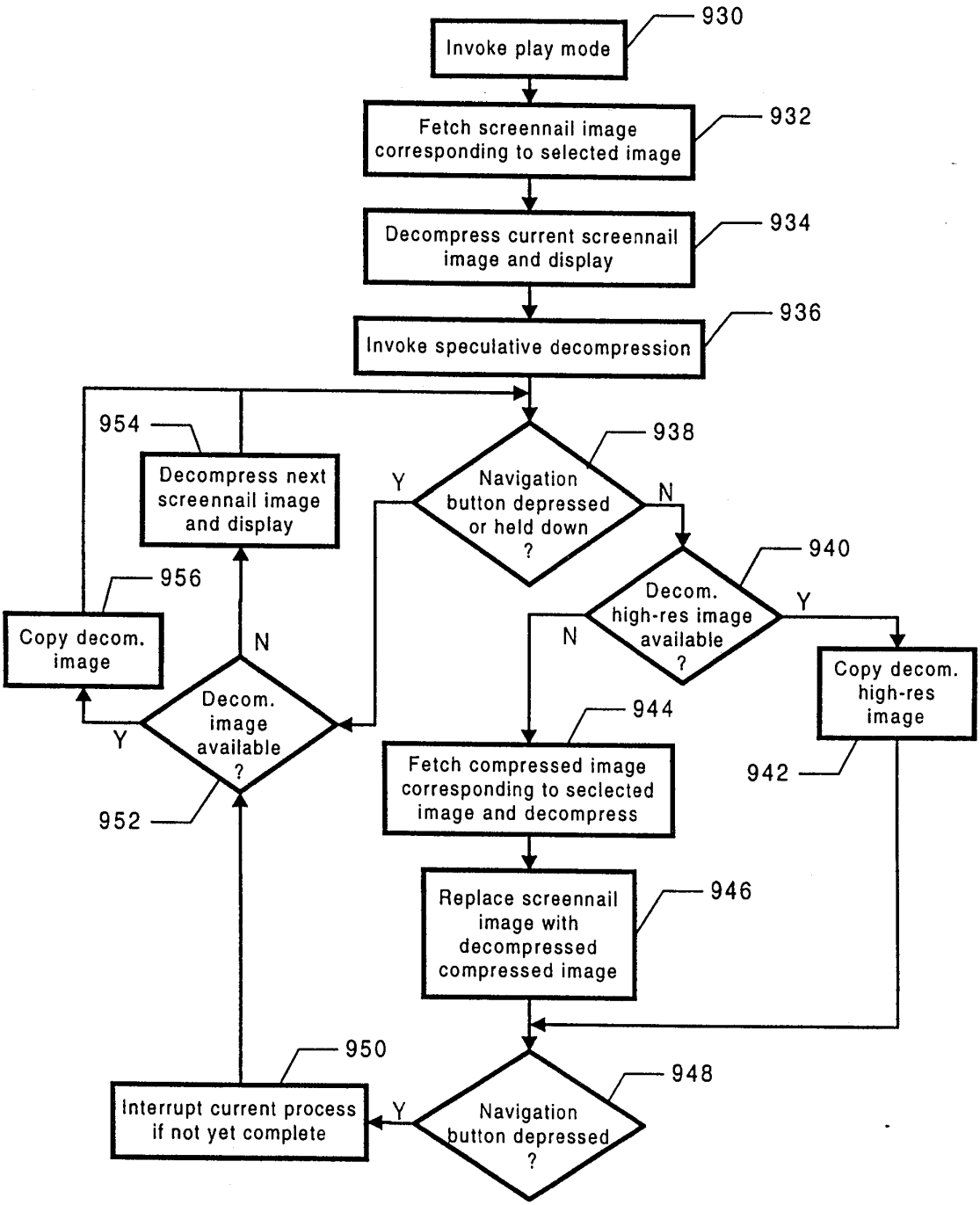

Invoke play mode
930
Fetch screennail image corresponding to selected image
932
Decompress current screennail image and display
934
Invoke speculative decompression
936
954
Decompress next screennail image and display
938
Navigation button depressed or held down ?
Y
N
940
Decom. high-res image available ?
Y
N
956
Copy decom. image
N
Decom. image available ?
Y
952
944
Fetch compressed image corresponding to seclected image and decompress
Copy decom. high-res image
942
946
Replace screennail image with decompressed compressed image
950
948
Interrupt current process if not yet complete
Y
Navigation button depressed ?

FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/11120

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :H04N 5/228
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/207, 220, 222, 223, 231, 239, 333, 334, 552, 384, 445; 386/27, 109, 117; 345/ 202, 507, 509; 395/872

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS
computer, video camera, compress?, memory, display?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,402,170 A (PARULSKI et al.) 28 March 1995 (28.03.95), col. 3, lines 10-60 and col. 5, lines 30-68.	1-8, 13-17
Y	US 5,345,552 A (BROWN) 06 September 1994 (06.09.94), col. 9, lines 5-29.	1-8, 13-17
Y	US 5,572,233 A (KAKEGAWA) 05 November 1996 (05.11.96), col. 3 and col. 4, lines 1-39.	1-8, 13-17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 02 SEPTEMBER 1998	Date of mailing of the international search report 07 OCT 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TUAN HO Diane Smith for Telephone No. (703) 305-4943

Form PCT/ISA/210 (second sheet)(July 1992)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/11120

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

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Electronic imaging apparatus

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An imaging apparatus includes an interline type CCD image sensor (12) having 1,000,000 or more pixels, which has a Bayer configuration color filter suitable for reading all pixel signals by a line-sequential scanning manner. The imaging apparatus drives the CCD image sensor in a high speed mode usually, and in a high quality image mode only for a trigger depression. In the high speed mode, the CCD image sensor outputs pixel signals for one line at intervals of three lines in the vertical direction. During the high speed mode operation of the CCD image sensor, images are displayed on a liquid crystal display portion (34) at a frame rate of 60 frames/second, the images being recognized for the human eyes as a dynamic image, i.e., motion picture.

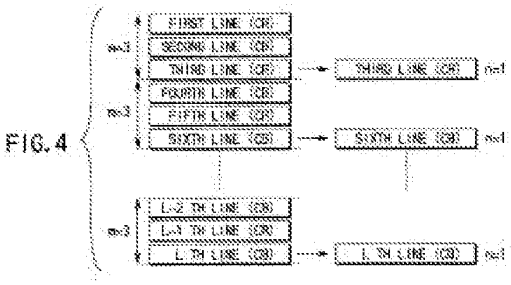


FIG. 4

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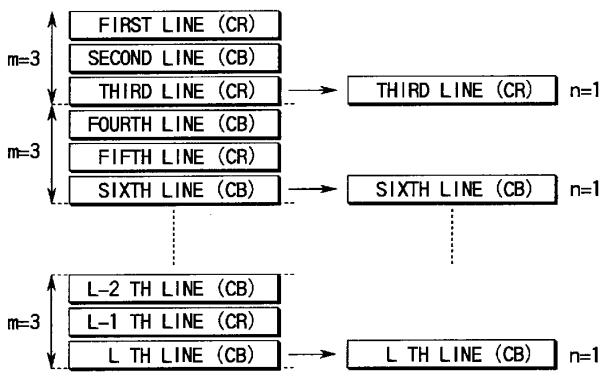
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(54) Electronic imaging apparatus

(57) An imaging apparatus includes an interline type CCD image sensor (12) having 1,000,000 or more pixels, which has a Bayer configuration color filter suitable for reading all pixel signals by a line-sequential scanning manner. The imaging apparatus drives the CCD image sensor in a high speed mode usually, and in a high quality image mode only for a trigger depression. In the high speed mode, the CCD image sensor outputs pixel signals for one line at intervals of three lines in the vertical direction. During the high speed mode operation of the CCD image sensor, images are displayed on a liquid crystal display portion (34) at a frame rate of 60 frames/second, the images being recognized for the human eyes as a dynamic image, i.e., motion picture.

FIG. 4



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Description

The present invention relates to an electronic imaging apparatus having a CCD image sensor, that is, a so-called electronic still camera.

Recently, research and development of electronic imaging apparatuses capable of inputting image data to multimedia equipment, so-called electronic still cameras have energetically been performed. In general, the electronic still camera obtains an image by using a CCD image sensor to display the obtained image on an electronic view finder, such as a liquid crystal panel, and to record the image on a recording medium by, for example, a magnetic means in accordance with depression of the trigger performed by a user.

Although the electronic still camera is a very easy device because no development is required, further improvement in the image quality and operation easiness have been required of the electronic still camera. To satisfy the foregoing requirements, an image having the same angle of views which is the same as that of the image which must be photographed is required to be observed real time through an electronic view finder as well as using a CCD image sensor having a large number of pixels.

CCD image sensors having the number of effective pixels, which is larger than 1,000,000, have been realized. It is considered that CCD image sensors having larger pixels will be put into practical use. CCD image sensors arranged to photograph a still image and adapted to sequential scanning for sequentially reading image signals for each line have been mainstream in place of the conventional interlaced scanning. The reason for this lies in that prevention of deterioration in the image quality occurring attributable to the difference in time required to read pixel signal from adjacent lines has been attempted.

The main stream of the operation clock frequencies of marketed A/D converters is about 15 MHz to about 20 MHz. When also reduction in the electric power consumption is attempted, higher drive frequencies are detrimental to the improvement. Frame rates of about 10 to 15 frames/second can be realized by the sequential scanning operation of CCD image sensors of 1,000,000-pixel class.

With the above-mentioned degree of the frame rate, the displayed image is recognized by the human eyes as a pseudo dynamic image (or motion picture) realized by frame advance in place of being recognized as a natural image. To display an image as a natural image for the human eyes, a frame rate of 30 to 60 frames/second is required.

An object of the present invention is to provide an electronic imaging apparatus having a large number of pixels, for example, 1,000,000 pixels, and capable of displaying an image which is recognized as a dynamic image in a non-photographing mode even with a relatively low operation frequency, for example, 20 MHz or lower.

The invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram showing the structure of a circuit in an electronic imaging apparatus according to an embodiment of the present invention.

FIG. 2 shows the structure of a Bayer configuration color filter.

FIG. 3 shows a state where pixel signals are read in a high quality image mode.

FIG. 4 shows a state where pixel signals are read in a first high speed mode.

FIG. 5 shows a state where pixel signals are read in a second high speed mode.

FIG. 6 shows a state where pixel signals are read in a third high speed mode.

FIG. 7 shows addition of pixel signals in a vertical transfer passage relating to the mode shown in FIG. 6.

FIG. 8 shows addition of pixel signals in a horizontal transfer passage relating to the mode shown in FIG. 6.

FIG. 9 shows a state where pixel signals are read in a fourth high speed mode.

FIG. 10 shows addition of pixel signals in the vertical transfer passage relating to the mode shown in FIG. 9.

FIG. 11 shows addition of pixel signals in the horizontal transfer passage relating to the mode shown in FIG. 9.

FIG. 12 shows switch of images displayed on a liquid crystal display portion.

FIG. 13 shows a state where control data for AF, AWB and AE is sequentially obtained for each frame.

FIG. 14 shows an example of switching of a reading mode in accordance with the operation of a trigger.

FIG. 15 shows another example of switching of the reading mode in accordance with the operation of the trigger.

Referring to the drawings, an embodiment of the present invention will now be described.

FIG. 1 is a block diagram showing the structure in a circuit in an electronic imaging apparatus according to an embodiment of the present invention. The electronic imaging apparatus has a CCD image sensor 12, a correlation double sampling circuit (CDS) 14, a gain control amplifier (AMP) 16 and an analog-to-digital converter 18. The CCD image sensor 12 is operated in response to a transfer pulse supplied from a timing generator 20. The correlation double sampling circuit (CDS) 14 is operated in response to a sample holding pulse supplied from the timing generator 20. The timing generator 20 is operated in synchronization with a signal generator 22 in accordance with a synchronizing signal gener-

ated by the signal generator 22.

An image processing portion 26 processes pixel signals supplied from the A/D converter 18 to form an image. A DRAM 28 temporarily stores image data supplied from the image processing portion 26, while a compressing/decompression circuit 30 compresses image data stored in the DRAM 28. A recording medium 32 is used to record compressed image data supplied from the compressing/decompression circuit 30. The compressing/decompression circuit 30 decompresses compressed image data recorded on the recording medium 32, while the DRAM 28 is used to temporarily store decompressed image data supplied from the compressing/decompression circuit 30.

An interface portion 36 is a terminal which enables data communication with an external unit, such as a monitor, a personal computer or the like. Thus, output of image data supplied from the image processing portion 26 or the DRAM 28 to the external unit is enabled or, in some cases, image data to be captured from the external unit.

A liquid crystal display portion 34 displays an image on the basis of the image data supplied from the image processing portion 26 or the decompressed image data supplied from the DRAM 28.

A CPU 24 controls the timing generator 20, the signal generator 22, a lens drive system 38 and a stop control system 42. Specifically, the CPU 24 follows an instruction to capture a still image issued from a trigger 46 to switch the operation mode of the CCD image sensor 12 and performs automatic focus control to drive a lens 40 in accordance with the image data supplied from the DRAM 28, control to change the aperture of a stop 44 and control of the quality of exposure of the CCD image sensor 12.

The CCD image sensor 12 is an inter-line type image sensor having 1,000,000 or more pixels and comprising a Bayer configuration color filter suitable for reading all pixels by line-sequential scanning. In this specification, "reading all pixels by line-sequential scanning" means sequential reading of data of pixels included in each line in the ascending line order as a first line, a second line and a third line to read all pixel signals as a result of one scanning operation.

The structure of the Bayer configuration color filter is shown in FIG. 2. Referring to FIG. 2, symbols R, G and B represent filter elements respectively permitting red, green and blue light to pass through. Each of the filter elements is disposed in front of one of photodiodes of the CCD image sensor 12. The foregoing Bayer configuration color filter is structured in such a manner that R (red) and G (green) filter elements are alternately disposed on the odd-numbered lines, while G (green) and B (blue) filter elements are alternately disposed on the even-numbered lines. Moreover, G (green) filter elements are disposed to form a checkered pattern as a whole.

The CCD image sensor 12 is operated in either of a high quality image mode or a high speed mode. Switching of the operation mode is performed by the timing generator 20 in such a manner that the timing generator 20 changes the transfer pulse to be output to the CCD image sensor 12. The high quality image mode is an operation mode in which all of the pixel signals obtained by the CCD image sensor 12 are read by the line-sequential scanning manner and with which a fine image can be obtained. However, time of 1/15 second to 1/10 second is required to read one image. On the other hand, the high speed mode is an operation mode arranged in such a manner that the number of horizontal transferring operations is reduced. The high speed mode is an operation mode in which pixel signals obtained by the CCD image sensor 12 are selectively read or added, and then read. Although the obtainable image quality is inferior to that obtainable from the high quality image mode, one image can be read in 1/60 second to 1/30 second. Therefore, an image can be obtained at a frame rate of 30 to 60 frames/second with which adaptation to a usual display of a dynamic image or motion picture is permitted.

In a usual state, that is, when no photographing operation is performed, the CCD image sensor 12 is operated in the high speed mode. Only when the trigger 46 has been depressed, that is, only when a photographing operation is performed, the CCD image sensor 12 is operated in the high quality image mode. During a period in which the CCD image sensor 12 is operated at the high speed mode, images are displayed on the liquid crystal display portion 34 at a frame rate of 30 to 60 frames/second, the images in the foregoing state being recognized as dynamic images. The fine image obtained in the high quality image mode is recorded on the recording medium 32. After the operation for recording the still image has been ended, the reading mode for the CCD image sensor 12 is returned to the high speed mode. The foregoing operation will be described with reference to FIG. 12.

Note that the electronic imaging apparatus may have a structure that the CCD image sensor 12 is operated in the high quality image mode also when the trigger 46 has been depressed. In the foregoing case, the image displayed on the liquid crystal display portion 34 is always recognized for the eyes of a human being as a dynamic image.

FIG. 3 illustrates a state where a pixel signal is read in the high quality image mode. In FIG. 3, the left-hand columns indicate pixel signals on respective lines obtained by the CCD image sensor 12, while the right-hand columns indicate pixel signals which are actually read. A consideration is made that odd-numbered lines include color data about red (R) in accordance with the correspondence to the color filter shown in FIG. 2, the odd-numbered lines are expressed as CR. On the other hand even-numbered lines are expressed as CB because the even-numbered lines include color data about blue (B).

In the high quality image mode the CCD image sensor 12 sequentially outputs pixel signals for each line. That is, pixel signals for a first line are output. After output of pixel signals for the first line has been ended, pixel signals for a second line are output. After output of the pixel signals for the second line has been ended, pixel signals for a third line are output. Then, the same process is repeated, and finally pixel signals for an L th line are output.

The line-sequential scanning operation, arranged to alternately read lines (CR) including information indicating red and lines (CB) including information indicating blue, enables a high resolution image to be obtained. Since pixel signals for the adjacent lines are exposed for the same time, a high quality image can be obtained. However, time of 1/15 to 1/10 second is required to read all of the pixel signals.

A variety of reading manners may be employed for the high speed mode. Specifically, a variety of manners may be considered by changing the manner of selecting lines from which pixel signals are read and the manner of processing the selected lines. A representative portions of variety of modes adaptable to the electronic imaging apparatus will now be described.

FIG. 4 illustrates a state where pixel signals are read in a first high speed mode. In FIG. 4, the left-hand column indicate pixel signals obtained by the CCD image sensor 12 for line units, while the right-hand column indicate, for line units, pixel signals which are actually read. Similarly to FIG. 3, lines including color data about red (R) are expressed as CR and lines including color data about blue (B) are expressed as CB.

As shown in FIG. 4, the foregoing high speed mode is arranged in such a manner that the CCD image sensor 12 sequentially outputs pixel signals for every three lines, that is, outputs pixel signals at intervals of three lines in the vertical direction. That is, pixel signals of a third line are initially output. After output of the pixel signals of the third line has been ended, pixel signals of a sixth line are output. After output of pixel signals of a sixth line has been ended, pixel signals of a ninth line are output. Then, the same process is repeated. Finally, pixel signals of an L th line are output. Although FIG. 4 shows that pixel signals of the L th line are output finally, that is, L is a multiple of 3 for convenience, there is no inevitability that L is a multiple of 3.

In the CCD image sensor, time required to perform the horizontal transfer generally contributes to time required to read pixel signals. That is, the number of horizontal transfer operations determines time required to read pixel signals.

In the high speed mode shown in FIG. 4, the number of lines, from which pixel signals are actually read, is one-third of the overall lines. Therefore, the number of the horizontal transfer operations is one-third of the number required for the high quality image mode. Thus, pixel signals are substantially read in one-third time. That is, pixel signals for one image can be read in 1/45 to 1/30 second. Therefore, an image can be obtained at a frame rate of 30 to 45 frames/second. The foregoing frame rate is a value with which a usual display of a dynamic image can be realized.

Since pixel signals for every three lines are read in the high speed mode shown in FIG. 4 with respect to the color filter having the Bayer configuration, that is, since pixel signals for one line are read at intervals of three lines in the vertical direction, read pixel signals, that is lines (CR) including red color information and lines (CB) including blue color information are alternately disposed in the vertical direction on the right-hand columns shown in FIG. 4. Therefore, a high resolution image can be obtained.

The configuration in which lines (CR) including red color information in the read pixel signal and lines (CB) including blue color information of the same are alternately positioned in the vertical direction is, in this specification, called "color line-sequential". Moreover, alternate reading of lines (CR) including red information and lines (CB) including blue information is called "color line-sequential scanning".

In the high speed mode shown in FIG. 4, pixel signals for one line are read at intervals of three lines in the vertical direction. The number of lines is not limited to the foregoing number of lines. For example one line at intervals of five lines in the vertical direction may be read. As an alternative to this, pixel signals for one or three lines may be read at intervals of seven lines.

Also in the case where pixel signals for one line are read at the intervals of three lines in the vertical direction, the line to be read is not limited to the third line. The line to be read may be a first line or a second line.

In view of the foregoing, the second high speed mode described with reference to FIG. 4 is a mode in which pixel signals for n lines are read at intervals of m lines in the vertical direction (where m and n are natural numbers satisfying $m > n$). Specifically, the mode is a mode in which pixel signals for $(2\beta - 1)$ lines are read at intervals of $(2\alpha - 1)$ lines in the vertical direction (where α and β are natural numbers satisfying $\alpha > \beta$).

In other words, the lines of the CCD image sensor are divided into a plurality of blocks in the vertical direction, each of the blocks including m lines, and the pixel signals for n lines are read from the each block. Specifically, the pixel signals for the $(2\beta - 1)$ lines are read from the each block consisting of the $(2\alpha - 1)$ lines.

In this case, time required to read pixel signals is substantially n/m of time required to read pixel signals in the high quality image mode, that is, $(2\beta - 1)/(2\alpha - 1)$. Pixel signals are read by the color line-sequential manner to the Bayer configuration color filter.

FIG. 5 illustrates a state where pixel signals are read by a second high speed mode. The meanings and expressions of CR and CB are the same as those shown in FIG. 4.

As shown in FIG. 5, the foregoing high speed mode is arranged in such a manner that the CCD image sen-

sor 12 sequentially outputs pixel signals for two lines at intervals of three lines. That is, it outputs pixel signals for two lines at intervals of four lines in the vertical direction. That is, pixel signals for a first line are initially output. After output of the pixel signals for the first line has been ended, pixel signals for a second line is output. After output of the pixel signals for the second line has been ended, pixel signals for a fifth line are output. After output of the pixel signals for the fifth line has been ended, pixel signals for a sixth line are output. Then, the same process is repeated, and finally pixel signals for an L - 3 th line are output. Then, pixel signals for an L - 2 th line are output. Although FIG. 5 illustrates that L is a multiple of four for convenience, there is no inevitability that L is a multiple of four.

In the high speed mode shown in FIG. 5, the actual number of lines from which pixel signals are read is half of the all of the lines. Therefore, the number of horizontal transfer operations is one-half of that required in the high quality image mode shown in FIG. 3. Thus, pixel signals are read in substantially one-half time. That is, pixel signals for one image can be obtained in 1/30 second. Therefore, an image can be obtained at a frame rate of 30 frames/second. The frequency frame rate is a value with which usual display of dynamic image can be realized.

In the high speed mode shown in FIG. 5, pixel signals for two lines are read at intervals of three lines to the color filter having the Bayer configuration. That is, pixel signals for two lines are read at intervals of four lines in the vertical direction. Therefore, the read pixel signals, that is, the right-hand columns shown in FIG. 5 are in the form of color line-sequential in which lines (CR) including red color information and lines (CB) including blue color information are alternately positioned in the vertical direction. Therefore, a high resolution image can be obtained.

In the high speed mode shown in FIG. 5, pixel signals for the first line and the second line are read at intervals of four lines in the vertical direction. Therefore, read pixel signals include color information of the line. Thus, an image free from considerable moiré can be obtained.

Although pixel signals for two lines are, in the high speed mode shown in FIG. 5, read at intervals of four lines in the vertical direction, the number of lines is not limited to the foregoing number. For example, pixel signals for two lines may be read at intervals of 6 lines in the vertical direction. As an alternative to this, pixel signals for four lines may be read at intervals of 8 lines.

Also in the case where pixel signals for two lines are read at the intervals of four lines in the vertical direction, the lines to be read is not limited to the first and second lines. The lines may be the second line and a third line, or a third line and a fourth line or the first line and the fourth line.

In view of the foregoing, the second high speed mode described with reference to FIG. 5 is a mode in which pixel signals for n lines are read at intervals of m lines in the vertical direction (where m and n are natural numbers satisfying $m > n$). Specifically, the mode is a mode in which pixel signals for 2β lines are read at intervals of 2α lines in the vertical direction (where α and β are natural numbers satisfying $\alpha > \beta$).

In other words, the lines of the CCD image sensor are divided into a plurality of blocks in the vertical direction, each of the blocks including m lines, and the pixel signals for n lines are read from the each block. Specifically, the pixel signals for the 2β lines are read from the each block consisting of the 2α lines.

In this case, time required to read pixel signals is substantially β/α of time required to perform reading in the high quality image mode.

Specifically, it can be said that 2β lines are composed of adjacent lines or lines obtained by reducing even-numbered lines. In this case, pixel signals are read by the color line-sequential manner to the Bayer configuration color filter. The pixel signals to be read include color information of adjacent lines.

FIG. 6 illustrates a state where pixel signals are read by a third high speed mode. The meanings of the drawing and expressions of CR and CB are the same as those shown in FIG. 4.

As shown in FIG. 6, the foregoing high speed mode is arranged in such a manner that the CCD image sensor 12 adds and outputs pixel signals for two lines at intervals of three lines in the vertical direction. That is, pixel signals for a first line and pixel signals for a third line are initially added and output. Then, pixel signals for a fourth line and pixel signals for a sixth line are added and output. Then, the same process is repeated, and finally pixel signals for the L - 2 th line and pixel signals for an L th line are added and output. Although FIG. 6 illustrates that L is a multiple of 3 for convenience, there is no inevitability that L is a multiple of 3.

In the high speed mode shown in FIG. 6, the actual number of read lines is one-third of all of the lines. Therefore, the number of horizontal transfer operations is one-third of that required in the high quality image mode shown in FIG. 3. Thus, the pixel signals can substantially be read in one-third time. Therefore, pixel signals for one image can be obtained in 1/45 to 1/30 second. The foregoing frame rate is a value with which usual display of dynamic image can be realized.

In the high speed mode shown in FIG. 6, pixel signals for two lines are added and read at intervals of three lines in the vertical direction to the Bayer configuration color filter. Therefore, read pixel signals are in the form of color line-sequential configuration in which lines (CR) including red information and lines (CB) including blue information are positioned alternately in the vertical direction. Therefore, a high resolution image can be obtained.

Since pixel signals for the uppermost line at intervals of three lines in the vertical direction and pixel signals for the lowermost line at the same are added and

read in the high speed mode shown in FIG. 6, read pixel signals include color information of adjacent lines. Therefore, an image free from considerable moiré can be obtained.

Addition of the pixel signals is performed in vertical transfer passages or a horizontal transfer passage. The addition in the vertical transfer passages will now be described, and then the addition in the horizontal transfer passage will be described.

FIG. 7 illustrates addition of pixel signals in the vertical transfer passages. Referring to FIG. 7, each square indicates a photodiode which is each pixel of the CCD image sensor. Characters R, G and B of the alphabet indicate colors which are respectively recognized by the photodiode. The photodiodes positioned at relatively the same positions when the photodiodes are divided into three lines in the vertical direction are given one of subscripts A, B and C corresponding to the uppermost line, the central line and the lowermost line and added to any one of the characters R, G and B of the alphabet indicating the colors.

In other words, the photodiodes are divided into a plurality of blocks in the vertical direction, each of which includes three lines. In the every blocks, the photodiodes in the uppermost line are represented by one of the alphabetic characters R, G and B with the subscript A, the photodiodes in the central line are represented by one of the alphabetic characters R, G and B with the subscript B, and the photodiodes in the lowermost line are represented by one of the alphabetic characters R, G and B with the subscript C.

Addition of the pixel signals on the uppermost line (photodiodes each of which is indicated by the letter of the alphabet having the subscript A) and the pixel signals on the lowermost line (photodiode each of which is indicated by the letter of the alphabet having the subscript C) is performed, for example, as follows: as shown in FIG. 7, initially, the pixel signals from the photodiodes indicated by the letter of the alphabet having the subscript A are shifted to a vertical transfer passage, and then the charges, which are the pixel signals, are stored in potential wells formed in the vertical transfer passages by the side of the photodiodes in the uppermost line. Then, the potential wells having the charge of the pixel signals are downwards shifted through the vertical transfer passages. Simultaneously with shift of the charges to the side of the photodiodes positioned downwards by two lines, that is, the photodiodes indicated by the letter of the alphabet having the subscript C, the pixel signals of the lowermost line photodiodes, that is, the photodiodes indicated by the letter of the alphabet having the subscript C are shifted to the vertical transfer passages. As a result, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript A and those shifted from the photodiodes indicated by the letter of the alphabet having the subscript C are collectively stored in the potential wells (indicated with an ellipse surrounding + shown in the drawing). That is, the pixel signals of the uppermost line photodiodes and the pixel signals of the lowermost photodiodes are added to each other. Then, the potential wells in which the added pixel signals are stored, are continuously moved on the vertical transfer passages in the downward direction to reach the horizontal transfer passage, and then shifted to the left so as to sequentially be read in line units.

The size of the potential wells may be the same as that of the potential wells which are used when all of the pixels are read, or may be different from therefrom.

If the size of the potential wells is the same as that of the potential wells which are used when all of the pixel signals are read, that is, if the capacity of the potential wells are the same as the capacity of the photodiodes when all of the pixels are read, the capacity of the photodiodes is preferably adjusted to one-half of the capacity of the potential wells by changing the overflow drain substrate voltage. In other words, the photodiodes are preferably operated with a dynamic range which is one half of that when all of the pixels are read. The foregoing change in the capacity, that is, the dynamic range prevents the charges from overflowing the vertical transfer passages after addition has been performed. Although the dynamic range of the photodiodes is limited to one-half, the following signal processing operation can be performed without any problem because the signal level after reading is the same as that when all pixels are read.

If the size of the potential wells is different from that of the potential wells which are used when all of the pixel signals are read, the size of the potential wells are preferably two times that of the potential wells which are used when all pixels are read if the photodiodes are operated without change in the dynamic range. The foregoing setting of the potential wells prevents charges from overflowing the vertical transfer passages after the addition. In this case, there is a merit in terms of the SN ratio because the dynamic range of the photodiodes can be fully used.

FIG. 8 illustrates addition of pixel signals in the horizontal transfer passage. The meanings of square and letters in the alphabet in the drawings are the same as those shown in FIG. 7.

The pixel signals on the uppermost line and pixel signals on the lowermost line are added as follows. Referring to FIG. 8, pixel signals of photodiodes indicated by the letter of the alphabet having the subscript A and pixel signals of the photodiodes indicated by the letter of the alphabet having the subscript C are collectively shifted to the vertical transfer passage so that charges which are the pixel signals are stored in potential wells (each of which is indicated by a white ellipse) formed on the side of each photodiode. Then, all of the potential wells are uniformly moved downwards on the vertical transfer passages. Even after the charges stored in the potential wells in the lowermost line divided into three lines have been shifted to the potential wells

(each of which is indicated by an ellipse surrounding + as shown in the drawing), downward shift of the potential wells for only two lines is continued. Also the charges stored in the potential wells on the uppermost line divided into three lines are shifted to the potential well formed on the horizontal transfer passage. As a result, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript A and the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript C are stored in the potential wells on the horizontal transfer passage. That is, the pixel signals of the photodiodes on the uppermost line and the pixel signals of the photodiodes on the lowermost line are added. Then, the potential wells on the horizontal transfer passage are shifted to the left so as to sequentially be read in line units.

Since the horizontal transfer passage is formed on the outside of the image forming region differently from the vertical transfer passages extending between photodiodes, the potential wells formed on the horizontal transfer passage can have a capacity twice as large as that of the potential wells on the vertical transfer passages. Since the horizontal transfer passage is able to have potential wells each having a large capacity as described above, there is no possibility that charges overflow the horizontal transfer passage even if the photodiodes are operated with full dynamic ranges. In the foregoing case, there is a merit in terms of SN ratio because the dynamic range of the photodiodes can be fully used.

Although the high speed mode shown in FIG. 6 is arranged in such a manner that pixel signals for two lines are read at intervals of three lines in the vertical direction, the number of lines is not limited to the foregoing number. For example, pixel signals for two lines may be added and read at intervals of five lines in the vertical direction. As an alternative to this, pixel signals for two or three lines may be added and read at intervals of seven lines.

In view of the foregoing, the second high speed mode described with reference to FIG. 6 is a mode in which pixel signals for n lines at intervals of m lines in the vertical direction are added and read (where m and n are natural numbers satisfying $m > n$). Specifically, the foregoing mode is a mode for adding and reading pixel signals for β lines at intervals of $(2\alpha - 1)$ lines in the vertical direction (where α and β are natural numbers satisfying $2\alpha - 1 > \beta > 1$).

In other words, the lines of the CCD image sensor are divided into a plurality of blocks in the vertical direction, each of the blocks including m lines, and the pixel signals for n lines are read and added for the each block. Specifically, the pixel signals for the β lines are read and added for the each block consisting of the $(2\alpha - 1)$ lines.

In this case, time required to read pixel signals is substantially n/m, that is, $\beta/(2\alpha - 1)$ of time required to perform reading in the high quality image mode.

Specifically, the β lines include at least each of the uppermost and lowermost lines at intervals of the $(2\alpha - 1)$ lines. That is, the β lines include the uppermost and lowermost lines of the each block. In this case, read pixel signals include color information of adjacent lines.

More specifically, the β lines is composed of odd-numbered lines including each of the uppermost and lowermost lines at intervals of the $(2\alpha - 1)$ lines. That is, the β lines consist of the odd-numbered lines including the uppermost and lowermost lines of the each block. In this case, pixel signals are read by the color line-sequential manner to the Bayer configuration color filter.

The addition described with reference to FIG. 7 is addition in which shift of charges for n lines to the vertical transfer passage is divided into n times and vertical transfer is performed by m - 1 times so that addition of n lines is performed in the vertical transfer passage, and then vertical transfer clocks are supplied in units of m times to perform transfer to the horizontal transfer passage.

The addition described with reference to FIG. 8 is arranged in which charges for n lines are shifted to the vertical transfer passage and vertical transfer clocks are supplied in units of m times to perform transfer to the horizontal transfer passage so that addition of n lines is performed in the horizontal transfer passage.

FIG. 9 illustrates a state where pixel signals are read in a fourth high speed mode. The meanings of the drawings and expressions CR and CB are the same as those shown in FIG. 4.

As shown in FIG. 9, the foregoing high speed mode is arranged in such a manner that the CCD image sensor 12 adds and outputs pixel signal for three lines consecutive in the vertical direction. That is, pixel signals for the first line, pixel signals for the second line and pixel signals for the third line are initially added and output. Then, pixel signals frequency the fourth line, pixel signals for the fifth line and pixel signals for the sixth line are added and output. Then, the same process is repeated, and finally pixel signals for the L - 2 th line, pixel signals for the L - 1 th line and pixel signals for the L th line are added and output. Although FIG. 9 illustrates that L is a multiple of 3 for convenience, there is no inevitability that L is a multiple of 3.

In the high speed mode shown in FIG. 9, the number of lines which are actually read is one-third of all of the lines. Therefore, the number of horizontal transfer operations is one-third of the number in the high quality image mode shown in FIG. 3. Thus, pixel signals are substantially read in one-third times. Therefore, pixel signals for one image can be obtained in 1/45 to 1/30 second. Therefore, an image can be obtained in a frame rate of 30 to 45 frames/second. The foregoing frame rate is a value with which a usual display of dynamic image can be realized.

Addition of the pixel signals are performed in the vertical transfer passages or the horizontal transfer pas-

sage. The addition in the vertical transfer passages will be first described. Then, the addition in the horizontal transfer passage will be described.

FIG. 10 illustrate the addition of pixel signals in the vertical transfer passages. The meanings of the square and alphabet are the same as those shown in FIG. 7.

The addition of pixel signals is performed, for example, as follows. Referring to FIG. 10, pixel signals of photodiodes indicated by the letter of the alphabet having the subscript A are initially shifted to the vertical transfer passages so that charges, which are pixel signals, are stored in the potential wells formed on the sides of the photodiodes. Then, the potential wells in which charges of the pixel signals of the photodiodes on the uppermost line are downwards moved through the vertical transfer passages. Simultaneously with shift of the charges to the photodiodes positioned downwards by one line, that is, the photodiodes indicated by the letter of the alphabet having the subscript B, pixel signals of photodiodes of a next line, that is, photodiodes indicated by the letter of the alphabet having the subscript B are shifted to the vertical transfer passages. As a result, charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript A and charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript B are collectively stored in the potential wells. Then, the potential wells in which charges of the pixel signals of the uppermost line and the next line are continuously moved downwards on the vertical transfer passages. Simultaneously with shift of the charges to the sides of the photodiodes positioned downwards by one line, that is, photodiodes indicated by the letter of the alphabet having the subscript C, pixel signals of the photodiodes of the lowermost line, that is, the photodiodes indicated by the letter of the alphabet having the subscript C are shifted to the vertical transfer passages. As a result, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript A, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript B and the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript C are collectively stored in the potential wells (indicated by ellipses each surrounding + shown in the drawing). That is, the pixel signals of the photodiodes on the uppermost line, the pixel signals of the photodiodes on the second line and the pixel signals of the photodiodes on the lowermost line are added. Then, the potential wells, in which the added pixel signals are stored, are continuously moved downwards on the vertical transfer passages. After the added pixel signals have been shifted to the horizontal transfer passage, they are shifted to the left so as to sequentially be read in line units.

The size of the potential wells may be the same as that of the potential wells which is used when all of the pixels are read, or may be different from therefrom.

If the size of the potential wells is the same as that of the potential wells which are used when all of the pixel signals are read, that is, if the capacity of the potential wells is the same as the capacity of the photodiodes when all of the pixels are read, the capacity of the photodiodes is preferably adjusted to one-third of the capacity of the potential wells by changing the overflow drain substrate voltage. In other words, the photodiodes are preferably operated with a dynamic range which is one-third of that when all of the pixels are read. The foregoing change in the capacity, that is, the dynamic range prevents the charges from overflowing the vertical transfer passages after addition has been performed. Although the dynamic range of the photodiodes is limited to one-third, the following signal processing operation can be performed without any problem because the signal level after reading is the same as that when all pixels are read.

If the size of the potential wells is different from that of the potential wells which are used when all of the pixel signals are read, the size of the potential well is preferably three times that of the potential wells which are used when all pixels are read if the photodiodes are operated without change in the dynamic range. The foregoing setting of the potential wells prevents charges from overflowing the vertical transfer passages after the addition. In this case, there is a merit in terms of the SN ratio because the dynamic range of the photodiodes can be fully used.

FIG. 11 shows addition of pixel signals in the horizontal transfer passage. The meanings of the square and alphabet are the same as those shown in FIG. 7.

Addition of the pixel signals is performed as follows: referring to FIG. 11, pixel signals of photodiodes indicated by the letter of the alphabet having the subscript A, pixel signals of photodiodes indicated by the letter of the alphabet having the subscript B and pixel signals of photodiodes indicated by the letter of the alphabet having the subscript C are collectively shifted to the vertical transfer passage so that charges, which are the pixel signals, are stored in potential wells (indicated by white ellipses shown in the drawing) formed on the sides of the photodiodes. Then, all of the potential wells are uniformly moved downwards on the vertical transfer passage. Even after the charges stored in the potential wells of the lowermost line divided every three lines have been shifted to the potential wells (each of which is indicated by an ellipse surrounding +) formed in the horizontal transfer passage, the downward movement of the potential wells for only the two lines is continued. Also the charges stored in the potential wells on the next line divided every three lines and charges stored in the potential wells on the uppermost are shifted to the potential wells formed on the horizontal transfer passage. As a result, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript A, the charges shifted from the photodiodes indicated by the letter of the alphabet having the subscript B and the charges shifted from the photodiodes

indicated by the letter of the alphabet having the subscript C are stored in the potential wells in the horizontal transfer passage. That is, pixel signal of the photodiodes of the three lines continued in the vertical direction are added. Then, the potential wells in the horizontal transfer passage are shifted to the left so as to sequentially be read in line units.

Since the horizontal transfer passage is positioned on the outside of the image forming region differently from the vertical transfer passage extending among the photodiodes, the width of the horizontal transfer passage can be enlarged. That is, the capacity of the horizontal transfer passage can be enlarged. Therefore, the capacity of the potential wells, which are formed in the horizontal transfer passage, can be enlarged to three or more times the capacity of the potential wells in the vertical transfer passages. Since the large-capacity potential wells can be formed in the horizontal transfer passage, there is no possibility that charges overflow the horizontal transfer passage. In this case, there is a merit in terms of SN ratio because the dynamic range of the photodiode can fully be used.

In the high speed mode shown in FIG. 9, pixel signal for three lines continued in the vertical direction are added and read. However, the number of lines is not limited to the foregoing number. For example, pixel signals for four or five lines continued in the vertical direction may be added and read.

When pixel signals for even-numbered lines in the vertical direction are added and read, the pixel signals read to the Bayer configuration color filter include R + 2G + B color information items. The foregoing value is close to the structure of a brightness signal and thus information of contrast can easily be obtained. Therefore, it is suitable for data for controlling automatic focusing.

In view of the foregoing, the second high speed mode described with reference to FIG. 9 is a mode in which pixel signal for q lines continued in the vertical direction (where q is a natural number).

The addition described with reference to FIG. 10 is addition in which shift of charges for q lines to the vertical transfer passage is divided into q times and vertical transfer is performed q - 1 times to addition of n lines is performed in the vertical transfer passage after which vertical transfer clocks are supplied in units of q times to perform transfer to the horizontal transfer passage.

The addition described with reference to FIG. 8 is addition in which charges for q lines is shifted to the vertical transfer passage, after which vertical transfer clocks are supplied in units of q times to perform transfer to the horizontal transfer passage so that addition of q lines is performed in the horizontal transfer passage.

As described above, the CCD image sensor 12 is, in a usual state, operated in the high speed mode and operated in the high quality image mode only when the trigger 46 is depressed to record a fine image on the recording medium 32. As shown in, for example, FIG. 12, the liquid crystal display portion 34 displays one image at each frame, that is, every 1/60 second. Immediately after the trigger 46 has been depressed, one image is displayed for time corresponding to six frames, that is, in 1/10 second. Display of one image in 1/60 second, that is, display of an image at a frame rate of 60 frames/second can be recognized for the eyes of a human being as a dynamic image. Therefore, an image obtainable in the high speed mode is expressed as a "dynamic image", while an image obtainable in the high quality image mode is expressed as a "still image" so as to be distinguished from the dynamic image. In relation to this, an image obtainable in the high speed mode is sometimes expressed as a "dynamic image" and an image obtainable from the high quality image mode is sometimes expressed as a "still image" in the following description.

Since time (1/10 second in the structure shown in FIG. 12) corresponding to a plurality of frames is required to read a still image, the still image is displayed on the liquid crystal display portion 34 for a certain period after the trigger has been depressed. During this, the still image is recorded on the recording medium 32. After the still image has been recorded, the reading mode of the CCD image sensor 12 is again switched to the high speed mode so that a dynamic is again displayed on the liquid crystal display portion 34.

The electronic imaging apparatus according to this embodiment obtains control data for an automatic focusing mechanism (AF), an automatic white balance adjustment mechanism (AWB) and an automatic exposure adjustment mechanism (AE) every frame, that is, every 1/60 second. Control data for AF, AWB and AE is obtained by the CPU 24 in accordance with image data temporarily stored in the DRAM 28 in the mode in which a partial image is read. That is, the CPU 24 extracts image data temporarily stored in the DRAM 28 at every frame, that is, every 1/60 second to subject image data to a proper calculation process to calculate data for any one of AF, AWB and AE. Control for AF, AWB and AE is sequentially calculated for each frame, and calculations of control data is repeatedly performed during display of a dynamic image.

Calculated control data for AF is supplied to the lens drive system 38 so that the lens drive system 38 shift the lens 40 in the direction of optical axis in accordance with supplied control data. Control data for AE is supplied to the stop control system 42 so that the stop control system 42 adjusts the aperture diameter of the stop 44 in accordance with the supplied control data. Control data for AWB is supplied to the image processing portion 26 so as to be used to correct the hue of the image.

Since control data for AF, AWB and AE is obtained at each frame, the DRAM 28 for temporarily storing image data may be employed as an electric circuit for obtaining control data. Although the conventional apparatus arranged to simultaneously obtain control data for

AF, AWB and AE requires three systems of exclusive circuits, the apparatus according to this embodiment is not need to have the foregoing circuits.

The high speed mode for displaying a dynamic image may be switched in the above-mentioned four modes. Moreover, a manner of calculating control data may be switched as the mode is switched. The reading mode is switched during display of a dynamic image is performed by, for example, operating the trigger. In this case, the trigger 46 is a two-step depression type trigger which acts as a first switch when the trigger is depressed by one step and acts as a second switch when the trigger is depressed by two steps after that. FIG. 14 illustrates an example of switch of the reading mode in accordance with the operation of the trigger.

In a usual state, the CCD image sensor 12 is operated in any one of the first, second and third high speed modes. FIG. 14 illustrates the foregoing high speed modes as "n-line" mode. During this, control data for AF, AWB and AE is repeatedly calculated for each frame in accordance with image data obtained from the n-line mode so that AF control, AWB control and AE control are performed.

In a certain time after the trigger 46 has been depressed by one step, the CCD image sensor 12 is operated in the fourth high speed mode. FIG. 14 illustrates the foregoing high speed mode as a "q-addition" mode. During this, control for the AF is calculated for each frame in accordance with image data obtained in the q-addition mode so that only AF control is performed. That is, a predetermined time after the trigger has been depressed by one step is assigned to only AF control. Since pixel signals read in the q-addition mode include R + 2G + B color information items and close to the structure of the brightness signal as described above, contrast information can easily be obtained and it is suitable for use in calculating control data for the AF. Therefore, the AF control using the optimal control data is performed in the foregoing period.

When the trigger 46 is depressed by two steps, the CCD image sensor 12 is switched to the reading mode immediately in the case of that a predetermined time for only the AF control has elapsed or after the predetermined time pass in the case of that the predetermined time has not been elapsed so as to be operated in the high quality image mode by the sequential scanning manner. Then, a fine image obtained by the sequential scanning operation is recorded on the recording medium 32 in 6 frames, that is, 1/10 second. After the still image has been recorded, the reading mode of the CCD image sensor 12 is returned to the n-line mode.

Since only the AF control is performed in accordance with optimal control data because of the switch of the reading mode and change of the control data, a further focused fine image can efficiently be obtained.

FIG. 15 illustrates another example of the switch of the reading mode which is performed in accordance with the operation of the trigger. In this example the CCD image sensor 12 is always operated in the q-addition mode except for the number of addition lines immediately before the still image is recorded is twice the number in the usual operation.

In a usual state, the CCD image sensor 12 is operated in the q-addition mode in which pixel signals for α lines (α is a natural number not smaller than 2) are added and read. During this, control data for AF, AWB and AE is repeatedly calculated at intervals of 1/60 second in accordance with image data obtained in the q-addition mode so that the AF control, the AWB control and the AE control are performed.

In a certain period after depression of the trigger 46 by one step, the CCD image sensor 12 is operated in the q-addition mode in which pixel signals for 2α lines continued in the vertical direction are added and read. During this, control data for the AF is calculated at intervals of 1/120 second in accordance with image data obtained in the q-addition mode. In accordance with control data, the AF control is performed.

When the trigger 46 is depressed by two steps, reading mode of the CCD image sensor 12 is switched immediately in the case of that a predetermined time for only the AF control has elapsed or after the predetermined time pass in the case of that the predetermined time has not been elapsed so as to be operated in the high quality image mode by the sequential scanning manner. Then, a fine image obtained by the sequential scanning operation is recorded on the recording medium 32 in 6 frames, that is, 1/10 second. After the still image has been recorded, the reading mode of the CCD image sensor 12 is returned to the q-addition mode for a usual state.

Since only the AF control is performed in accordance with control data which can be obtained at a rate which is twice the rate in a usual state because of switch of the reading mode and change of control data, a fine image focused more quickly can efficiently be obtained at an optimal shutter release opportunity.

As easily understood from the above description, the CCD image sensor is, when no photographing operation is performed, operated in a high speed mode in which, for example, pixel signals for n lines are read at intervals of m lines in the vertical direction. As a result, an electronic imaging apparatus can be obtained which has a 1,000,000 pixel class CCD image sensor which displays an image which can be recognized as dynamic images when no photographing operation is performed even with an operation frame rate is not higher than 20 MHz.

Claims

1. An electronic imaging apparatus comprising:

   an image forming optical system (38, 40, 42 and 44) for forming an image of a subject;
   pixel signal output means (12, 14, 16, 18, 20,

22 and 24) for converting the image formed by said image forming optical system into electric pixel signals to output the electronic signals;
information processing means (26) for processing the pixel signals output from said pixel signal output means to generate image data;
trigger means (46) for instructing recording of image data; and
image recording means (32) for recording the image data in accordance with an instruction issued from said trigger means, characterized in that
said pixel signal output means has a CCD image sensor (12) and drive control means (20 and 24) for controlling the operation of said CCD image sensor, said drive control means operates said CCD image sensor in a high quality image made or a high speed mode, said high quality mode is a mode for sequentially reading all of the pixel signals for each line in a vertical direction and said high speed mode is a mode for outputting the pixel signals for n lines at intervals of m lines in the vertical direction (where both m and n are natural numbers satisfying $m > n$ and $m \geq 3$).

2. An electronic imaging apparatus comprising:

an image forming optical system (38, 40, 42 and 44) for forming an image of a subject;
pixel signal output means (12, 14, 16, 18, 20, 22 and 24) for converting the image formed by said image forming optical system into electric pixel signals to output the electronic signals;
information processing means (26) for processing the pixel signals output from said pixel signal output means to generate image data;
trigger means (46) for instructing recording of image data; and
image recording means (32) for recording the image data in accordance with an instruction issued from said trigger means, characterized in that
said pixel signal output means has a CCD image sensor (12) and drive control means (20 and 24) for controlling the operation of said CCD image sensor, said drive control means operates said CCD image sensor in a high quality image made or a high speed mode, said high quality mode is a mode for sequentially reading all of the pixel signals for each line in a vertical direction and said high speed mode is a mode for adding and outputting the pixel signals for n lines at intervals of m lines in the vertical direction (where both m and n are natural numbers satisfying $m > n$).

3. An electronic imaging apparatus comprising:

an image forming optical system (38, 40, 42 and 44) for forming an image of a subject;
pixel signal output means (12, 14, 16, 18, 20, 22 and 24) for converting the image formed by said image forming optical system into electric pixel signals to output the electronic signals;
information processing means (26) for processing the pixel signals output from said pixel signal output means to generate image data;
trigger means (46) for instructing recording of image data; and
image recording means (32) for recording the image data in accordance with an instruction issued from said trigger means, characterized in that
said pixel signal output means has a CCD image sensor (12) and drive control means (20 and 24) for controlling the operation of said CCD image sensor, said drive control means operates said CCD image sensor in a high quality image made or a high speed mode, said high quality mode is a mode for sequentially reading all of the pixel signals for each line in a vertical direction and said high speed mode is a mode for adding and outputting the pixel signals for q lines consecutive in the vertical direction (where q is a natural number not smaller than 2).

4. An electronic imaging apparatus having a mode for causing a two-dimensional solid state imaging device (12) to extract all pixel signals by sequential scanning to record a still image; and a mode for causing the solid state imaging device (12) to extract pixel signals for n lines at intervals of m lines in the vertical direction to record a still image or subject the same to a dynamic image process.

5. An electronic imaging apparatus according to claim 4, characterized in that pixel signals for n lines are extracted at intervals of m lines in the vertical direction to obtain a still image or color signals of image data to be subjected to a dynamic image process in the form of line-sequential data.

6. An electronic imaging apparatus according to claim 4, characterized in that a color filter of the solid state imaging device (12) is formed by a line-sequential filter.

7. An electronic imaging apparatus according to claim 4, characterized in that $n = 2\alpha$.

8. An electronic imaging apparatus according to claim 4, characterized in that $m = 2\alpha + 1$ and $n = 1$.

9. An electronic imaging apparatus according to claim 4, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information.

10. An electronic imaging apparatus according to claim 4, characterized in that signals subjected to a dynamic image process are used as AF information or AWB information, one data item of control data for AF, AWB and AE is sequentially calculated for one frame and calculation of data is sequentially performed.

11. An electronic imaging apparatus according to claim 4, characterized in that signals subjected to a still image process or a dynamic image process are supplied to an accompanying display unit (34) or an external display unit.

12. An electronic imaging apparatus according to claim 4, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information and also supplied to an accompanying display unit (34) or an external display unit.

13. An electronic imaging apparatus having a mode for causing a two-dimensional solid state imaging device (12) to extract all pixel signals by sequential scanning to record a still image; and a mode for causing the solid state imaging device (12) to add pixel signals for n lines at intervals of m lines in the vertical direction to extract pixel signals so as to record a still image or subject the same to a dynamic image process.

14. An electronic imaging apparatus according to claim 13, characterized in that color signals of image data obtained by adding n lines at intervals of m lines in the vertical direction and by extracting pixel signals to subject a still image process or a dynamic image process are obtained by line-sequential data.

15. An electronic imaging apparatus according to claim 13, characterized in that a color filter of the solid state imaging device (12) is formed by a line-sequential filter.

16. An electronic imaging apparatus according to claim 13, characterized in that each of n lines to be added has the same color filter elements.

17. An electronic imaging apparatus according to claim 13, characterized in that each of n lines to be added has the same color filter elements, and color filter elements of n lines are different from these of next n lines at intervals of m lines.

18. An electronic imaging apparatus according to claim 13, characterized in that $m = 2\alpha + 1$.

19. An electronic imaging apparatus according to claim 13, characterized in that shift of charges for n lines to vertical transfer passages is divided into n times and vertical transfer is performed by m - 1 times so that vertical transfer clocks are supplied in units of m times after addition of n lines has been performed in the vertical transfer passages to perform transfer to a horizontal transfer passage.

20. An electronic imaging apparatus according to claim 19, characterized in that the substrate voltage for controlling overflowing is made to be different from that when sequential scanning is performed when addition of n lines and transfer to the horizontal transfer passage are performed.

21. An electronic imaging apparatus according to claim 13, characterized in that charges for n lines are shifted to the vertical transfer passages, and then vertical transfer clocks are supplied in units of m times to perform transfer to the horizontal transfer passage so as to perform addition of n lines in the horizontal transfer passage.

22. An electronic imaging apparatus according to claim 21, characterized in that exposure is controlled in such a manner that the quantity of exposed charge for each pixel is z/n times or lower of capacity z of the transfer passage when addition of n lines is performed.

23. An electronic imaging apparatus according to claim 13, characterized in that exposure is controlled in such a manner that the quantity of exposed charge for each pixel is 1/n times or lower of the capacity of the exposed charge in a mode in which all of the pixel signals are extracted by the sequential scanning operation.

24. An electronic imaging apparatus according to claim 13, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information.

25. An electronic imaging apparatus according to claim 13, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information, one data item of control data for AF, AWB and AE is sequentially calculated for one frame and calculation of data is sequentially performed.

26. An electronic imaging apparatus according to claim 13, characterized in that signals subjected to a still image process or a dynamic image process are

supplied to an accompanying display unit (34) or an external display unit.

27. An electronic imaging apparatus according to claim 13, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information and also supplied to an accompanying display unit (34) or an external display unit.

28. An electronic imaging apparatus having a mode for causing a two-dimensional solid state imaging device (12) to extract all pixel signals by sequential scanning to record a still image; and a mode for causing the solid state imaging device (12) to extract pixel signals added at intervals of q lines continued in the vertical direction to record a still image or perform a dynamic image process.

29. An electronic imaging apparatus having a mode for causing a two-dimensional solid state imaging device (12) to extract all pixel signals by sequential scanning to record a still image; a mode for causing the solid state imaging device (12) to extract pixel signals for n lines at intervals of m lines in the vertical direction to record a still image or subject the same to a dynamic image process; and a mode for causing the solid state imaging device (12) to extract pixel signals added at intervals of q lines continued in the vertical direction to record a still image or perform a dynamic image process.

30. An electronic imaging apparatus having a mode for causing a two-dimensional solid state imaging device (12) to extract all pixel signals by sequential scanning to record a still image; a mode for causing the solid state imaging device (12) to add n lines at intervals of m lines in the vertical direction and extract the pixel signals to record a still image or subject the same to a dynamic image process; and a mode for causing the solid state imaging device (12) to extract pixel signals added at intervals of q lines continued in the vertical direction to record a still image or perform a dynamic image process.

31. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that a color filter of the solid state imaging device (12) is formed by a line-sequential filter.

32. An electronic imaging apparatus according to claim 30, characterized in that each of n lines to be added has the same color filter elements.

33. An electronic imaging apparatus according to claim 30, characterized in that each of n lines to be added has the same color filter elements, and color filter elements of n lines are different from these of next n lines at intervals of m lines.

34. An electronic imaging apparatus according to claim 29, characterized in that $n = 2\alpha$.

35. An electronic imaging apparatus according to claim 29, characterized in that $m = 2\alpha + 1$ and $n = 1$.

36. An electronic imaging apparatus according to claim 30, characterized in that $m = 2\alpha + 1$.

37. An electronic imaging apparatus according to claim 29, characterized in that $m/n = q$.

38. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that shift of charges for q lines to the vertical transfer passages is divided into q times, and vertical transfer clocks are supplied in units of q times after addition of q lines is performed in the vertical transfer passages by performing vertical transfer by q - 1 times to perform transfer to the horizontal transfer passage.

39. An electronic imaging apparatus according to claim 30, shift of charges for n lines to the vertical transfer passages is divided into n times and vertical transfer is performed by m - 1 times when n lines are added at intervals of m lines so that addition of n lines is performed in the vertical transfer passages, and vertical transfer clocks are supplied in units of m times to perform transfer to the horizontal transfer passage and when addition at intervals of q lines is performed, shift of charges for q lines to the vertical transfer passages is divided into q times and vertical transfer is performed by q - 1 times so that addition of q lines is performed in the vertical transfer passages after which vertical transfer clocks are supplied in units of q times so that transfer to the horizontal transfer passage is performed.

40. An electronic imaging apparatus according to claim 39, characterized in that the substrate voltage for controlling overflowing is made to be different from that when sequential scanning is performed when addition of n lines or q lines and transfer to the horizontal transfer passage are performed.

41. An electronic imaging apparatus according to any one of claims 25, 26 and 27, characterized in that charges for q lines are shifted to the vertical transfer passages, and then vertical transfer clocks are supplied in units of q times to perform transfer to the horizontal transfer passage so as to perform addition of q lines in the horizontal transfer passage.

42. An electronic imaging apparatus according to claim 30, characterized in that when n lines are added at

intervals of m lines, charges for n lines are shifted to the vertical transfer passages, and vertical transfer clocks are supplied in units of m times to perform transfer to the horizontal transfer passage so as to perform addition of n lines in the horizontal transfer passage, when addition of intervals of q lines is performed, charges for q lines are shifted to the vertical transfer passages after which vertical transfer clocks are supplied in units of q times to perform transfer to the horizontal transfer passage so as to perform addition of q lines in the horizontal transfer passage.

43. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that exposure is controlled in such a manner that the quantity of exposure when addition of q lines is performed is 1/q times of the quantity of exposure when all of the pixel signals are extracted by the sequential scanning operation.

44. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that signals subjected to a dynamic image process are used as AF information, AE information or AWB information.

45. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that signals subjected to the dynamic image process in any one of the modes are used as AF information, AE information or AWB information, any one of control data items for AF, AE and AWB is calculated for each frame and calculation of data is sequentially and repeatedly performed.

46. An electronic imaging apparatus according to any one of claims 28, 29 and 30, signals subjected to the still image process or the dynamic image process in any one of the modes is supplied to an accompanying display unit (34) or an external display unit.

47. An electronic imaging apparatus according to any one of claims 28, 29 and 30, characterized in that signals subjected to the dynamic image process in any one of the modes are used as AF information, AE information or AWB information and supplied to an accompanying display unit (34) or an external display unit.

48. An electronic imaging apparatus according to claim 28, characterized in that the number of q lines to be added is made to be different between a case where signals subjected to the dynamic image process is used as AF information, AE information or AWB information and a case where the same is displayed on the accompanying display unit (34) or the external display unit.

49. An electronic imaging apparatus according to claim 29, characterized in that switching means is provided which is arranged in such a manner that when signals subjected to the dynamic image process to be supplied to the accompanying display unit (34) or the external display unit or to be used as AE information or AWB information are obtained, the mode for extracting the pixel signals for n lines at intervals of m lines in the vertical direction is selected and when signals subjected to the dynamic image process are obtained for use as AF information or AE information, the mode for extracting pixel signal added at intervals of q lines continued in the vertical direction is selected.

50. An electronic imaging apparatus according to claim 29, characterized in that switching means is provided which is arranged in such a manner that when signals subjected to the dynamic image process to be supplied to the accompanying display unit (34) or the external display unit or to be used as AE information or AWB information are obtained, the mode for adding n lines at intervals of m lines in the vertical direction and extracting the pixel signals is selected and when signals subjected to the dynamic image process are obtained for use as AF information or AE information, the mode for extracting pixel signal added at intervals of q lines continued in the vertical direction is selected.

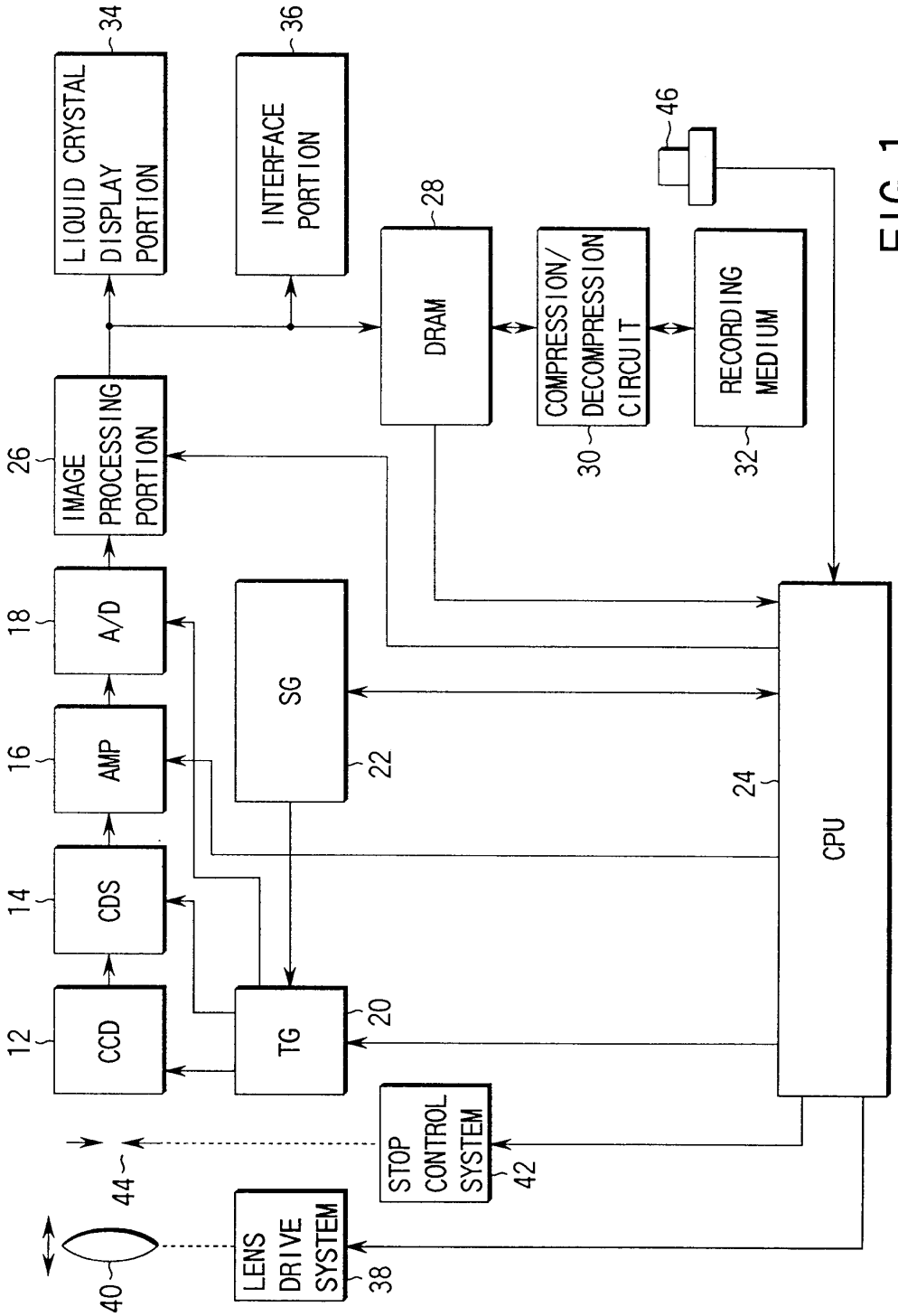

LIQUID CRYSTAL DISPLAY PORTION
34
INTERFACE PORTION
36
46
28
DRAM
COMPRESSION/ DECOMPRESSION CIRCUIT
30
RECORDING MEDIUM
32
IMAGE PROCESSING PORTION
26
A/D
18
AMP
16
CDS
14
CCD
12
SG
22
TG
20
CPU
24
STOP CONTROL SYSTEM
42
44
LENS DRIVE SYSTEM
38
40

FIG. 1

FIG. 2

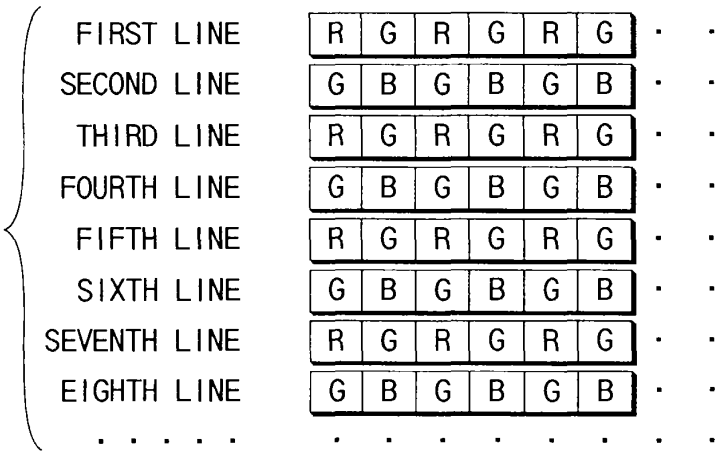
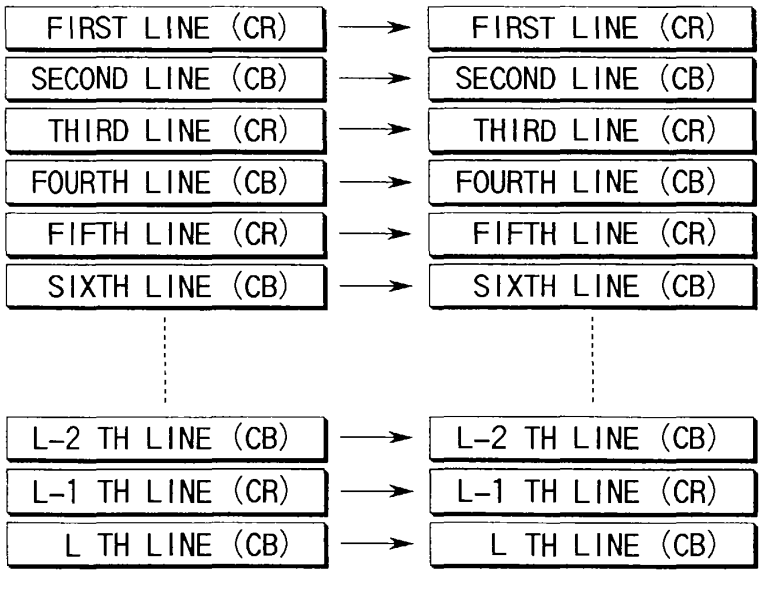

FIRST LINE
SECOND LINE
THIRD LINE
FOURTH LINE
FIFTH LINE
SIXTH LINE
SEVENTH LINE
EIGHTH LINE
R G R G R G
G B G B G B

FIG. 3


FIRST LINE (CR)
SECOND LINE (CB)
THIRD LINE (CR)
FOURTH LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
L-2 TH LINE (CB)
L-1 TH LINE (CR)
L TH LINE (CB)
FIRST LINE (CR)
SECOND LINE (CB)
THIRD LINE (CR)
FOURTH LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
L-2 TH LINE (CB)
L-1 TH LINE (CR)
L TH LINE (CB)

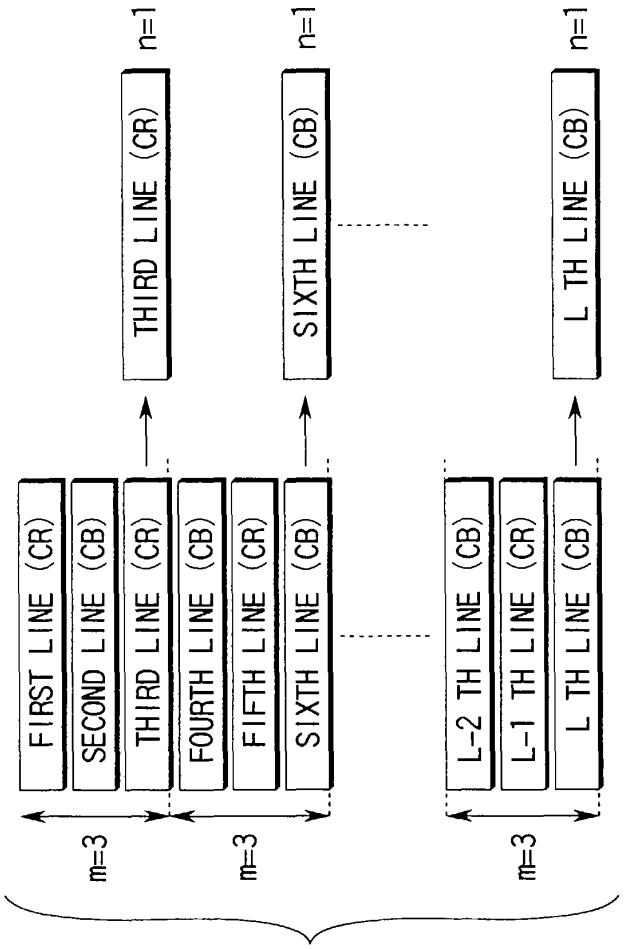

FIRST LINE (CR)
SECOND LINE (CB)
THIRD LINE (CR)
FOURTH LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
L-2 TH LINE (CB)
L-1 TH LINE (CR)
L TH LINE (CB)
THIRD LINE (CR)
SIXTH LINE (CB)
L TH LINE (CB)
n=1
n=1
n=1
m=3
m=3
m=3

FIG. 4

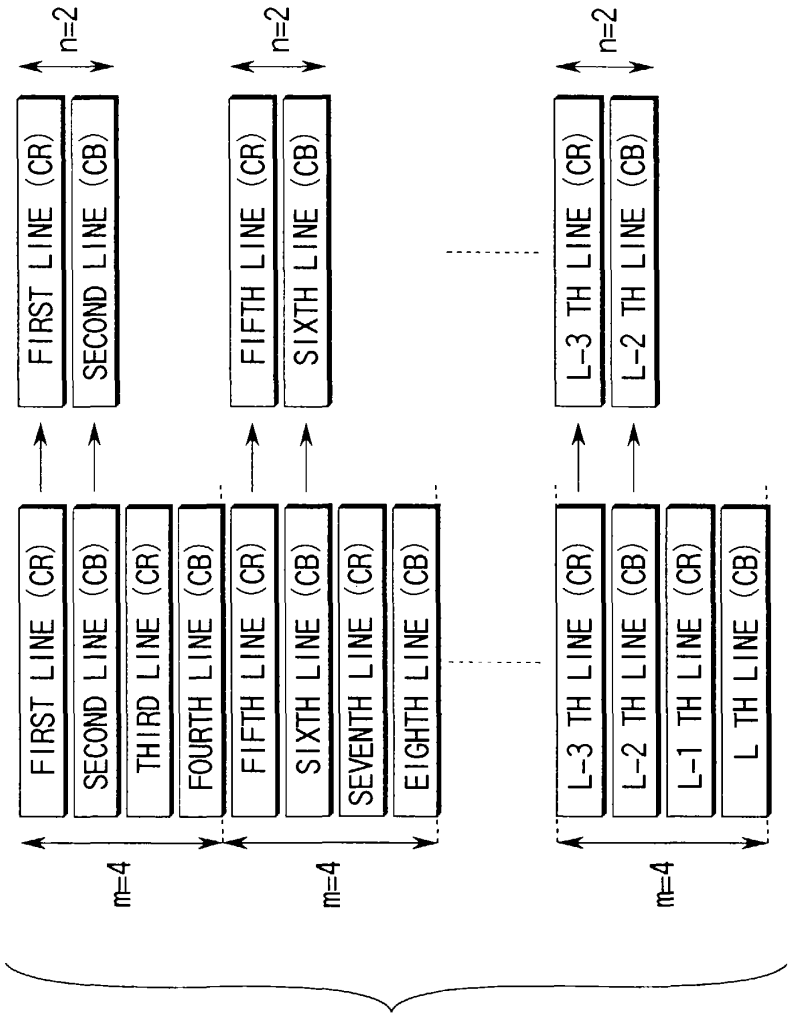

n=2
n=2
n=2
FIRST LINE (CR)
SECOND LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
L-3 TH LINE (CR)
L-2 TH LINE (CB)
FIRST LINE (CR)
SECOND LINE (CB)
THIRD LINE (CR)
FOURTH LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
SEVENTH LINE (CR)
EIGHTH LINE (CB)
L-3 TH LINE (CR)
L-2 TH LINE (CB)
L-1 TH LINE (CR)
L TH LINE (CB)
m=4
m=4
m=4

FIG. 5

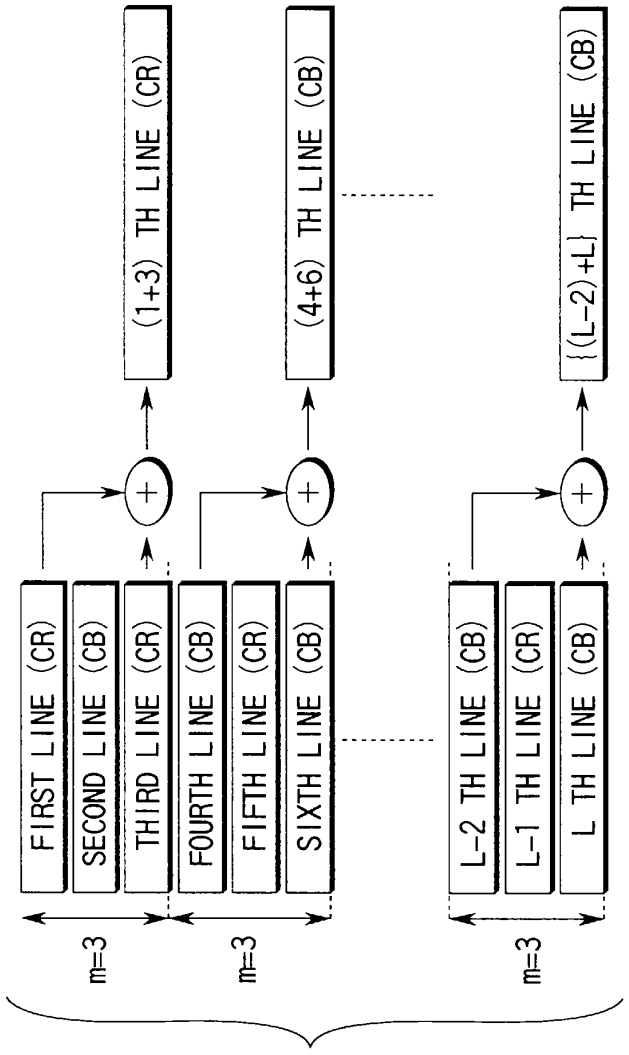

FIRST LINE (CR)
SECOND LINE (CB)
THIRD LINE (CR)
FOURTH LINE (CB)
FIFTH LINE (CR)
SIXTH LINE (CB)
L-2 TH LINE (CB)
L-1 TH LINE (CR)
L TH LINE (CB)
(1+3) TH LINE (CR)
(4+6) TH LINE (CB)
{(L-2)+L} TH LINE (CB)
m=3
m=3
m=3

FIG. 6

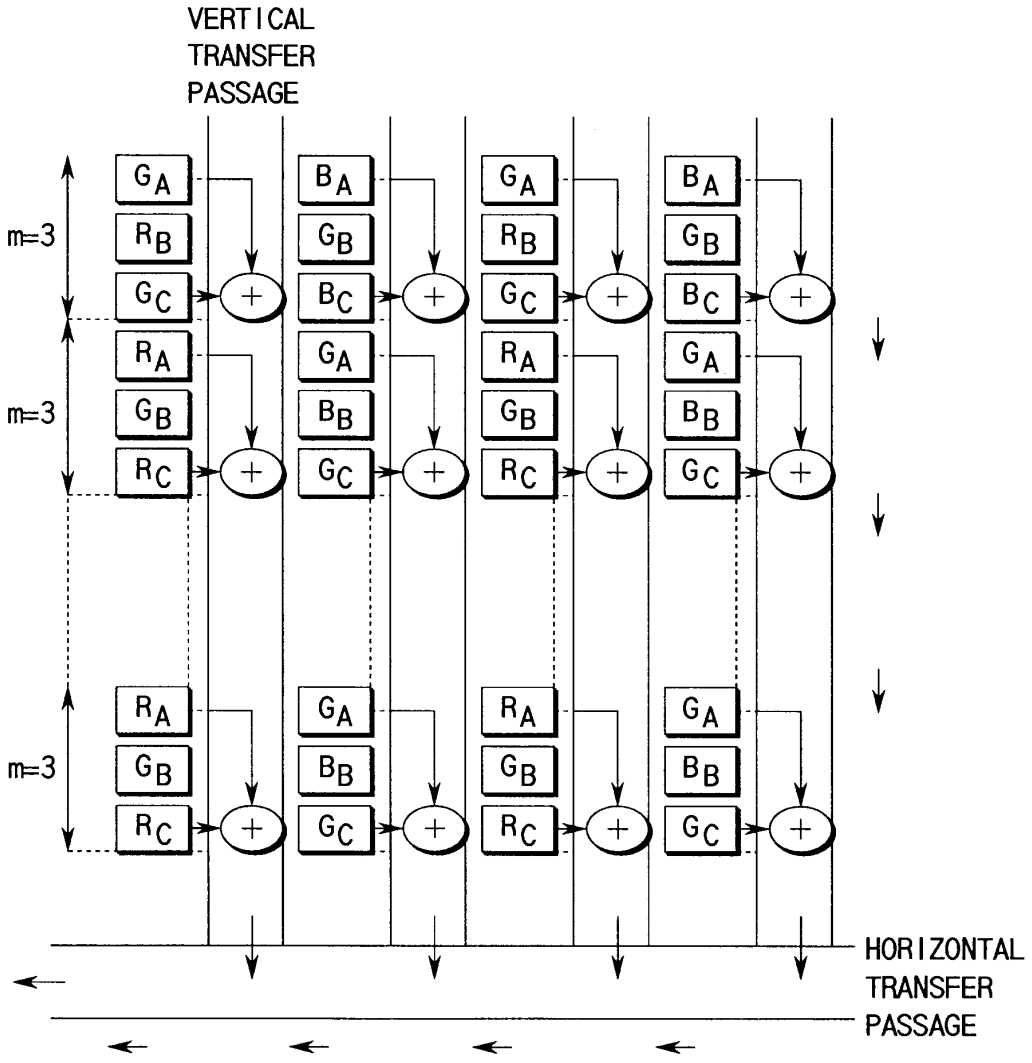

VERTICAL
TRANSFER
PASSAGE
m=3
m=3
m=3
HORIZONTAL
TRANSFER
PASSAGE

FIG. 7

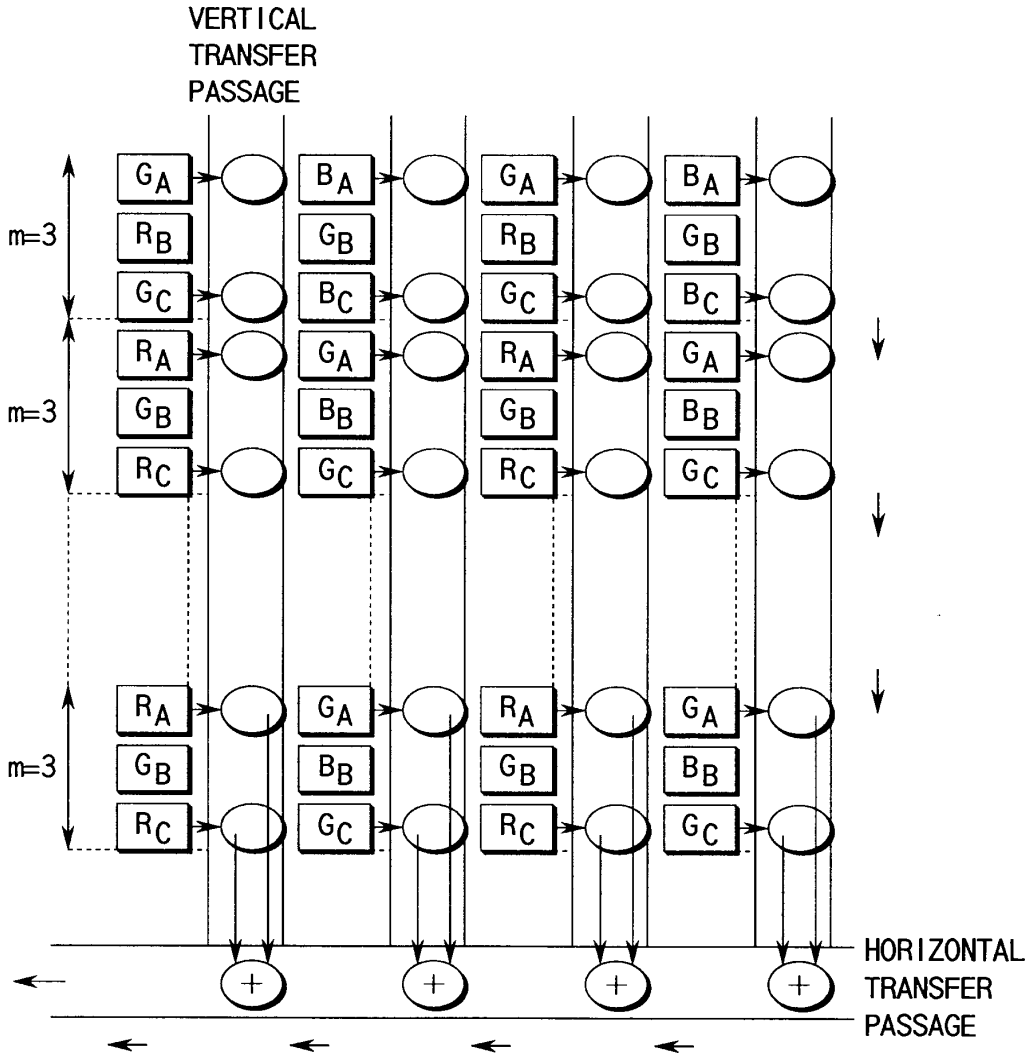

VERTICAL
TRANSFER
PASSAGE
m=3
m=3
m=3
HORIZONTAL
TRANSFER
PASSAGE

FIG. 8

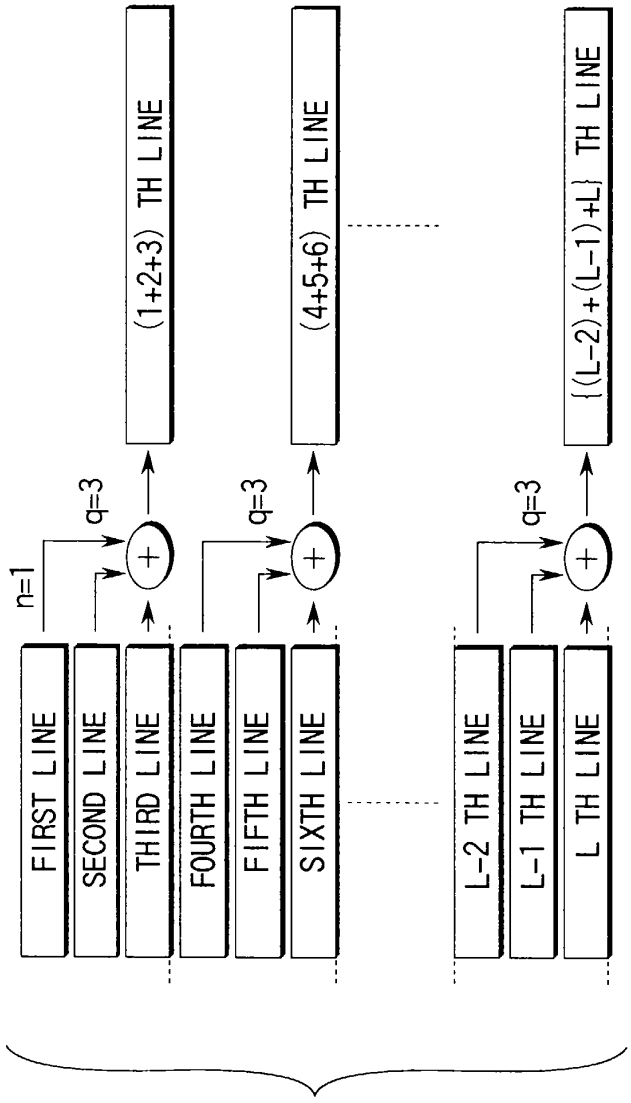

FIRST LINE
SECOND LINE
THIRD LINE
FOURTH LINE
FIFTH LINE
SIXTH LINE
L-2 TH LINE
L-1 TH LINE
L TH LINE
n=1
q=3
q=3
q=3
(1+2+3) TH LINE
(4+5+6) TH LINE
{(L-2)+(L-1)+L} TH LINE

FIG. 9

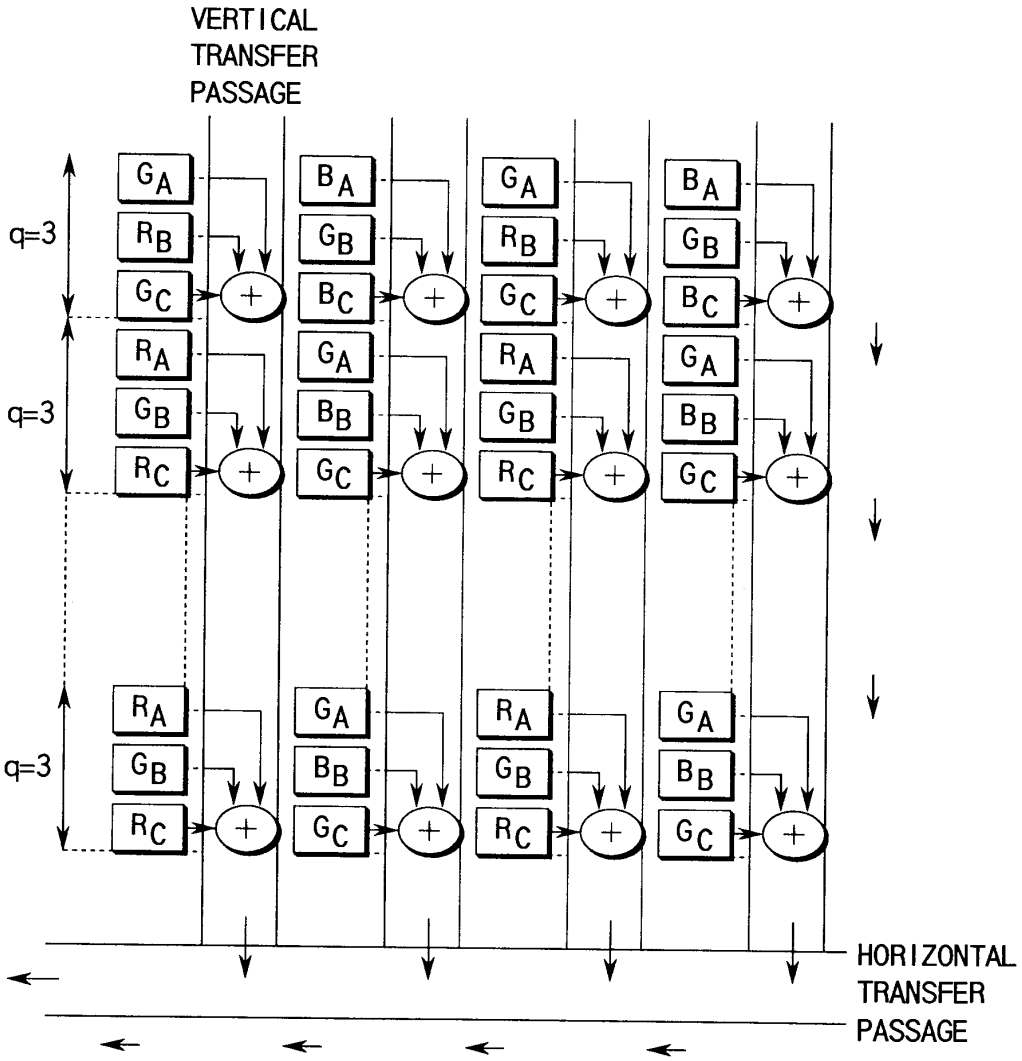

VERTICAL
TRANSFER
PASSAGE
q=3
q=3
q=3
HORIZONTAL
TRANSFER
PASSAGE

FIG. 10

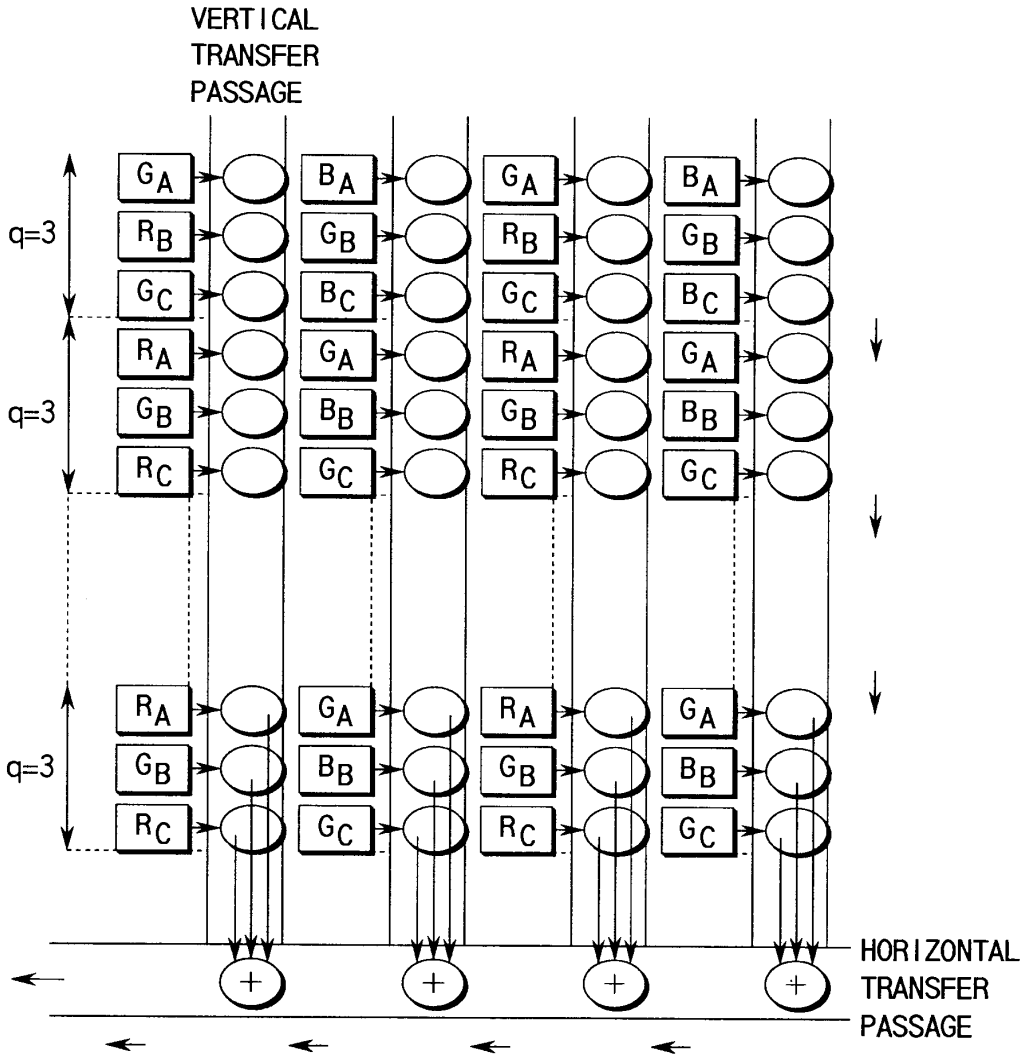

VERTICAL
TRANSFER
PASSAGE
q=3
q=3
q=3
HORIZONTAL
TRANSFER
PASSAGE

FIG. 11

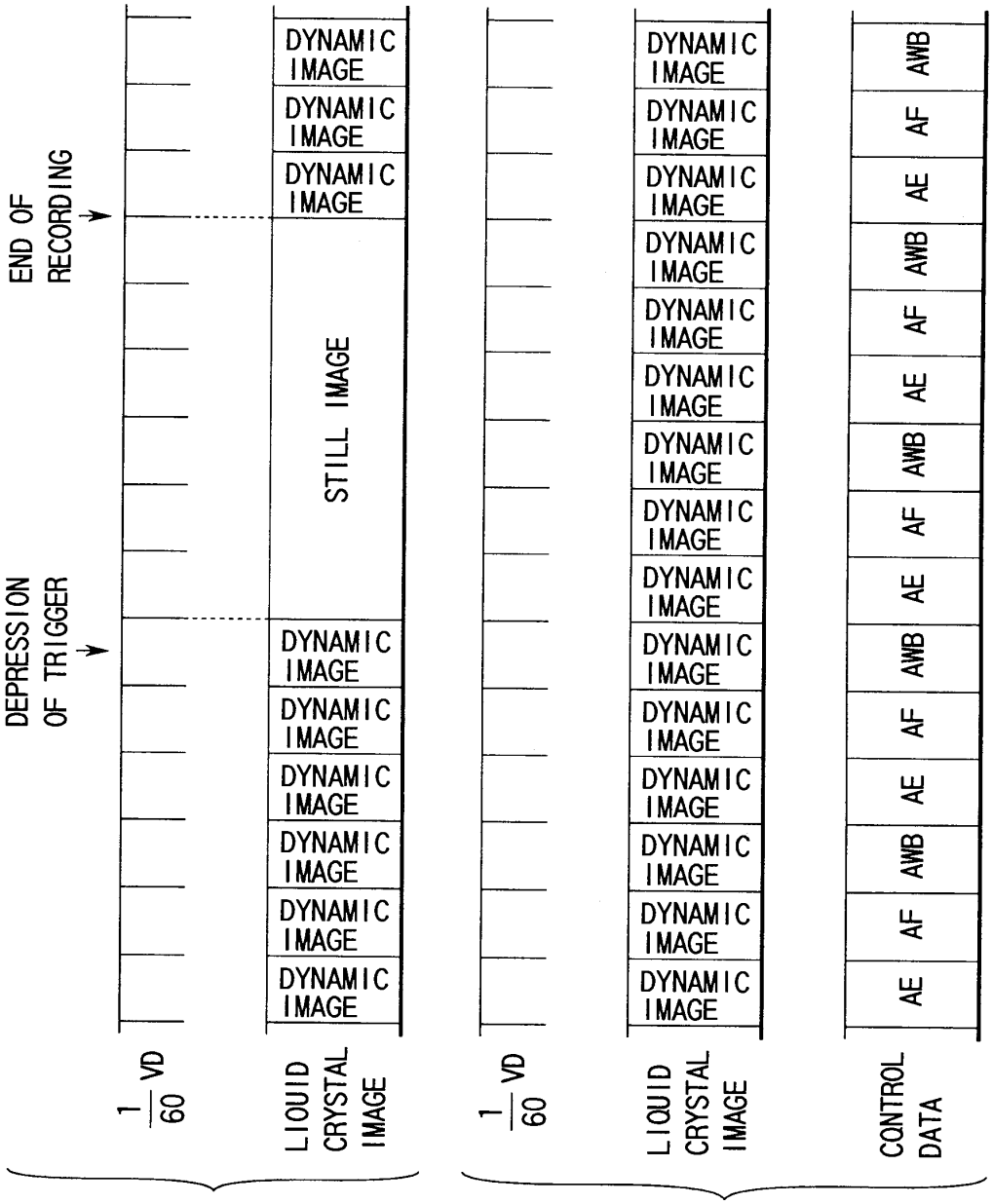

DEPRESSION OF TRIGGER
END OF RECORDING
DYNAMIC IMAGE
STILL IMAGE
1/60 VD
LIQUID CRYSTAL IMAGE
AE
AF
AWB
CONTROL DATA

FIG. 12

FIG. 13

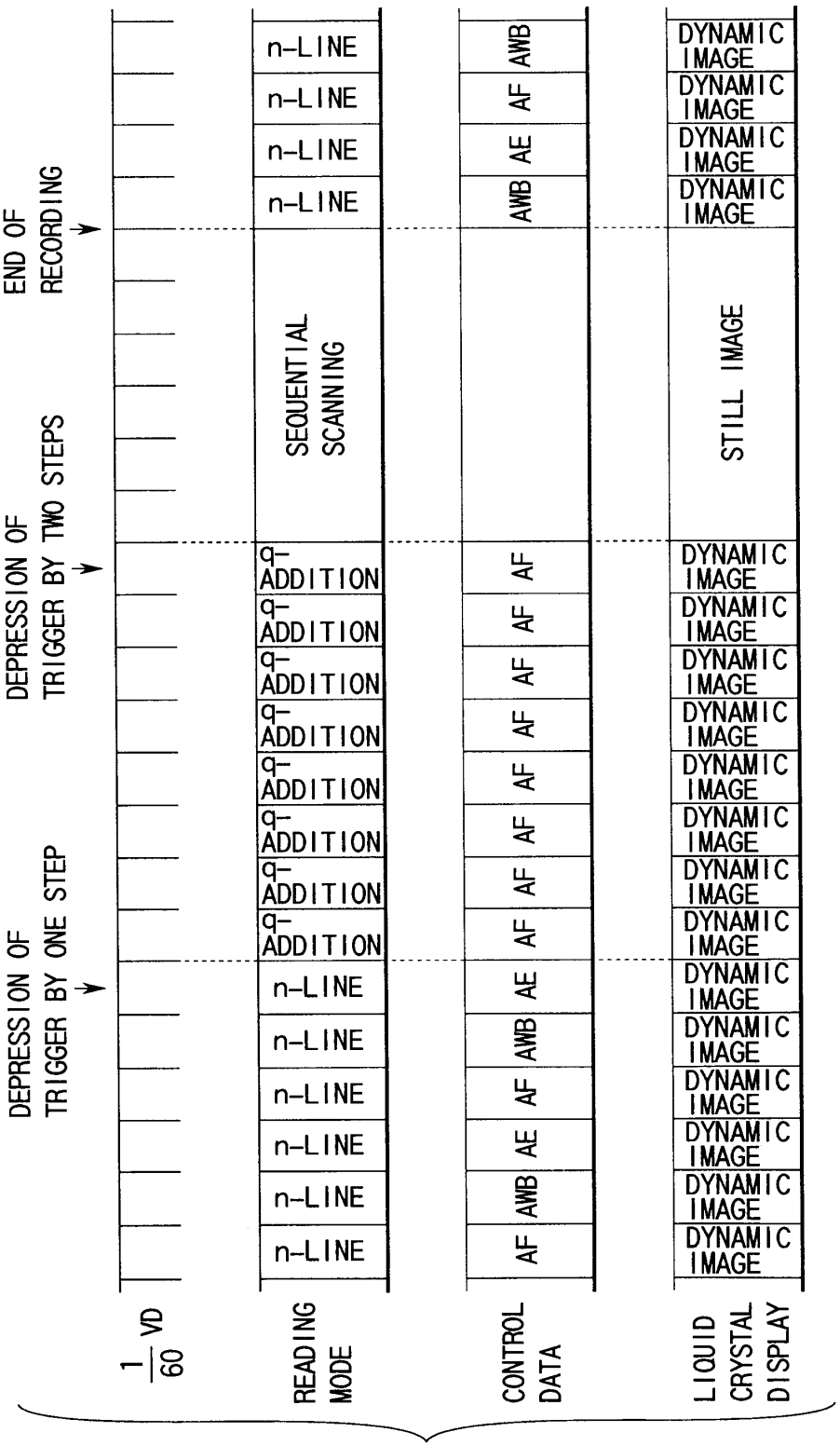

DEPRESSION OF TRIGGER BY ONE STEP
DEPRESSION OF TRIGGER BY TWO STEPS
END OF RECORDING
1/60 VD
READING MODE
CONTROL DATA
LIQUID CRYSTAL DISPLAY
n-LINE
SEQUENTIAL SCANNING
9-ADDITION
AF
AE
AWB
DYNAMIC IMAGE
STILL IMAGE

FIG. 14

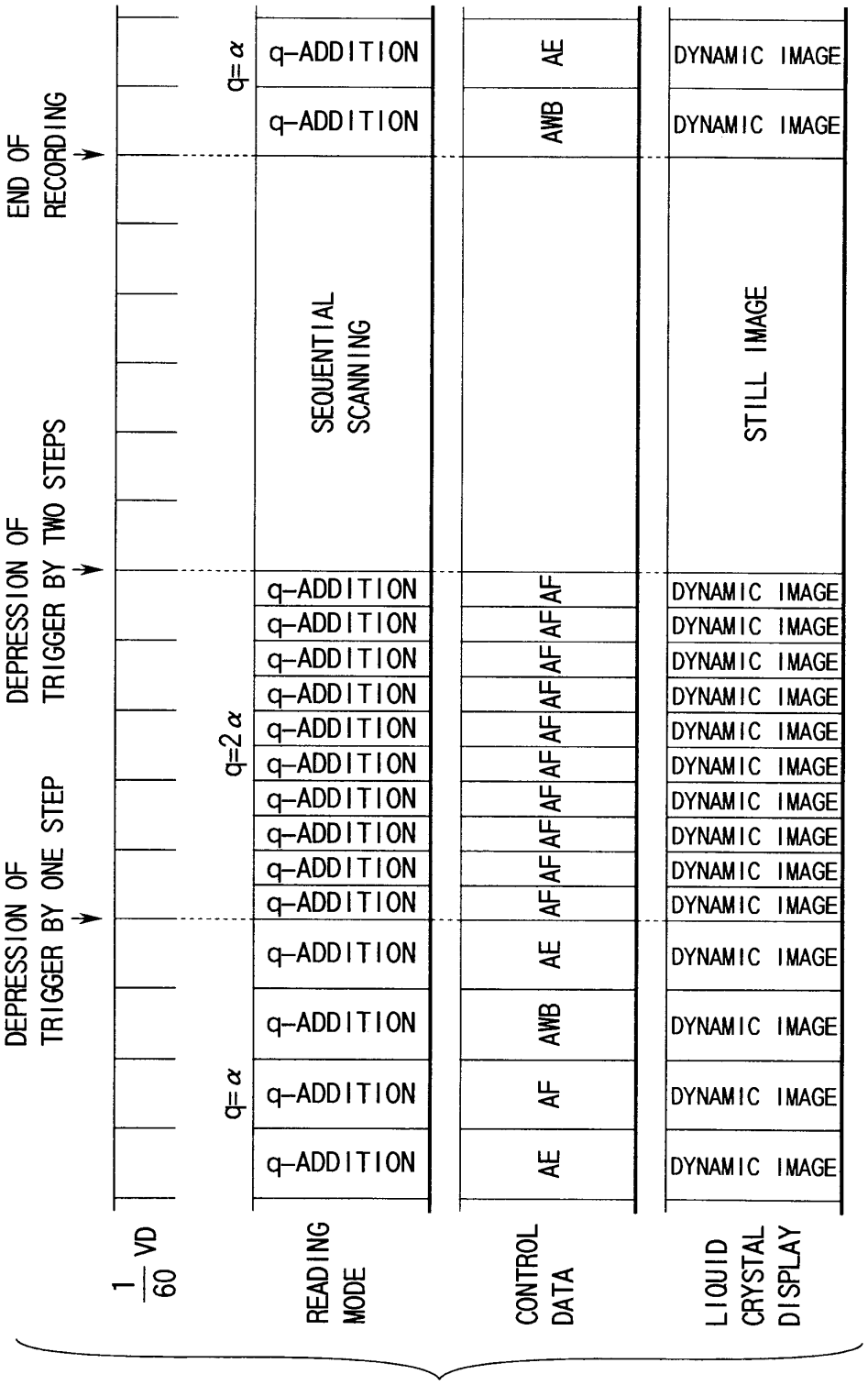

DEPRESSION OF TRIGGER BY ONE STEP
DEPRESSION OF TRIGGER BY TWO STEPS
END OF RECORDING
1/60 VD
READING MODE
CONTROL DATA
LIQUID CRYSTAL DISPLAY
q=α
q=2α
q=α
q-ADDITION
SEQUENTIAL SCANNING
AE
AWB
AF
STILL IMAGE
DYNAMIC IMAGE

FIG. 15

Espacenet

Bibliographic data: EP0587954 (A1) — 1994-03-23

Electronic direction finder.

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Applicant(s): MOTOROLA INC [US] ± (MOTOROLA, INC)

Classification: **- international:** ***G01C17/30; G01S19/18; G01S19/48; G01S19/54; G01S5/14;*** (IPC1-7): G01S3/14; G01S3/40; G01S5/14

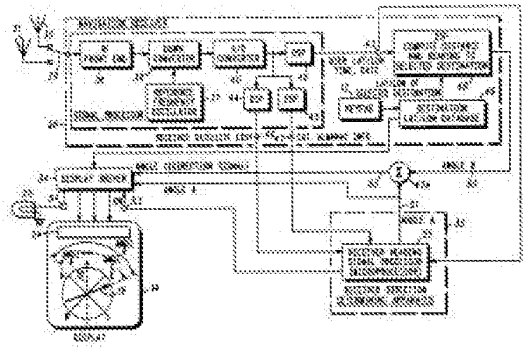
- cooperative: **G01C17/30 (EP); G01C21/20 (EP)**

Application number: EP19920309074 19921005 Global Dossier

Priority number (s): US19910770850 19911004

Also published as: AU2359592 (A) CA2079160 (A1) US5146231 (A)

Abstract of EP0587954 (A1)



An electronic direction finder (10), having a housing (11) with a major axis (18), has a GPS receiver (28) and directional (31) and omnidirectional (30) antennas and provides an electrical signal (angle A) indicative of the direction of the housing axis (18) with respect to a predetermined compass heading (North). The electrical signal (angle A) is provided by using determined positions of the GPS receiver (28) and one GPS satellite to calculate a compass bearing from the receiver (28) to the one satellite and using the directional antenna (31) to determine the orientation of the housing axis (18) with respect to the satellite. This eliminates using electrical output terrestrial magnetism sensing devices to sense direction finder/receiver orientation with respect to compass direction, and

therefore avoids the inaccuracies and costs associated with such magnetism sensing devices.

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(54) Electronic direction finder.

(57) An electronic direction finder (10), having a housing (11) with a major axis (18), has a GPS receiver (28) and directional (31) and omnidirectional (30) antennas and provides an electrical signal (angle A) indicative of the direction of the housing axis (18) with respect to a predetermined compass heading (North). The electrical signal (angle A) is provided by using determined positions of the GPS receiver (28) and one GPS satellite to calculate a compass bearing from the receiver (28) to the one satellite and using the directional antenna (31) to determine the orientation of the housing axis (18) with respect to the satellite. This eliminates using electrical output terrestrial magnetism sensing devices to sense direction finder/receiver orientation with respect to compass direction, and therefore avoids the inaccuracies and costs associated with such magnetism sensing devices.

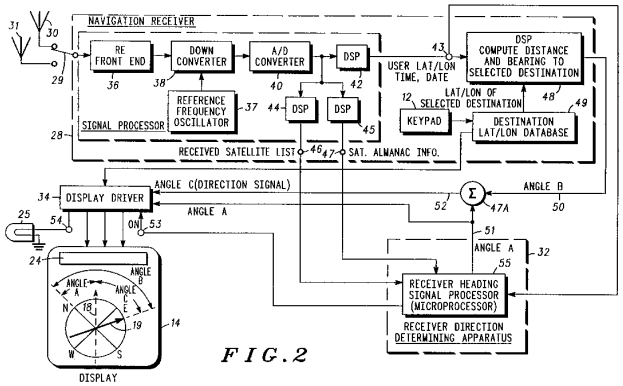


FIG.2

EP 0 587 954 A1

Cross Reference to Related Applications

The present invention is related to the apparatus disclosed in copending PCT patent application No. PCT/US92/03152 and entitled, "Electronic Direction Finder". The inventors of that copending application are George L. Lauro and Ralph E. Menick, and the application is assigned to same assignee as the present invention.

Field of the Invention

The present invention is generally directed to the field of electronic direction finders in which bearing/heading information is provided to a user with respect to the user's present heading and/or with respect to the heading which a user should follow to arrive at a desired destination.

Background of the Invention

Conventionally, magnetic compasses are used to sense terrestrial magnetism and provide a visual indication identifying at least one predetermined compass heading such as north, south, east or west. Recently, magnetic flux gate compasses have been utilized to sense terrestrial magnetism and to provide an electronic signal which identifies the predetermined compass direction. Because these devices operate in response to sensed terrestrial magnetism, they are somewhat inaccurate since they are subject to local disturbances and variations of the earth's magnetic field. In addition, the magnetic north sensed by such sensors does not, in general, correspond to the true north compass direction and therefore correction or calibration of the compass output may be required if accurate compass headings are to be achieved.

The electronic direction finder described in the above noted copending patent application utilizes a flux gate compass to provide an electronic signal indicative of the orientation of a global positioning system (GPS) receiver, and its visual display, with respect to a predetermined compass heading such as north. A signal is also generated which determines, which respect to predetermined compass directions, the direction, from the receiver, of a desired destination. The prior direction finder then provides on its display a rotatable pointer which provides a visual indication of the bearing towards a selected desired destination. The sensing of terrestrial magnetism by the flux gate compass determines the orientation of the GPS receiver with respect to compass directions and ensures the proper orientation of the displayed visual arrow to the desired destination.

The electronic direction finder described in the above identified copending patent application represents a substantial improvement over other direction finders currently available. It is contemplated that such a direction finder will be of a size so as to be hand holdable and therefore represent a portable navigation device usable by hikers and other pedestrians as well as usable by boaters. However, terrestrial magnetism sensors such as flux gate compasses are relatively expensive and their cost therefore might prevent the widespread adoption and commercial success of such a hand held GPS receiver. Also, the flux gate compass and its associated circuitry appreciably adds to the total size of a hand held GPS receiver when included therewith. In addition, sensing of terrestrial magnetism would also require calibration to correct for known variations of the earth's magnetic field. Also, such a system would be susceptible to errors in sensed magnetic field cause by local disturbances of the earth's magnetic field.

Thus there is a need for an electronic direction finder apparatus which is relatively inexpensive and small in size and does not utilize a flux gate compass or any sensing of terrestrial magnetism in order to produce an accurate visual display of compass directions and/or the direction to a desired destination.

Some prior direction systems rigidly mount two widely spaced omnidirectional antennas on a vehicle, such as a ship, and calculate the direction of the vehicle heading by calculating the position of each fixed antenna location. This is not practical for a small hand held direction finder device.

Summary of the Invention

In one embodiment of the present invention, an electronic direction finder is provided. The electronic direction finder includes a housing having a major axis; an omnidirectional antenna for receiving signals from at least three satellites; a navigation receiver fixed within the housing and coupled to the omnidirectional antenna for receiving the satellite signals therefrom and in response thereto determining the position of the receiver and also determining the position at least one of the satellites; directional antenna means, having a directional antenna pattern, fixed to and rotatable with the navigation receiver for also providing the satellite signals to the receiver; direction means for determining when the directional antenna pattern is oriented at a predetermined direction with respect to the at least one satellite; and means for providing an electrical signal indicative of the direction of the housing axis with respect to at least one predetermined compass heading when the directional antenna pattern is oriented at the predetermined direction by using the determined positions of the at least one satellite and of the receiver to calculate

a bearing from the receiver to the at least one satellite.

Preferably, the navigation receiver comprises a GPS receiver, the directional antenna means implements a directional antenna pattern having a single narrow band null and the electronic direction finder includes a display for providing a visual indication of the orientation of the housing axis with respect to the predetermined compass heading. In addition, preferably the electronic direction finder also includes means for generating a destination direction signal indicative of a bearing from the position of the receiver toward a desired destination, and the display, in accordance with the destination direction signal, provides a visible image of a pointer which points in the direction of the desired destination.

Brief Description of the Drawings

The present invention can be better understood by reference to the drawings in which:

FIG. 1 is a perspective view of a portable direction finder constructed according to the present invention;

FIG. 2 is a schematic block diagram of the direction finder shown in FIG. 1;

FIG. 3 is a more detailed schematic block diagram of one portion of the direction finder shown in FIG. 2;

FIG. 4 is a schematic diagram which illustrates details of a display driver shown in FIG. 2 and its associated resultant visual displays;

FIG. 5 is a flowchart illustrating the operation of the direction finder shown in FIGs. 1 and 2; and

FIG. 6 illustrates two possible directional antenna patterns which may be provided by a directional antenna shown in FIG. 2.

Description of the Preferred Embodiments

Referring to FIG. 1, a hand held portable direction finder 10 is shown whose housing 11 contains a keypad 12 and a visual display 14. The keypad 12 allows a user to input data regarding the latitude and longitude of the user's present position and the latitude and longitude of desired destinations (sometimes also referred to as waypoints). The keypad also enables the user to define as "HOME" a specific desired destination, which may correspond to the user's present position. The keypad includes a push button 15 that controls the on/off function of the portable direction finder 10 and a push button 16 by which a user may command the direction finder to generate an arrow to point in the direction of either "HOME" or some other specific desired destination. The keypad 12 includes a push button 17 labeled DIR. which corresponds to a direction push button that places the portable direction finder 10 in a direction finding mode. In the direction finding mode, the finder 10 provides a visual display indicative of the direction of a major axis 18 of the direction finder housing 11 with respect to a predetermined compass heading, such as true north. The term "compass heading" is used herein to indicate the navigational direction headings generally provided by a compass. However, the direction finder 10 is not contemplated as including a magnetic or flux gate compass or any other type of device which senses terrestrial magnetism to provide an electrical signal or a visual display indicative of compass headings. Other functions which are not especially pertinent to the basic functions of the finder 10 may also be actuated by the keypad 12.

If desired, a permanent graphic indication of the major axis 18 can be applied to the housing 11, such as by printing an arrow on the display 14 or by notching the housing. However, due to a preferred rectangular shape for the housing 11, this may not be necessary and no such permanent graphic indication is shown in FIG. 1. Fixed within the direction finder 10 is a navigation receiver and other circuits which will be discussed more fully below. These components enable the direction finder 10 to provide a visual arrow indication pointing towards either home or towards any other desired destination as selected by the push button 16.

Referring now to the display 14, this display generates an image of a pointer 19 which preferably is illustrated in the form of an arrow and which will point towards a desired destination, selected by the user, with respect to the user's heading. The term "user's heading" is considered herein to be a direction parallel to the major axis 18 of the direction finder housing 11. Thus, with the user facing in the direction of the axis 18, the pointer 19 shown in FIG. 1 clearly indicates that the user should turn to the right approximately 75° in order to be heading towards a desired destination. If the user is facing directly towards the desired destination the pointer 19 will point directly along the axis 18. In such a pointing system the user does not need to be familiar with compass or navigation terminology in order to determine the direction of a route towards the desired destination.

The display 14 also generates the image of a compass card which indicates at least one compass point or predetermined compass heading such as north (N). In the illustrated embodiment, the compass card includes a circle 20, the compass points N, S, E and W, and a pair of orthogonal line segments 21 and 22 connecting to N to S and E to W, respectively. In response to circuitry within the direction finder 10, the image of the compass card rotates around a center point 23

of the circle 20 so that the compass point N and the line segment 21 line up with the predetermined compass heading of true north. The location of the visual compass point N is indicative of the difference between the direction of true north and the housing axis 18. This arrangement provides the user not only with the easy to read pointer 19, but also with a visual compass display to provide additional navigation information. Because the pointer 19 is overlayed on the image of the compass card, and because the pointer 19 is also rotatable about the card's center 23, the compass heading of the desired destination can be read directly from the display.

It should be noted that the complexity of the compass card visual display may be modified to provide any desired degree of resolution. For example, only a single compass point N and the orthogonal line segments 21 and 22 could be illustrated if less resolution is required, whereas additional compass points may be added along with additional axes corresponding to additional line segments if greater resolution is required.

With the exception of the push buttons 16 and 17, what is shown in FIG. 1 and explained above directly corresponds to the electronic direction finder described in copending PCT patent application No. PCT/US92/03152 to George L. Lauro and Ralph E. Menick entitled, "Electronic Direction Finder" and assigned to the same assignee as the present invention. That copending application describes circuitry within the direction finder which produces the above described displays through the use of a magnetic flux gate compass which senses the earth's magnetic field to provide information regarding the orientation of the major axis 18 with respect to true compass north direction. Because the copending application describes details of the production of such a visual display the entire contents of that application is hereby incorporated by reference so as to minimize the amount of invention description provided herein.

Essentially, the present invention is directed to an improved direction finder in which the need for a flux gate compass or other type of magnetic field sensing compass is eliminated. This reduces the cost of the electronic direction finder, enhances its accuracy by avoiding errors due to local magnetic field disturbances and variations and results in a reduction in size for the direction finder since space does not have to be provided for the flux gate compass. All this is achieved by operation of the circuitry within the direction finder 10 wherein this circuitry is illustrated in FIG. 2 and will be subsequently described.

Before reciting the detailed operation of the circuitry within the direction finder 10 with regard to FIG. 2, it should be noted that FIG. 1 also illustrates, as part of the visual display 14, a display portion 24 which will identify the destination to which the pointer 19 will point. Thus the display portion 24 may comprise destination name graphics such as "HOME" or other terminology identifying the name of a particular destination and/or it may display the latitude and longitude of a specific destination. In addition, the display 14 includes an indicator light 25 adjacent which is the graphic label "REFERENCE SATELLITE LOCK". When the portable direction finder 10 shown in FIG. 1 is oriented such that it can produce an appropriate visual display 14, then indicator light 25 will be actuated so as to provide an indication that the finder 10 can now provide desired pointer arrows to destinations, such as arrow 19, as well as providing an indication of compass headings with respect to the major axis 18 of the direction finder housing. All this will be explained in connection with the operation of the circuitry shown in FIG. 2 which will now be described.

Referring to FIG. 2, the major components of the direction finder 10 comprise the display 14, a navigation receiver 28 fixed within the housing 11 and coupled via a selector switch 29 to either an omnidirectional receiving antenna 30 or a directional receiving antenna 31, a receiver direction determining apparatus 32 and a display driver 34. Generally speaking, the navigation receiver 28 and the receiver direction determining apparatus 32 generate signals that are combined so as to generate a "direction signal". This direction signal is indicative of a bearing towards a desired destination of the user, and the bearing is relative to the user's heading which corresponds to the orientation of the major axis 18 of the direction finder 10. The major axis of the housing 11 coincides with and is sometimes also referred to herein as the major axis of the finder 10. The "direction signal", which in FIG. 2 is identified as angle C, is applied to the display driver 34 which causes the display 14 to generate the image of the rotatable pointer 19 overlayed on the image of a compass card and to cause the pointer 19 to point in the direction of the desired destination.

Referring now to the navigation receiver 28, this preferably is a GPS receiver which may be of conventional construction. Preferably the GPS receiver 28 has a signal processing section that includes an RF front end 36 connected to a down converter mixer 38 which receives a reference frequency signal from an oscillator 37. The output from the down converter 38 is applied to an A/D (analog to digital) converter 40 and from there to a DSP (digital signal processor) 42. The DSP 42 provides an output signal at an output terminal 43 indicative of the user's latitude and longitude which therefore is indicative of the location of the direc-

tion finder 10. The time and date are also customarily provided as part of the output of the DSP 42 and are so indicated in FIG. 2. Conventional GPS receivers all have a digital signal processor corresponding to the DSP 42 which provides the receiver location, time and date signals provided at the terminal 43.

In addition, the GPS receiver 28 includes additional digital signal processors (DPSs) 44 and 45 connected to the output of the A/D converter 40. The DSP 44 provides at a terminal 46 information identifying all of the global positioning satellites which are transmitting signals currently being received by the GPS receiver 28. The DSP 45 provides location information about every GPS satellite at an output terminal 47 which information is conventionally termed "Satellite Almanac Information". This Satellite Almanac Information comprises equations which, when combined with actual time of day, exactly define the location of every GPS satellite. The DSPs 44 and 45 are conventional and are present in every GPS receiver. The GPS satellites repetitively broadcast the satellite almanac equations and that is how the DSP 45 provides this information at the terminal 47. In addition, each GPS satellite broadcasts information identifying its transmitted signals as being transmitted by a specific one of the GPS satellites. In order for the DSP 42 to determine the location of the GPS receiver it compares signals it receives from each one of at least three different GPS satellites and therefore the navigation receiver 28 knows the identity of each transmitting satellite which it is receiving signals from. Therefore the DSP 44 merely provides a list of all of these satellites which are currently sending signals received by the receiver 28, and this is the information provided at terminal 46.

The GPS navigation receiver 28 includes another conventional DSP 48 which receives two inputs, one from the DSP 42 (terminal 43) and a second input from a database 49 that contains the latitudes and longitudes of various waypoints or destinations, as input by the user via the keypad 12. Operating conventionally, the DSP 48 uses those inputs to compute the distance and the bearing, with respect to a compass direction such as north, to the destination selected by the user. The computed bearing to the destination is provided on lead 50 as a signal angle B. The signal angle B is generally indicated on the display 14 as shown in FIG. 2, and angle B represents the bearing angle, relative to due north, to the location of the desired destination. Angle B is not used directly to provide the pointer 19. Instead, it is applied as one input to a conventional combining circuit 47, the other input to which is developed by the receiver direction determining apparatus 32.

Preferably the receiver direction determining apparatus 32 replaces the flux gate compass shown in the above referred to copending patent application. Because of this, the direction finder 10 described herein is smaller, less expensive and less subject to error than the direction finder described in the previously noted copending patent application. The basic function of the receiver direction determining apparatus 32 is to provide a direction angle A signal which is indicative of the orientation of the direction finder 10 (more specifically the orientation of the major axis 18 of the direction finder housing 11) with respect to true north compass direction. Angle A is generally indicated on the display 14 shown in FIG. 2.

The providing of angle A is achieved in the finder 10 without the use of a flux gate compass and in fact without the use of any terrestrial magnetism sensing apparatus. Because of this, there is no need to correct a sensed angle A due to known variations in the earth's magnetic field and there is no way that local unknown disturbances in the earth's magnetic field can affect the accuracy of the angle A. In the prior direction finder, a local disturbance of the magnetic field of the earth, such as the presence of the side panel of a large truck next to the direction finder or the presence of magnetic rocks on the ground located near the direction finder, could cause a substantial error. This is not the case with regard to the present receiver direction determining apparatus 32. Also, the use of a magnetic field sensor in prior direction finders required the use of a magnetic anomaly correction circuit to correct for known variations in the Earth's magnetic field, and such a correction circuit is not needed if receiver direction is derived without sensing terrestrial magnetism. The detailed operation of the receiver direction determining apparatus 32 will be described subsequently.

To develop the signal angle C which represents the direction of the desired destination with respect to the user's heading, the output of the receiver direction determining apparatus, comprising the angle A, is provided on a lead 51 which is connected as a second input to the combining circuit 47. The angle A signal is also provided as an input to the display driver 34. The combining circuit 47 functions such that angle A is subtracted from angle B to produce angle C on a lead 52. The signal representing angle C is the "direction signal" that causes the pointer 19 to point in the direction of the user's desired destination. The relationship between the angles A, B and C is best shown in FIG. 2 with regard to its illustration of the display 14. From this display illustration it is clear that angle A represents the orientation of the major axis 18 of the finder housing 11 with regard to the true compass direction north and angle B represents

the calculated bearing of the desired destination with regard to the true compass direction north. Angle C, which is the difference of angles B and A, represents the direction of the desired destination with respect to the major axis 18 of the direction finder housing 11.

Referring now to the display driver 34, this includes conventional circuitry, such as logic circuitry and/or a microprocessor, for driving the display 14 and for using the signals representing the angles A and C to activate appropriate portions of the display 14. The above noted copending application explains in detail how a display driver, such a the driver 34, can provide suitable visual displays so as to implement all of the displays discussed above. Therefore, substantial discussion of the operation of the display driver 34 will not be provided herein. However, it should be noted that the display driver 34 is only activated when it receives an ON signal at an input terminal 53 wherein the receiver direction determining apparatus 32 provides such a signal. In addition, the display driver, besides providing the visual displays indicated by the display 14 shown in FIG. 2, also provides at an output terminal 54 an excitation signal, which essentially corresponds to the signal at the terminal 53, and this results in illuminating the reference satellite lock lamp 25 shown in FIGs. 1 and 2. It should be noted that the lamp 25 may also be considered as part of the display 14.

Referring now to FIG. 3, the operation of the receiver direction determining apparatus 32 will now be described with respect as to how this apparatus enables the direction finder 10 to produce an electrical signal (angle A) on line 51 indicative of the predetermined direction the finder housing axis 18 with respect to the predetermined compass heading of north. This occurs by the receiver direction determining apparatus 32 using the predetermined positions of at least one satellite and of the receiver 28 to calculate a bearing, with respect to true north, from the receiver to the one satellite. This results in the creation of the angle A signal provided on line 51 when the major axis 18 is aligned in the direction of the predetermined one of the satellites which transmitted GPS information to the receiver 28. The receiver direction determining apparatus 32 essentially comprises a receiver heading circuit or signal processing microprocessor 55. FIG. 3 represents in block form the basic functions of that circuit or the basic functional programming of a microprocessor which implements those functions.

Referring to FIG. 3, the information at terminal 46, which comprises a list of all satellites having GPS signals being received by the GPS receiver 28, is provided to both a satellite null detector 56 and an optimal satellite selector 57. The optimal selector 57 also receives as an input the satellite almanac equation data provided at the terminal 47. The optimal satellite selector 57 also receives from the terminal 43 information as to the location of the GPS receiver and the current time. Based on all of these inputs provided to the optimal satellite selector 57, this component selects as an optimal satellite one satellite close to the horizon as viewed from the GPS receiver location but a few degrees, such as 10, above the horizon wherein the selected satellite is one of the satellites currently transmitting GPS information to the GPS receiver. The calculations provided by the optimal satellite selector are possible because the received almanac data identifies, in conjunction with the current time of day provided at the terminal 43, the location of every satellite. The information at the terminal 46 identifies those satellites that are currently being received by the receiver 28 and therefore this narrows down the list of possible satellites to be selected. Other criteria also may be utilized in selecting the optimal satellite if two satellites are identified as having the same approximate azimuth height above the horizon, such as selecting as the optimal satellite the one of these two satellites which transmits the largest strength signal to the receiver 28. Information identifying which satellite has been selected as the optimal satellite by the selector 57 is provided to both the satellite null detector 56 and a satellite direction calculator 58. The satellite direction calculator 58 also receives an input from the terminal 43 which defines the location of the receiver 28 and the time of day.

Essentially, the satellite null detector 56 receives a list from terminal 46 of all satellites currently transmitting GPS signals received by the navigation receiver 28. It also receives identification information as to the specific one optimal satellite selected by the optimal satellite selector 57. Whenever the satellite null detector 56 determines that the selected satellite identified by the selector 57 is no longer one of the satellites transmitting signals that are received by the receiver 28, it will produce a null detection signal at an output terminal 59 and this is provided as an input to the satellite direction calculator 58. In response to this null detection, the satellite direction calculator 58 will calculate the direction, with respect to true north, between the receiver location and the location of the optimal satellite selected by the selector 57 and provide this bearing data as an output (angle A) at a terminal 60.

The signal at terminal 60 will correspond to the angle A that represents the angle between true north and the axis 18 of the direction finder housing 11. This is because the satellite null detector will produce a null indication when the switch 29 is switched from its omnidirectional antenna 30 to its

directional antenna 31 and the directional antenna pattern of the directional antenna 31 will be positioned such that it has a null directed towards the low horizon satellite selected by the optimal satellite selector 57. At the same time that the satellite null detector 56 activates the satellite direction calculator 58, the satellite null detector 56 will also actuate a display and lock light turn-on driver 61 that provides the turn-on signal to the terminal 53 to actuate the display driver 34. These operations are perhaps best understood by reference to the overall flowchart shown in FIG. 5 and the directional antenna patterns shown in FIG. 6.

Referring to FIG. 5, an overall flowchart 70 of the operation of the direction finder 10 is illustrated. The flowchart begins at a receiver turn-on step 71 corresponding to actuation of the push button 15 which provides power to the GPS receiver 28. With power applied to the receiver 28, initially the switch 29 is connected such that the omnidirectional antenna 30 is connected to the GPS receiver. Thus the receiver 28 receives GPS signals from all satellites which are operational and able to transmit signals to the receiver 28 based on the position of the satellites and the position of the receiver. From block 71, process flow continues to block 72 which determines the navigation receiver position and the time of day. This corresponds to the operation of the DSP 42 which, as is the case in conventional GPS receivers, receives signals from a plurality of at least three GPS satellites and in response thereto provides a signal indicative of the position of the receiver and also provides a time of day signal wherein these signals are provided at the terminal 43 in FIG. 2. After process block 72, control proceeds to process block 73 by which the optimal satellite selector 57 will select one of the satellites transmitting signals to the navigation receiver 28 as an optimal satellite wherein this optimal satellite will be utilized for providing a heading fix for the direction finder 10.

After the process block 73, control passes to a process block 74 which corresponds to the user of the direction finder 10 pressing the direction button 17. This causes the receiver 28 to enter into a direction finder mode. After block 74, as part of the direction finder mode, a process block 75 stores and maintains angle B provided by the DSP 48 and the block 75 switches the RF front end 36 of the GPS receiver from the omnidirectional antenna 30 to the directional antenna 31 via movement of the switch 29.

Referring now to FIG. 6, two somewhat different directional antenna patterns are shown as patterns 100 and 101 each of which representing a single narrow band null antenna pattern with the single narrow band null generally corresponding to the major axis 18 of the direction finder housing 11. Pattern 100 is drawn basically as a completely omnidirectional pattern except for a single very narrow band null which is coincident with the axis 18, whereas pattern 101 has more of a cardiod shape also with single narrow band null coinciding with the axis 18 of the direction finder housing 11. Either of these two antenna patterns can be provided for the directional antenna 31 by conventional directional antenna construction. It should be noted that the directional antenna 31 is contemplated as being fixed to and rotatable with the navigation receiver 28 such that any change in the orientation of the directional antenna 31 and its antenna pattern (100 or 101) corresponds to an identical change in the orientation of the direction finder 10 and the major axis 18.

Referring again to FIG. 5, after the process step 75, control passes to a process step 76 which corresponds to the user rotating the receiver 28 (comprising the direction finder 10) up to a maximum of 360° along the horizon until the user will note that the reference satellite lock light is actuated. This corresponds to the GPS receiver 28 receiving all prior received GPS satellite signals except for satellite signals from the optimal selected satellite which is now directly in-line with the major axis 18 of the direction finder housing. When the direction finder 10 points the major axis 18, coinciding with a directional antenna pattern null, towards the selected optimal satellite, the display and lock light turn-on driver 61 will result in actuating the lamp 25 indicating that the direction finder axis 18 is pointing towards the known selected satellite. Substantially at the same time, the process block 77 in FIG. 5 will calculate the direction finder housing axis 18 direction with respect to a predetermined compass heading based on the known receiver and optimal satellite positions. This is accomplished by the satellite direction calculator 58 which operates in a manner similar to the conventional DSP 48 that computes a bearing direction from the receiver to a selected destination with respect to true north based on the position of the receiver and the position of the selected destination. The only difference with regard to the operation of the satellite direction calculator 58 shown in FIG. 3 is that now the selected destination is the location of the optimal selected satellite. The location of the optimal satellite is known based on the GPS almanac information which is always transmitted to the GPS receiver and defines the positions of all of the GPS satellites at any known time.

After the process block 77 control passes to process block 78 which corresponds to the display 14 providing a visual display of the cardinal compass points such as north, south, east and west, as shown in FIG. 2, with respect to the axis 18. With just this display the user now can identify the

direction of true north just based on the visual display 14 provided by the direction finder 10. In order for this step and all the subsequent steps in the flowchart 70 to be accurate, this will only occur when the direction finder 10 and GPS receiver 28 are maintained with respect to their orientation towards the optimal selected satellite. If this orientation is not maintained, the satellite null detector 56 will no longer provide a null detection signal at the terminal 59 and therefore the display driver 61 will no longer provide an on signal at the terminal 53 actuating the display 14 and the lamp 25. In other words, after satellite lock is obtained, the display 14 will only be correct when the axis 18 of the finder 10 is maintained at its prior lock direction orientation. It is assumed that the latitude and longitude position of the finder 10 is maintained after block 74 to insure no changes to angle B.

After the process block 78, control passes to a process block 79 which allows the user to press the home/destination button 16 when he desires the creation of a vector pointer towards a desired destination, such as HOME or some other destination the location of which has been input into the direction finder 10. After step 79, and assuming that push button 16 has been actuated, control passes to a process block 80 which results in displaying an arrow on the display 14 directed towards the desired destination wherein this arrow corresponds to the arrow 19. At the same time, a process block 81 represents the display portion 24 displaying the name and/or latitude and longitude of the destination to which the arrow 19 is pointing. A final process block 82 indicates that the user may now select other destinations and have a visual display representing the direction to that destination and the name of that destination provided or he may then terminate the direction mode preferably by again actuating the direction push button 17 so as to return the navigation receiver 28 to its omnidirectional antenna and terminate the satellite null detection provided by the satellite null detector 56.

A review of the preceding description reveals that the direction finder 10 functions by utilizing a directional antenna pattern to determine when a major axis of the direction finder housing is orientated at a single predetermined direction with respect to one selected GPS satellite. Then an electrical signal corresponding to the angle A is provided which is indicative of the predetermined direction of the finder housing axis with respect to a predetermined compass heading such as north. The angle A signal is provided by using the determined positions of the selected satellite and the direction finder to calculate the bearing from the the finder 10 to the selected satellite. Preferably the directional antenna pattern 100 or 101 has one narrow band null, and preferably the entire navigation receiver and direction finder 10 is dimensioned so as to be hand holdable. The display 14 and lamp 25 preferably provide a visual indication of when the receiver 28 and finder 10 are oriented at a predetermined direction with respect to the selected satellite. Note that the detection of a loss of a GPS signal by use of a directional antenna pattern having a narrow band null is preferable to the detection of reception of a GPS signal on a high gain narrow band directional antenna pattern. This is because detecting reception of a GPS signal would require a signal lock up time which is not needed to detect a loss of GPS signal. Thus null detection is preferred for the direction determining apparatus 32.

While in the preceding description it is noted that the finder 10 axis 18 coincides with a single null in the directional antenna pattern 100 or 101, obviously as long as any angular difference between the null and the axis is fixed and known, the magnitude of the angle A signal can be corrected to compensate for any such fixed offset. Also, in addition to providing a visual display for the finder housing that indicates true compass direction with respect to the axis 18 of the direction finder 10, clearly the present apparatus can also be used in conjunction with generating at least one destination direction signal indicative of a bearing, with respect to the axis 18, from the position of the receiver towards a desired destination, and the display 14 can provide a visual display, such as the pointer 19, so as to point in the direction of the desired destination. By means of the push button 16, clearly a user can select any one of a plurality of destinations to which the visual pointer 19 will point at, and the rest of the keyboard 12 enables the user to enter data defining the location of such desired destinations since most prior GPS receivers which are part of navigation systems allows the user entry of a plurality of different desired destinations or waypoints. All this is achieved without the use of a flux gate compass or any other terrestrial magnetism sensing apparatus because of the use of the locations of the GPS receiver and a selected satellite in conjunction with the use of a directional antenna. Thus the cost of a magnetic sensing device and the cost of correcting the inherent anomalies provided by such a magnetic sensing device, when such anomalies are correctable, is avoided and a much more accurate and less expensive direction finder is provided.

Note that there is no detailed description of the apparatus shown in FIG. 4 since the above noted copending patent application fully explains how a display driver such as the display driver 34 in FIG. 4 is utilized to produce a display similar to display 14, except for the following. The present display

driver 34 is turned on via the input from terminal 53, and the lighting of the lamp 25 is directly in response to the excitation signal at the terminal 54 which directly corresponds to the signal at the terminal 53. Clearly this requires no additional explanation. In addition, the present display driver 34 provides a visual indication of the name of a selected destination on the display portion 24. The providing of a graphic indication on display portion 24 identifying the name of the selected destination to which the pointer 19 will point is also conventional since any display driver, such as the driver 34, can produce such a visual indication by utilizing techniques as are conventionally used in display monitors. The information as to the name of the destination to be displayed in the portion 24 is provided by the destination database 49 which, in addition to supplying the latitude and longitude information to the DSP 48, also supplies destination name information and/or destination latitude and longitude information to the display driver 34. This connection is shown in FIG. 2.

While we have shown and described specific embodiments of this invention, further modifications and improvements will occur to those skilled in the art. One such modification could be to use different known phasing between fixed antenna elements mounted on the finder 10 to control the generation and automatic sweeping of a directional antenna pattern having a null. The automatic sweeping would cease when the null was pointing at the selected satellite, and the known phasing would determine the angular offset between the axis 18 and the direction of the null. This offset would be used to provide a corrected angle A. All such modifications which retain the basic underlying principles disclosed and claimed herein are within the scope of this invention.

Claims

1. Electronic direction finder (10) comprising:

a housing (11) having a major axis (18);

an omnidirectional antenna (30) for receiving signals from at least three satellites;

navigation receiver (28) fixed within said housing (11) and coupled to said omnidirectional antenna (30) for receiving said satellite signals from said omnidirectional antenna and in response thereto determining (at 43) the position of the receiver (28) and also determining (at 47) the position of at least one of the satellites; said finder (10) characterized by the combination of

directional antenna means (31), having a directional antenna pattern (100 or 101), fixed to and rotatable with said navigation receiver (28) for also providing said satellite signals to said receiver;

direction means (56) for determining when said directional antenna pattern is oriented at a predetermined direction with respect to said at least one satellite; and

means (57,58) for providing an electrical signal (A) indicative of the direction of said housing axis (18) with respect to at least one predetermined compass heading when said directional antenna pattern is oriented at said predetermined direction by using the determined positions of said at least one satellite and of said receiver to calculate a bearing from said receiver to said at least one satellite.

2. Electronic direction finder according to claim 1 wherein said directional antenna pattern (100 or 101) has at least one narrow band null and wherein said direction means (56) determines when said narrow band null is directed towards said at least one satellite.

3. Electronic direction finder according to claim 2 wherein said navigation receiver (28) and housing (11) are dimensioned so as to be hand holdable.

4. Electronic direction finder according to claim 2 which includes display means (14,25) coupled to said navigation receiver (28) for providing a visual indication indicative of when said directional antenna pattern (100 or 101) is oriented at said predetermined direction with respect to said at least one satellite.

5. Electronic direction finder according to claim 4 wherein said display means (14) also includes means (20,21,22,34) for providing, in accordance with said electrical signal (A), a visual indication of the orientation of said housing axis (18) with respect to said one predetermined compass heading.

6. Electronic direction finder according to claim 5 wherein said navigation receiver (28) includes means (47A) for generating at least one destination direction signal (C) indicative of a bearing from the position of the receiver (28) toward a desired destination, and wherein said display means (14), in accordance with the destination direction signal, provides a visible image (19) of a rotatable pointer and causes the pointer to point in the direction of the desired destination.

7. Electronic direction finder according to claim 6 which includes means (16) for a user selecting said desired destination to which said rotatable

pointer will point.

8. Electronic direction finder according to claim 7 which includes means (15,16,17, rest of keyboard 12) for entering data defining the location of said desired destination.

9. Electronic direction finder according to any of claims 1 or 8 wherein said navigation receiver (28) comprises a GPS receiver.

10. Electronic direction finder according to claim 9 which includes an antenna switch means (29) for selectively connecting said navigation receiver (28) to each one of said omnidirectional antenna (30) and said directional antenna means (31).

11. Electronic direction finder according to claim 1 which includes a display means (14) coupled to said navigation receiver (28) for providing, in accordance with said electrical signal (A), a visual indication of the orientation of said housing axis with respect to said one predetermined compass heading.

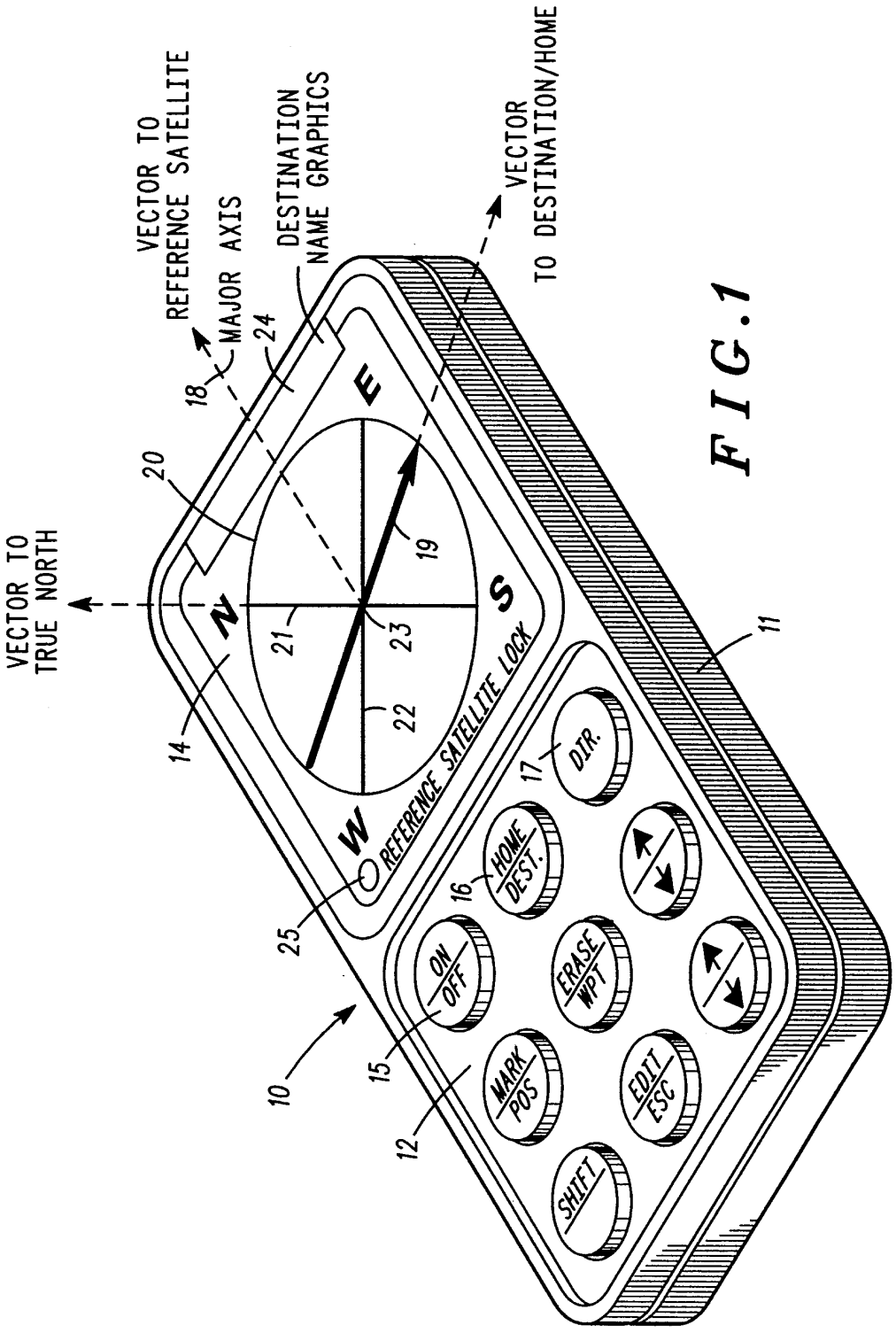

VECTOR TO TRUE NORTH
VECTOR TO REFERENCE SATELLITE
MAJOR AXIS
DESTINATION NAME GRAPHICS
VECTOR TO DESTINATION/HOME
N
E
S
W
REFERENCE SATELLITE LOCK
DIR.
HOME DEST.
ON OFF
ERASE WPT
MARK POS
EDIT ESC
SHIFT
10
11
12
14
15
16
17
18
19
20
21
22
23
24
25

FIG.1

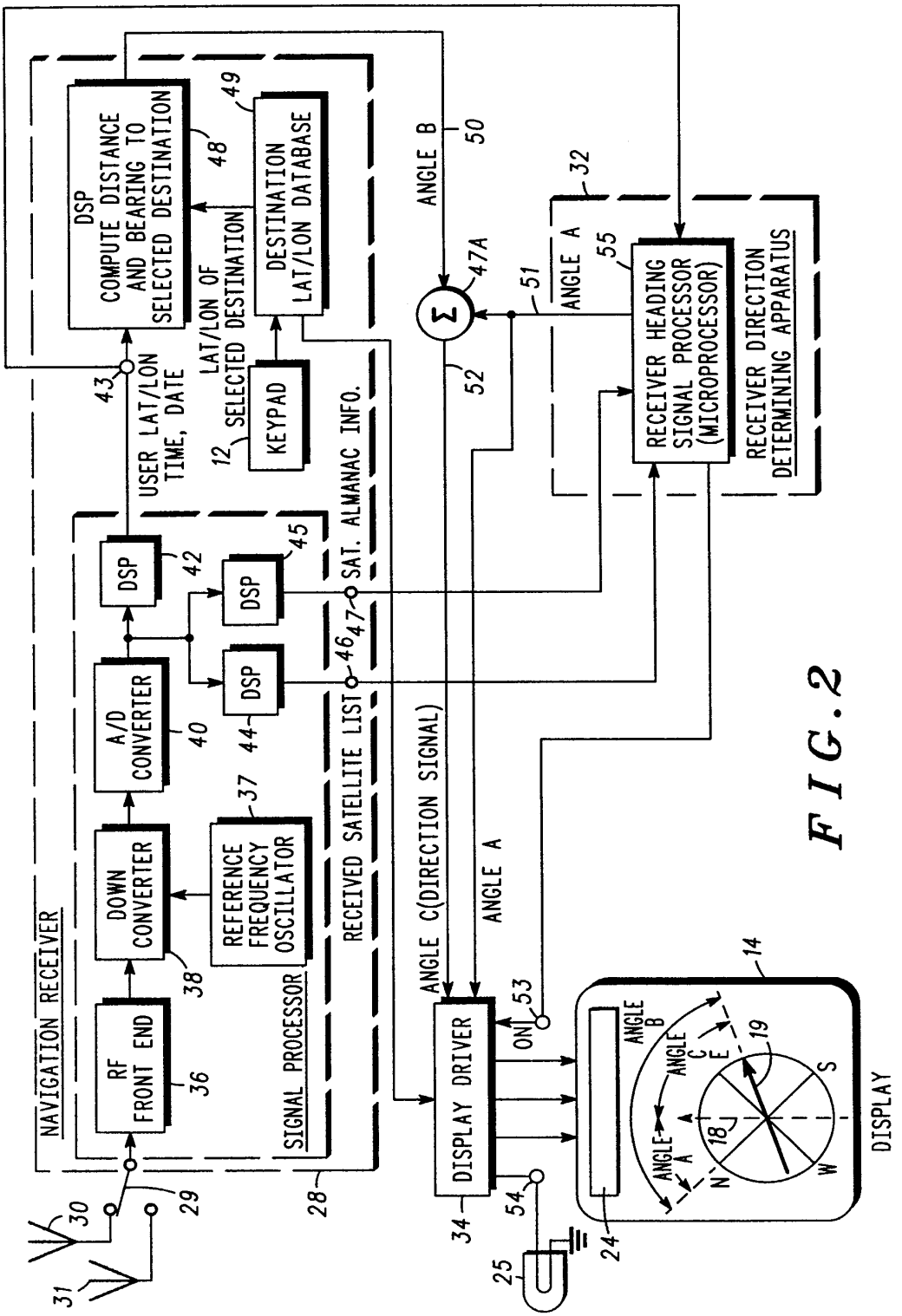
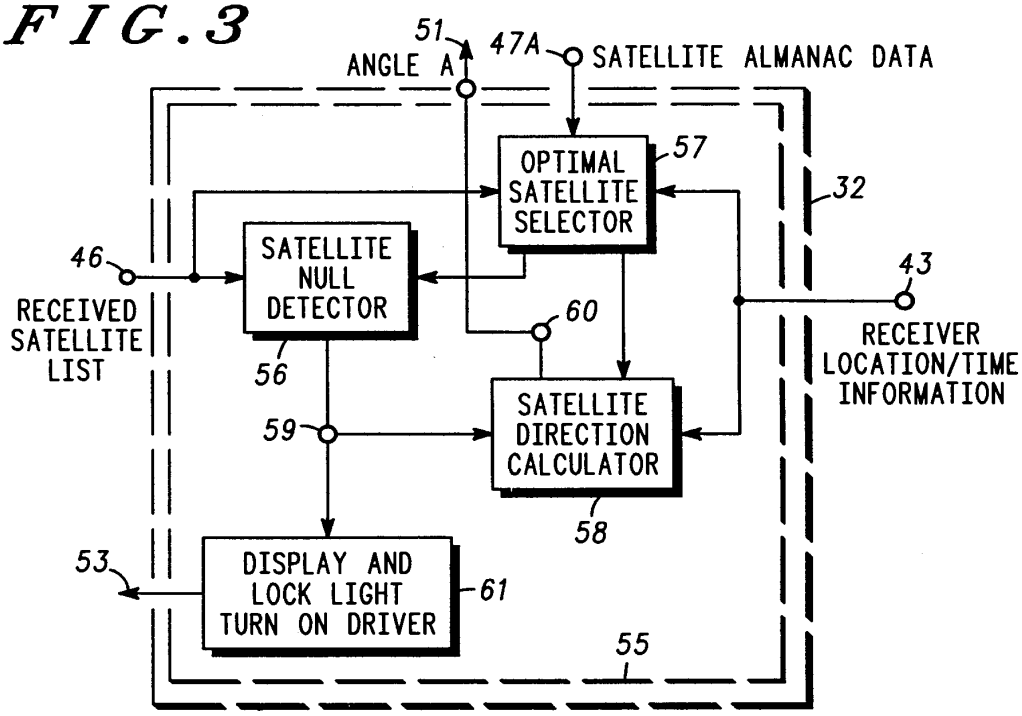

NAVIGATION RECEIVER
RF FRONT END
DOWN CONVERTER
REFERENCE FREQUENCY OSCILLATOR
A/D CONVERTER
DSP
DSP
DSP
DSP
SIGNAL PROCESSOR
DSP COMPUTE DISTANCE AND BEARING TO SELECTED DESTINATION
DESTINATION LAT/LON DATABASE
KEYPAD
USER LAT/LON TIME, DATE
LAT/LON OF SELECTED DESTINATION
SAT. ALMANAC INFO.
RECEIVED SATELLITE LIST
ANGLE B
ANGLE A
ANGLE C(DIRECTION SIGNAL)
ANGLE A
RECEIVER HEADING SIGNAL PROCESSOR (MICROPROCESSOR)
RECEIVER DIRECTION DETERMINING APPARATUS
DISPLAY DRIVER
ON
ANGLE B
ANGLE C
ANGLE A
N
E
S
W
DISPLAY
30
31
29
28
36
38
37
40
44
42
45
46
47
43
48
49
50
47A
51
52
32
55
34
54
53
25
24
14
19
18

FIG. 2

FIG. 3


51
ANGLE A
47A
SATELLITE ALMANAC DATA
OPTIMAL SATELLITE SELECTOR
57
32
46
RECEIVED SATELLITE LIST
SATELLITE NULL DETECTOR
56
60
43
RECEIVER LOCATION/TIME INFORMATION
59
SATELLITE DIRECTION CALCULATOR
58
53
DISPLAY AND LOCK LIGHT TURN ON DRIVER
61
55

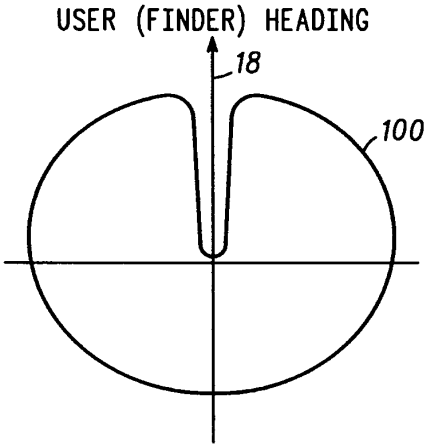

USER (FINDER) HEADING
18
100

FIG. 6

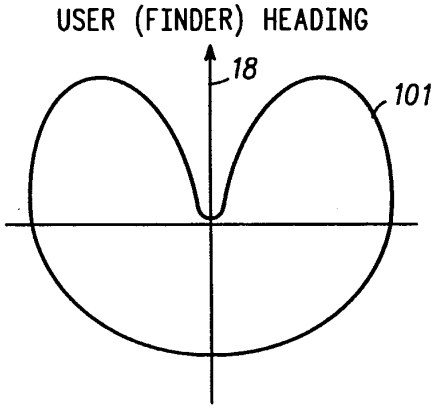

USER (FINDER) HEADING
18
101

FIG.4

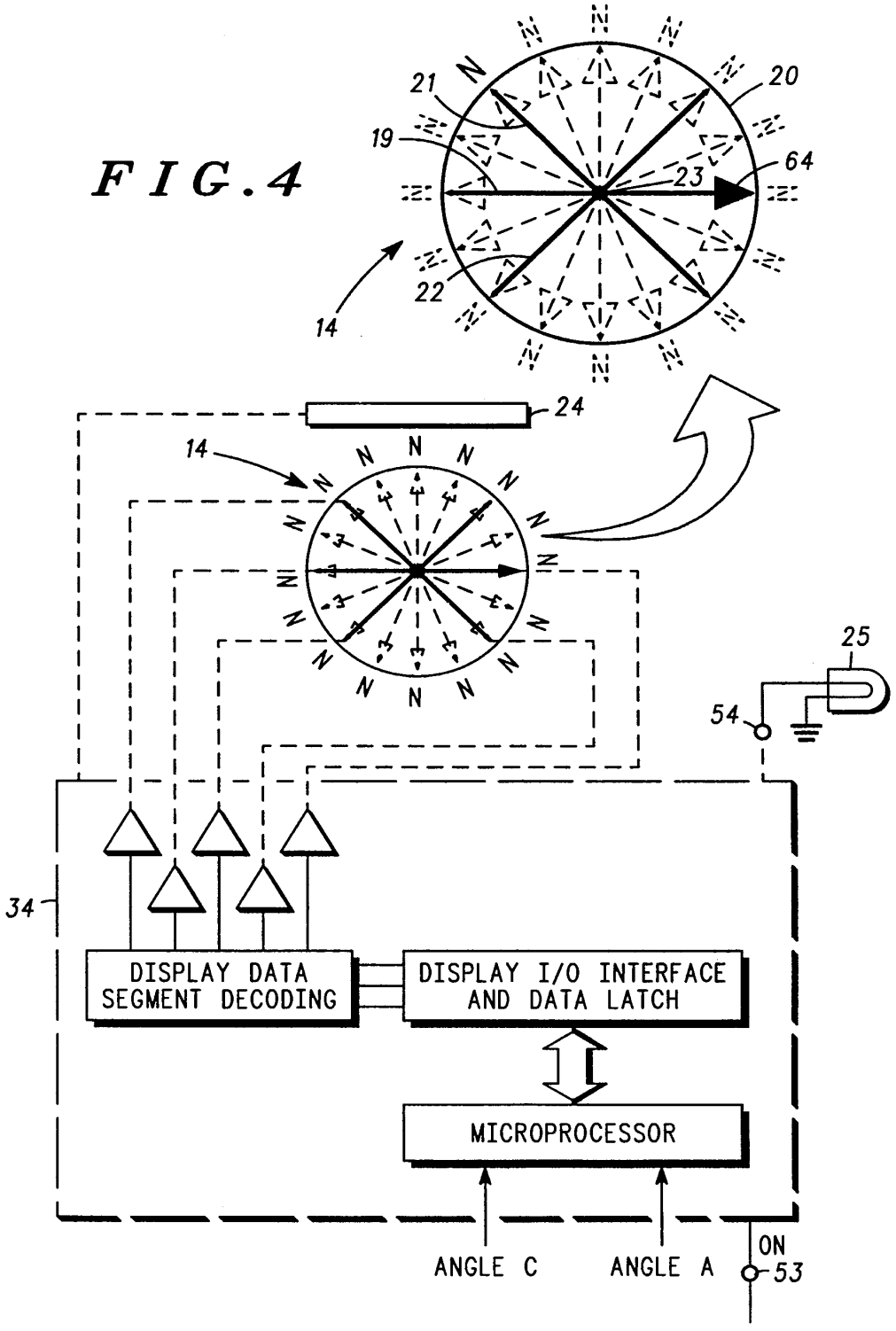
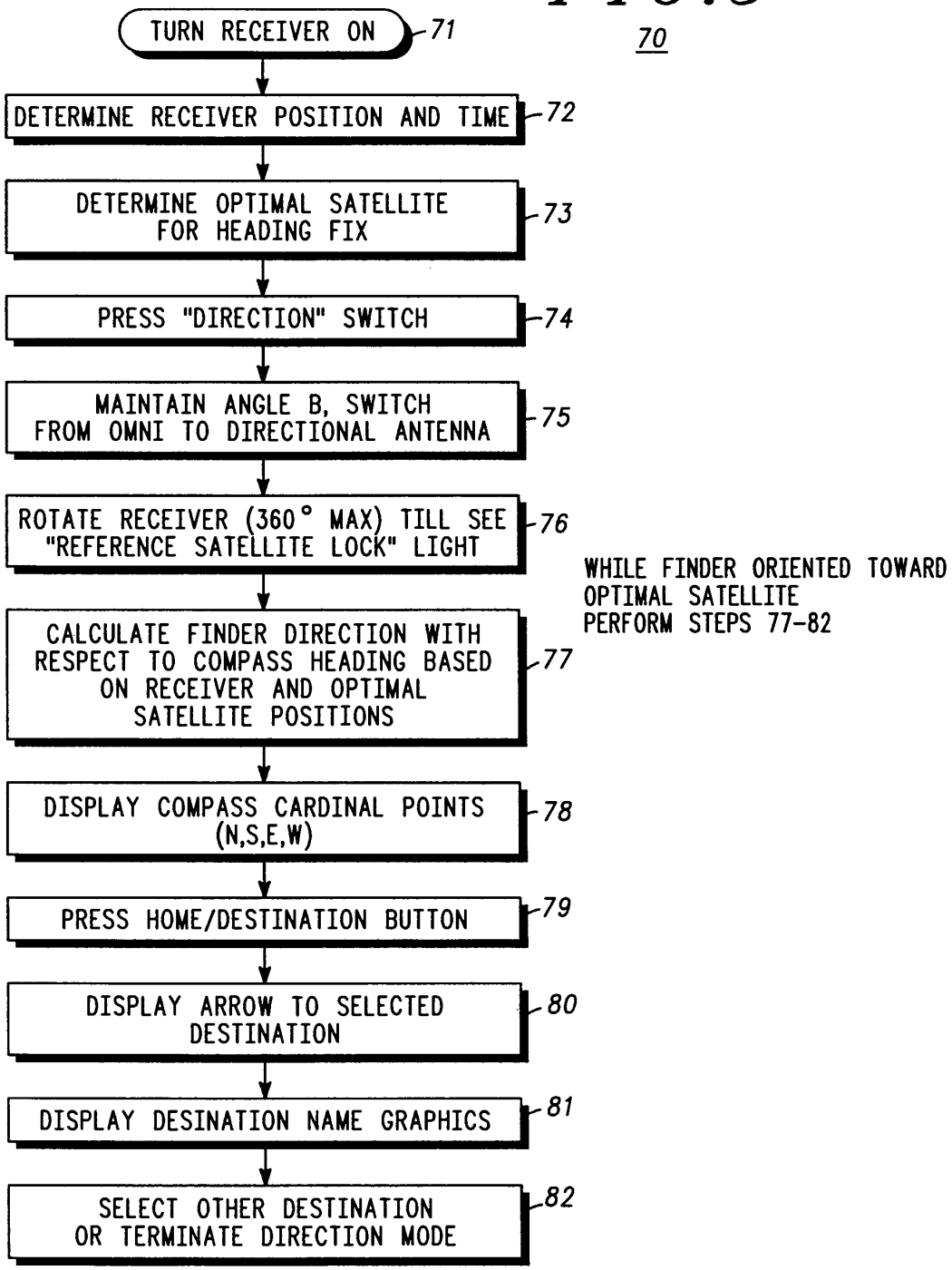

21
20
19
64
23
22
14
24
14
25
54
34
DISPLAY DATA SEGMENT DECODING
DISPLAY I/O INTERFACE AND DATA LATCH
MICROPROCESSOR
ANGLE C
ANGLE A
ON
53

FIG. 5


70
TURN RECEIVER ON
71
DETERMINE RECEIVER POSITION AND TIME
72
DETERMINE OPTIMAL SATELLITE FOR HEADING FIX
73
PRESS "DIRECTION" SWITCH
74
MAINTAIN ANGLE B, SWITCH FROM OMNI TO DIRECTIONAL ANTENNA
75
ROTATE RECEIVER (360° MAX) TILL SEE "REFERENCE SATELLITE LOCK" LIGHT
76
WHILE FINDER ORIENTED TOWARD OPTIMAL SATELLITE PERFORM STEPS 77-82
CALCULATE FINDER DIRECTION WITH RESPECT TO COMPASS HEADING BASED ON RECEIVER AND OPTIMAL SATELLITE POSITIONS
77
DISPLAY COMPASS CARDINAL POINTS (N,S,E,W)
78
PRESS HOME/DESTINATION BUTTON
79
DISPLAY ARROW TO SELECTED DESTINATION
80
DISPLAY DESINATION NAME GRAPHICS
81
SELECT OTHER DESTINATION OR TERMINATE DIRECTION MODE
82

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 9074

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
P,X	US-A-5 146 231 (GHAEM ET AL) * abstract; figure 2 * ---	1,3,5-9, 11	G01S5/14 G01S3/40 G01S3/14
A	US-A-4 881 080 (JABLONSKI) * abstract; figure 1 * ---	1	
A	US-A-4 384 293 (DEEM ET AL) * abstract; figure 4 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

G01S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 January 1994	HAFFNER, R

CATEGORY OF CITED DOCUMENTS

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Espacenet

Bibliographic data: JPH06136481 (A) — 1994-05-17

HIGH TENSILE STRENGTH STEEL EXCELLENT IN PLATING CRACK RESISTANCE

Inventor(s): OKAGUCHI HIDEJI ± (OKAGUCHI HIDEJI)

Applicant(s): SUMITOMO METAL IND ± (SUMITOMO METAL IND LTD)

Classification: **- international:** ***C22C38/00; C22C38/14; C22C38/54; C22C38/58;*** (IPC1-7): C22C38/00; C22C38/14; C22C38/54; C22C38/58

- cooperative:

Application number: JP19920286076 19921023

Priority number (s): JP19920286076 19921023

Abstract of JPH06136481 (A)

PURPOSE:To make excellent the plating crack resistance of the weld heat- affected zone in high tensile strength steel by specifying the content of Al and O in steel and adding suitable amounts of Ti and N thereto. CONSTITUTION:The compsn. of the high tensile strength steel is constituted of, by weight, 0.01 to 0.20% C, <=1.0% Si, 0.3 to 2.0% Mn, 0.005 to 0.05% Ti, 0.0005 to <0.005% solAl, 0.0005 to 0.0035% O, 0.003 to 0.014% N and 0.001% B, and the balance Fe with inevitable impurities. If required, one or more kinds among <=2.0% Cu, <=2% Ni, <=1% Cr, <=1% Mo, <=0.12% Nb and <=0.12% V are furthermore incorporated therein. The steel having this compsn. is effective as high strength steel applied with hot-dip plating and used for a large-sized welding structure or the like.

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(54)【発明の名称】　耐めっき割れ性に優れた高張力鋼

(57)【要約】
【構成】重量%で、Ｃ：0.01～0.20%、Si：　1.0%以下、Mn：　0.3～2.0　%、Ti：　0.005～0.05%、sol.Al：0.0005%以上 0.005%未満、Ｏ（酸素）：0.0005～0.0035%以下、Ｎ：　0.003～0.014　%、Ｂ：　0.001%以下を含み、残部がFe及び不可避不純物からなる高張力鋼。更に、鋼の強度と靭性を高めるために、Cu(2.0%以下）、Ni(２%以下）、Cr(１%以下）、Mo（１%以下）、Nb(0.12%以下）およびＶ（0.12%以下）の中の１種以上を含有させてもよい。
【効果】耐めっき割れ性、特に、溶接熱影響部の耐めっき割れ性に非常に優れており、大形溶接構造物や高強度鋼を使用する構造物のめっき割れの防止に極めて有効である。

【特許請求の範囲】
【請求項１】重量％で、Ｃ：0.01～0.20％、Si： 1.0％以下、Mn： 0.3～2.0 ％、Ti： 0.005～0.05％、sol.Al：0.0005％以上 0.005％未満、Ｏ：0.0005～0.0035％、Ｎ：0.003～0.014 ％、Ｂ： 0.001％以下を含み、残部がFe及び不可避不純物からなることを特徴とする耐めっき割れ性に優れた高張力鋼。
【請求項２】請求項１に記載の成分に加えて、さらに、重量％で、Cu： 2.0％以下、Ni：２％以下、Cr：１％以下、Mo：１％以下、Nb：0.12％以下およびＶ：0.12％以下の中の１種以上を含み、残部がFe及び不可避不純物からなることを特徴とする耐めっき割れ性に優れた高張力鋼。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】この発明は、建築物、鉄塔及び橋梁等に使用される耐めっき割れ性に優れた高張力鋼に関する。
【０００２】
【従来の技術】従来から、鋼材の防錆を目的として、例えば鋼材の表面に亜鉛（Zn）などを溶融めっきする手段が広く用いられている。このような方法は防錆上極めて有効な手段であるが、構造物が大形のものであったり、構造物に使用されている鋼材の組成やめっき浴への浸漬の仕方によっては、構造物を溶融めっき浴に浸漬した際に、特に溶接熱影響部（以下、ＨＡＺという）に割れが発生する場合がある。このような割れをめっき割れと称しているので、以下、これに対する耐性を「耐めっき割れ性」と記す。
【０００３】上記のめっき割れは、鋼の粒界に亜鉛などの液体金属が浸入することにより鋼材が脆化し、割れに至るものと考えられており、特に鋼材のＨＡＺに大きな応力が付加された状態で亜鉛等の液体金属浴に浸漬した場合に脆化が著しいことが知られている。耐めっき割れ性を向上させる手段として、特公平２－5814号公報には、耐亜鉛めっき割れ性に有害なＣ、SiやMnなどの含有量を規制した、Nb、Ｖ及びTiを含む高強度低合金鋼が、また、特開平２－ 57669号公報には、Ｃ、Si、Mnに加え、さらにＢの含有量を２ppm 以下に抑えた高張力鋼が開示されている。
【０００４】しかしながら、このように限られた化学成分のコントロールのみでは大形構造物や高強度鋼を利用した構造物におけるめっき割れの防止対策としては不十分である。すなわち、構造物の大形化にともなって溶接残留応力や、めっき時に発生する熱応力が増大するので、めっき割れの発生を皆無にすることはできず、また、鋼材の高強度化にともなう耐めっき割れ性の劣化を抑制することはできなかった。
【０００５】
【発明が解決しようとする課題】一般に、めっき割れは鋼材の厚みが大きいほど、また、強度が高いほど発生し易い傾向があるが、本発明は、特に機械的特性や経済性を損なわずに、母材およびＨＡＺの耐めっき割れ性を飛躍的に向上させた高張力鋼を提供することを目的とする。
【０００６】
【課題を解決するための手段】本発明者は、上記の目的を達成するために研究を重ねた結果、鋼中に含まれるAl（アルミニウム）とＯ（酸素）の量を特定し、かつ適量のTiとＮを加えることによって、粒界、特にＨＡＺの粒界の耐めっき割れ性を著しく向上させ、耐亜鉛めっき割れ性に有害とされているＣ、Si、MnおよびＢなどをある程度含む鋼についても十分な耐めっき割れ性を付与できることを見いだした。
【０００７】本発明は上記の知見に基づいてなされたもので、その要旨は下記の高張力鋼にある。
【０００８】(1) 重量％で、Ｃ：0.01～0.20％、Si：1.0％以下、Mn： 0.3～2.0 ％、Ti： 0.005～0.05％、sol.Al：0.0005％以上 0.005％未満、Ｏ：0.0005～0.0035％、Ｎ： 0.003～0.014 ％、Ｂ： 0.001％以下を含み、残部がFe及び不可避不純物からなることを特徴とする耐めっき割れ性に優れた高張力鋼。
【０００９】(2) 前記 (1)に記載の成分に加えて、さらに、重量％で、Cu： 2.0％以下、Ni：２％以下、Cr：１％以下、Mo：１％以下、Nb：0.12％以下およびＶ：0.12％以下の中の１種以上を含み、残部がFe及び不可避不純物からなることを特徴とする耐めっき割れ性に優れた高張力鋼。
【００１０】
【作用】以下に、本発明の高張力鋼を構成する成分の作用効果と、それらの含有量の限定理由について述べる。なお、合金元素の「％」はいずれも「重量％」を意味する。
【００１１】Ｃ：Ｃは鋼の強度を高めるために必須の元素で、60kg/mm²(590N/mm²)以上の強度を得るには0.01％以上含有させることが必要である。一方、その含有量が0.20％を超えると、母材および溶接部の靭性が損なわれるだけでなく、ＨＡＺの耐めっき割れ性も低下するので、Ｃの含有量は0.01～0.20％とした。
【００１２】Si：Siは脱酸のためだけでなく、強度確保のためにも必要な元素であるが、 1.0％を超えて含有させると、母材と溶接部の靭性が損なわれるだけでなく、ＨＡＺのめっき割れ性も低下する。従って、Siの含有量は、 1.0％以下とした。
【００１３】Mn：Mnは鋼の強度と靭性を確保するために必須の元素であるが、その含有量が ０．３％未満では効果が不十分であり、また ２．０％を超えて含有させると、溶接部の靭性が損なわれるだけでなく、ＨＡＺの耐めっき割れ性も低下する。従って、Mnの含有量は、0.3～2.0 ％とした。

【００１４】Ti：Tiは、鋼中で微細なTiの炭窒化物を生成し、結晶粒を微細化することによって、母材および溶接部の靭性を高める。また、Al、NおよびOの含有量を後述のように限定したこととの相乗効果により微細なAlの酸化物の析出を促進させ、鋼材、特にＨＡＺの耐めっき割れ性を向上させる。しかし、その含有量が 0.005%未満では耐めっき割れ性の向上効果は発揮されず、また0.05%を超えて含有させると過度な析出硬化によって母材および溶接部の靭性が低下するので、Tiの含有量は0.005～0.05%とした。

【００１５】sol.Al：sol.Alの含有量を0.0005%以上0.005%未満に規制することは、ＨＡＺの耐めっき割れ性を向上させるために極めて重要である。すなわち、sol.Alの含有量を0.005%未満に抑えることによって、溶接の際、溶接部におけるオーステナイト相からフェライト相への変態が促進され、ＨＡＺの組織が微細化し、めっき割れ感受性を高める島状マルテンサイトの粒間での生成が抑制される。

【００１６】さらに、鋼中に含まれる極微量のAlは、Ti、NおよびOの含有量を前記あるいは後述のように限定したことと相俟って微細なAlの酸化物を生成し、ＨＡＺのオーステナイト粒を微細化することによって粒界の強度を高める効果を発揮する。

【００１７】この微細なAl酸化物はsol.Al量を0.0005%以上 0.005%未満に調整することによって得られる。従って、sol.Alの含有量は0.0005%以上 0.005%未満とした。

【００１８】O（酸素）：Oはsol.Alと反応して微細なAlの酸化物の析出を促進させ、ＨＡＺの組織を微細化して耐めっき割れ性を格段に向上させる効果がある。しかし、Oの含有量が0.0035%を超えるとその効果が著しく低下し、一方、0.0005%未満では微細なAl酸化物の生成が期待できないので、Oの含有量は0.0005～0.0035%とした。

【００１９】N：Nは適量のAl、Ti、Oと共存することにより、微細なTiの炭窒化物の析出を促進し、溶接時のＨＡＺにおける粒成長を抑制し、粒界強度を増大させる。また、耐めっき割れ性に悪影響を及ぼすBやNb等を窒化物として捕捉することによりその悪影響を軽減してＨＡＺの耐めっき割れ性を向上させる作用を有している。

【００２０】Nの含有量が 0.003%未満ではこれらの効果は十分ではなく、また 0.014%を超えて含有させると粗大なTiNが生成し、かえって耐めっき割れ性を低下させるので、Nの含有量は 0.003～0.014 %とした。

【００２１】Ｂ：Ｂは鋼の強度を上昇させるために有効な元素である。しかし、Ｂは耐めっき割れ性を低下させる元素であるから、その含有量を抑える必要がある。0.001%を超えると、上記のように他の成分の含有量を調整しても、耐めっき割れ性の低下が著しくなるから、その含有量を 0.001%以下とした。

【００２２】前記 (1)の発明の鋼は上記の成分の他残部が実質的にFeからなる高張力鋼である。 (2)の発明の鋼は (1)の発明の鋼にさらに、Cu、Ni、Cr、Mo、NbおよびＶの１種以上を含有させ、鋼の強度と靭性を高めた高張力鋼である。

【００２３】CuおよびNiは２%を、CrおよびMoは１%を、NbおよびＶは0.12%を、それぞれ超えると、母材の靭性が損なわれるだけでなくＨＡＺの耐めっき割れ性も低下するので、これらの元素の含有量は、CuおよびNiについてはそれぞれ２%以下、CrおよびMoについてはそれぞれ１%以下、NbおよびＶについてはそれぞれ0.12%以下とした。

【００２４】

【実施例】表１に示す化学組成を有する鋼を溶製した後、制御圧延（加熱温度：1150℃、仕上温度： 720℃）により引張強度がおよそ60～80kg/mm²(590～780N/mm²)で、厚さが20mmの鋼板に仕上げた。

【００２５】この鋼板から厚さ15mmの試験板を切り出し、図１に示すように、20パスの拘束溶接を行って拘束継手試験材を作製した。図１において、ａが試験板（厚さｔ＝15mm、長さｌ＝ 150mm、幅ｗ＝50mm）、ｂが試験ビード（長さl_b ＝50mm）、ｃが20パスの拘束ビードである。なお、拘束継手試験材は各鋼種あたり３体作製した。また、溶接は被覆アーク溶接法（予熱なし）を用い、拘束ビードは 220Ａ、26Ｖ、150mm/分の条件で、試験ビードは 170Ａ、24Ｖ、150mm/分の条件で溶接した。

【００２６】この拘束継手試験材を 470℃の溶融亜鉛めっき浴中に10分間浸漬した後、試験ビードｂ部を磁気探傷により検査し、割れの有無を調査した。

【００２７】表２に割れ検査結果を示す。検査は各鋼種それぞれ３つの試験片による３回の試験について行った。なお、同表には、各鋼種の引張強度および降伏強度も併せて示した。この結果から明らかなように、比較鋼ではいずれも２体以上の拘束継手試験片に割れが発生しているのに対し、本発明鋼では、590N/mm²（60kg/mm²）以上の引張強度を有しながら、１体の拘束継手試験片にも割れの発生は認められなかった。

【００２８】

【表１（１）】

【００２９】【表１（２）】

表 1 (1)

鋼種		化学組成 (重量%、残部はFeと不純物)													
		C	Si	Mn	Ti	sol.Al	O	N	B	Cu	Ni	Cr	Mo	Nb	V
本発明鋼	1	0.14	0.21	1.42	0.018	0.002	0.0015	0.0065	0.0002	–	–	–	–	–	–
	2	0.12	0.18	1.55	0.006	0.001	0.0012	0.0041	0.0000	–	–	–	–	–	–
	3	0.09	0.08	1.65	0.015	0.001	0.0018	0.0052	0.0001	–	–	–	–	–	–
	4	0.16	0.12	0.85	0.014	0.001	0.0015	0.0081	0.0004	0.25	–	–	–	–	–
	5	0.08	0.01	1.55	0.016	0.004	0.0008	0.0067	0.0001	–	0.32	–	–	–	–
	6	0.07	0.32	1.64	0.008	0.003	0.0012	0.0077	0.0004	–	–	0.21	–	–	–
	7	0.10	0.25	1.45	0.015	0.001	0.0014	0.0058	0.0001	–	–	–	0.15	–	–
	8	0.06	0.21	1.58	0.012	0.001	0.0018	0.0065	0.0002	–	–	–	–	0.035	–
	9	0.11	0.18	1.50	0.018	0.002	0.0019	0.0055	0.0001	–	–	–	–	–	0.050
	10	0.08	0.15	1.71	0.016	0.001	0.0017	0.0074	0.0004	0.31	0.15	–	–	0.036	–
	11	0.06	0.02	1.64	0.014	0.002	0.0015	0.0062	0.0003	–	–	0.21	0.01	0.018	–
	12	0.06	0.19	1.67	0.013	0.001	0.0016	0.0088	0.0006	–	0.54	–	–	–	0.040
	13	0.04	0.22	1.72	0.010	0.001	0.0014	0.0055	0.0001	0.21	–	–	0.22	0.031	–
	14	0.08	0.25	1.42	0.016	0.001	0.0017	0.0061	0.0002	–	–	0.15	–	0.021	0.040
	15	0.09	0.31	1.47	0.009	0.004	0.0016	0.0039	0.0002	–	–	–	–	0.018	–
	16	0.06	0.24	1.55	0.012	0.003	0.0018	0.0054	0.0001	0.25	0.45	–	0.08	–	–
	17	0.08	0.01	1.75	0.005	0.001	0.0014	0.0055	0.0001	–	–	–	0.21	0.024	0.030
	18	0.07	0.21	1.45	0.018	0.002	0.0019	0.0087	0.0004	–	0.45	–	–	0.028	0.045

表１（２）

鋼種		化学成分（重量%、残部はFeと不純物）												
		C	Si	Mn	Ti	sol.Al	O	N	B	Cu	Ni	Cr	Mo	Nb	V
比較鋼	31	0.14	0.21	1.35	0.020	*0.010	0.0018	0.0051	0.0002	—	—	—	—	—	—
	32	0.12	0.15	1.38	*0.001	0.002	0.0017	0.0043	0.0001	—	—	—	—	0.036	—
	33	0.08	0.22	1.62	*0.051	0.002	0.0015	0.0041	0.0002	0.21	0.14	—	—	0.029	0.045
	34	0.07	0.17	1.45	0.015	0.001	*0.0046	*0.0012	0.0002	—	—	—	—	0.031	0.034
	35	*0.34	0.26	1.25	0.013	0.002	0.0018	0.0052	0.0005	—	0.21	—	—	0.012	—

（注）＊印は本発明で規定する条件から外れていることを示す。

【００３０】

【表２】

表　２

鋼種		引張強度 (N/mm²)	降伏強度 (N/mm²)	拘束継手試験		
				1	2	3
本発明鋼	1	625	523	○	○	○
	2	634	541	○	○	○
	3	631	559	○	○	○
	4	628	595	○	○	○
	5	641	568	○	○	○
	6	655	581	○	○	○
	7	687	592	○	○	○
	8	624	556	○	○	○
	9	638	544	○	○	○
	10	725	587	○	○	○
	11	748	621	○	○	○
	12	708	615	○	○	○
	13	686	606	○	○	○
	14	634	546	○	○	○
	15	641	538	○	○	○
	16	721	634	○	○	○
	17	731	642	○	○	○
	18	626	541	○	○	○
比較鋼	31	613	473	×	×	×
	32	595	480	○	×	×
	33	685	592	×	×	×
	34	654	583	×	○	×
	35	795	635	×	×	×

拘束継手試験　○：割れなし、×：割れ有り

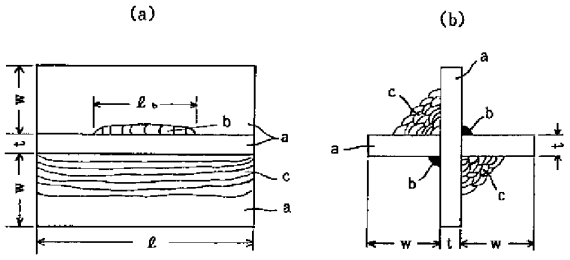
【００３１】

【発明の効果】本発明の高張力鋼は耐めっき割れ性、特に、ＨＡＺの耐めっき割れ性に非常に優れている。従って、溶融めっきを施して大形溶接構造物等に使用する高強度鋼として極めて有効である。

【図面の簡単な説明】

【図１】拘束継手試験片の構造を示す図で、(a) 図は正面図、(b) 図は側面図である。

【図１】



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Bibliographic data: JPH06136481 (A) — 1994-05-17

HIGH TENSILE STRENGTH STEEL EXCELLENT IN PLATING CRACK RESISTANCE

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Applicant(s): SUMITOMO METAL IND ± (SUMITOMO METAL IND LTD)

Classification: **- international:** ***C22C38/00; C22C38/14; C22C38/54; C22C38/58;*** (IPC1-7): C22C38/00; C22C38/14; C22C38/54; C22C38/58

- cooperative:

Application number: JP19920286076 19921023

Priority number (s): JP19920286076 19921023

Abstract of JPH06136481 (A)

PURPOSE:To make excellent the plating crack resistance of the weld heat- affected zone in high tensile strength steel by specifying the content of Al and O in steel and adding suitable amounts of Ti and N thereto. CONSTITUTION:The compsn. of the high tensile strength steel is constituted of, by weight, 0.01 to 0.20% C, <=1.0% Si, 0.3 to 2.0% Mn, 0.005 to 0.05% Ti, 0.0005 to <0.005% solAl, 0.0005 to 0.0035% O, 0.003 to 0.014% N and 0.001% B, and the balance Fe with inevitable impurities. If required, one or more kinds among <=2.0% Cu, <=2% Ni, <=1% Cr, <=1% Mo, <=0.12% Nb and <=0.12% V are furthermore incorporated therein. The steel having this compsn. is effective as high strength steel applied with hot-dip plating and used for a large-sized welding structure or the like.

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DESCRIPTION JPH06136481A

[0001]

INDUSTRIAL APPLICABILITY The present invention relates to high-strength steel having excellent plating crack resistance used for buildings, steel towers, bridges, and the like.

[0002]

PROBLEM TO BE SOLVED: To prevent rust of a steel material, for example, a means of hot-dip galvanizing zinc (Zn) or the like on the surface of the steel material has been widely used.

Such a method is an extremely effective means for preventing rust, but depending on the size of the structure, the composition of the steel material used for the structure, and the method of immersion in the plating bath, the structure When immersed in a hot-dip plating bath, cracks may occur particularly in the weld heat-affected zone (hereinafter referred to as HAZ). Since such cracks are referred to as plating cracks, the resistance to these cracks will be hereinafter referred to as "plating crack resistance".

[0003]

It is considered that the above-mentioned plating cracks cause the steel material to become brittle due to the infiltration of liquid metal such as zinc into the grain boundaries of the steel, leading to cracks. It is known that embrittlement is remarkable when immersed in a liquid metal bath such as.

As a means for improving the crack resistance to plating, Japanese Patent Publication No. 2-5814 regulates the content of C, Si, Mn, etc., which are harmful to the crack resistance to galvanization, and has high strength including Nb, V and Ti. Low-alloy steels, and Japanese Patent Application Laid-Open No. 2-57669 discloses high-strength steels in which the content of B is suppressed to 2 ppm or less in addition to C, Si, and Mn.

[0004]

However, such limited control of chemical components is not sufficient as a measure to prevent plating cracks in large structures and structures using high-strength steel.

That is, since the welding residual stress and the thermal stress generated during plating increase as the structure becomes larger, it is not possible to eliminate the occurrence of plating cracks, and the resistance to increase the strength of the steel material. Deterioration of plating crackability could not be suppressed.

[0005]

PROBLEM TO BE SOLVED: In general, plating cracks tend to occur as the thickness of a steel material increases and the strength increases, but the present invention does not particularly impair mechanical properties and economic efficiency. , An object of the present invention is to provide a high-strength steel in which the plating crack resistance of the base material and HAZ is dramatically improved.

[0006]

[Means for Solving the Problems] As a result of repeated studies to achieve the above object, the present inventor has specified the amounts of Al (aluminum) and O (oxygen) contained in steel, and the appropriate amounts. By adding Ti and N, the grain boundary, especially the grain boundary of HAZ, is significantly improved, and steel containing C, Si, Mn, B, etc., which are considered to be harmful to the galvanizing crack resistance, to some extent. It was also found that sufficient plating crack resistance can be imparted.

[0007]

The present invention has been made based on the above findings, and the gist thereof is in the following high-strength steel.

[0008]

(1)

By weight%, C: 0.01 to 0.20%, Si: 1.0% or less, Mn: 0.3 to 2.0%, Ti: 0.005 to 0.05%, sol.

Al: 0.0005% or more and less than 0.005%, O: 0.0005 to 0.0035%, N: 0.003 to 0.014%, B: 0.001% or less, and the balance is composed of Fe and unavoidable impurities. High-strength steel.

[0009]

(2) In addition to the components described in (1) above, in% by weight, Cu: 2.0% or less, Ni: 2% or less, Cr: 1% or less, Mo: 1% or less, Nb: 0.12% or less and V: A high-strength steel with excellent plating crack resistance, which contains one or more of 0.12% or less and the balance is composed of Fe and unavoidable impurities.

[0010]

[Action] Hereinafter, the action and effect of the components constituting the high-strength steel of the present invention and the reasons for limiting their contents will be described.

The "%" of the alloying element means "% by weight".

[0011]

C: C is an essential element for increasing the strength of steel, and it is necessary to contain 0.01% or more in order to obtain strength of 60 kg / mm2 (590 N / mm2) or more.

On the other hand, if the content exceeds 0.20%, not only the toughness of the base metal and the welded portion is impaired, but also the plating crack resistance of HAZ is lowered, so the C content is set to 0.01 to 0.20%.

[0012]

Si: Si is an element necessary not only for deoxidation but also for ensuring strength, but if it is contained in excess of 1.0%, not only the toughness of the base metal and the welded part is impaired, but also the HAZ Welding crackability is also reduced.

Therefore, the Si content was set to 1.0% or less.

[0013]

Mn: Mn is an essential element for ensuring the strength and toughness of steel, but if its content is less than 0.3%, the effect is insufficient, and if it is contained in excess of 2.0%, Not only is the toughness of the welded portion impaired, but the plating crack resistance of HAZ is also reduced.

Therefore, the Mn content was set to 0.3 to 2.0%.

[0014]

Ti: Ti produces fine Ti carbonitrides in steel and refines the crystal grains to increase the toughness of the base metal and welds.

Further, the synergistic effect of limiting the contents of Al, N and O as described later promotes the precipitation of fine Al oxides, and improves the plating crack resistance of steel materials, especially HAZ.

However, if the content is less than 0.005%, the effect of improving the plating crack resistance is not exhibited, and if the content exceeds 0.05%, the toughness of the base metal and the welded portion is lowered due to excessive precipitation hardening. The content was 0.005 to 0.05%.

[0015]

sol.

Al: sol.

It is extremely important to regulate the Al content to 0.0005% or more and less than 0.005% in order to improve the plating crack resistance of HAZ.

That is, sol. By suppressing the Al content to less than 0.005%, the transformation from the austenite phase to the ferrite phase in the weld is promoted during welding, the HAZ structure becomes finer, and the island-shaped martensite grains increase the sensitivity to cracking of the plating. Generation between them is suppressed.

[0016]

Further, a very small amount of Al contained in the steel produces fine Al oxides in combination with limiting the contents of Ti, N and O as described above or described later, and HAZ austenite grains. It exerts the effect of increasing the strength of grain boundaries by refining.

[0017]

This fine Al oxide is sol.

It is obtained by adjusting the amount of Al to 0.0005% or more and less than 0.005%.

Therefore, sol. The Al content was 0.0005% or more and less than 0.005%.

[0018]

O (oxygen): O is sol.

It has the effect of reacting with Al to promote the precipitation of fine Al oxides, making the HAZ structure finer, and significantly improving the plating crack resistance. However, when the O content exceeds 0.0035%, the effect is remarkably reduced, while when it is less than 0.0005%, the formation of fine Al oxide cannot be expected. Therefore, the O content is set to 0.0005 to 0.0035%.

[0019]

By coexisting with appropriate amounts of Al, Ti, and O, N: N promotes the precipitation of fine Ti carbonitrides, suppresses grain growth in HAZ during welding, and increases grain boundary strength.

Further, by capturing B, Nb, etc., which adversely affect the plating crack resistance, as nitrides, the adverse effect is reduced and the plating crack resistance of HAZ is improved.

[0020]

If the N content is less than 0.003%, these effects are not sufficient, and if the N content exceeds 0.014%, coarse TiN is generated, which in turn lowers the plating crack resistance. Therefore, the N content is 0.003 to It was set to 0.014%.

[0021]

B: B is an element effective for increasing the strength of steel.

However, since B is an element that lowers the plating crack resistance, it is necessary to suppress its content.

0.001%If it exceeds, even if the content of other components is adjusted as described above, the plating crack resistance is significantly reduced. Therefore, the content is set to 0.001% or less.

[0022]

The steel according to the invention of (1) is a high-strength steel in which the rest of the above components is substantially Fe.

(2)

The steel of the invention of (1) is a high-strength steel in which one or more of Cu, Ni, Cr, Mo, Nb and V are further contained in the steel of the invention of (1) to enhance the strength and toughness of the steel.

[0023]

If Cu and Ni exceed 2%, Cr and Mo exceed 1%, and Nb and V exceed 0.12%, not only the toughness of the base metal is impaired, but also the plating crack resistance of HAZ is reduced. The element content of Cu and Ni was 2% or less, Cr and Mo were 1% or less, and Nb and V were 0.12% or less.

[0024]

[Example] After melting steel having the chemical composition shown in Table 1, the tensile strength is about 60 to 80 kg / mm2 (590 to 760 N / mm2) by controlled rolling (heating temperature: 1150 ° C., finishing temperature: 720 ° C.).), Finished into a steel plate with a thickness of 20 mm.

[0025]

A test plate having a thickness of 15 mm was cut out from this steel plate, and as shown in FIG. 1, 20-pass restraint welding was performed to prepare a restraint joint test material.

In FIG. 1, a is a test plate (thickness t = 15 mm, length l = 150 mm, width w = 50 mm), b is a test bead (length lb = 50 mm), and c is a 20-pass restraint bead.

Three restraint joint test materials were prepared for each steel type.

Welding was performed by the shielded metal arc welding method (without preheating), the restraint beads were welded under the conditions of 220A, 26V, 150mm / min, and the test beads were welded under the conditions of 170A, 24V, 150mm / min.

[0026]

After immersing this restraint joint test material in a hot-dip galvanized bath at 470 ° C for 10 minutes, the test bead b was inspected by magnetic particle inspection to check for cracks.

[0027]

Table 2 shows the crack inspection results.

The inspection was performed three times with three test pieces for each steel type.

The table also shows the tensile strength and yield strength of each steel type.

As is clear from this result, the comparative steel has cracks in two or more restraint joint test pieces, whereas the steel of the present invention has a tensile strength of 590 N / mm2 (60 kg / mm2) or more. However, no cracks were observed in one restraint joint test piece.

[0028]

[Table 1 (1)]

[0029]

[Table 1 (2)]

[0031]

[Effects of the Invention] The high-strength steel of the present invention is extremely excellent in plating crack resistance, particularly HAZ plating crack resistance.

Therefore, it is extremely effective as a high-strength steel that is subjected to hot-dip plating and used for large welded structures and the like.

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CLAIMS JPH06136481A

1.

By weight%, C: 0.01 to 0.20%, Si: 1.0% or less, Mn: 0.3 to 2.0%, Ti: 0.005 to 0.05%, sol. Al: 0.0005% or more and less than 0.005%, O: 0.0005 to 0.0035%, N: 0.003 to 0.014%, B: 0.001% or less, and the balance is composed of Fe and unavoidable impurities. High-strength steel.

2.

In addition to the components according to claim 1, in% by weight, Cu: 2.0% or less, Ni: 2% or less, Cr: 1% or less, Mo: 1% or less, Nb: 0.12% or less and V: 0.12. A high-strength steel having excellent plating crack resistance, which contains one or more of% or less and the balance is composed of Fe and unavoidable impurities.

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Bibliographic data: JPH03117985 (A) — 1991-05-20

DRIVING SYSTEM FOR SOLID-STATE IMAGE PICKUP ELEMENT

Inventor(s): EGAWA YOSHITAKA; ENDO YUKIO ± (EGAWA YOSHITAKA, ; ENDO YUKIO)

Applicant(s): TOSHIBA CORP ± (TOSHIBA CORP)

Classification: **- international:** ***H04N5/335; H04N5/341; H04N5/343; H04N5/347; H04N5/369; H04N5/3725; H04N5/3728; H04N5/374;*** (IPC1-7): H04N5/335

- cooperative:

Application number: JP19890255464 19890930

Priority number (s): JP19890255464 19890930

Also published as: JP2799003 (B2)

Abstract of JPH03117985 (A)

PURPOSE:To enable electronic zooming by using a solid-state image pickup element forming multiple picture elements by transferring a charge accumulated in a first charge transfer element for the picture element less than the plural picture elements corresponding to a ratio between a length for the whole row of a photoelectric converting device and a length for a whole continuous column, accumulating the charge in a second charge transfer element and afterwards, successively transferring the charge in a row direction. CONSTITUTION:At the time of high resolution or an enlarged mode, the number of the picture elements to read the signal charge of a vertical transfer part to a horizontal transfer part with an enlarged area as the center of the element during the blanking period of a video signal is reduced rather than that of a standard mode. At such a time, the signal charges before and behind the enlarged area not to be transferred during the vertical effective period of the video signal are read out during the vertical blanking period while overlapping the preceding and following charges by a high-speed transfer pulse. For reading out the signal charge of the horizontal transfer part, the signal charge with the picture elements, which number is less than that of the standard mode, is detected by a signal charge detection part. At such a time, the signal charges before and behind the enlarged area not to be

transferred during a horizontal effective period are read out by impressing a speedy horizontal transfer pulse during the horizontal blanking period while overlapping the preceding and following charges. Thus, in the solid-state image pickup element, electronic zooming can be executed with high function.

⑲日本国特許庁（JP）　⑪特許出願公開

⑫公開特許公報（A）　平3－117985

⑤Int. Cl.⁵　識別記号　庁内整理番号　⑬公開　平成3年(1991)5月20日
H 04 N　5/335　F　8838－5C

審査請求　未請求　請求項の数　2　（全11頁）

⑭発明の名称　固体撮像素子の駆動方式

⑳特　願　平1－255464
㉒出　願　平1(1989)9月30日

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明　細　書

1．発明の名称

固体撮像素子の駆動方式

2．特許請求の範囲

（1）マトリックス状に形成された光電変換素子と、夫々の列について前記光電変換素子で形成された電荷を蓄積しこれを列方向に転送する複数の第一の電荷転送素子と、これら第一の電荷転送素子のそれぞれの端部に接続し転送されてきた電荷を蓄積しこれを行方向に転送する第二の電荷転送素子と、この第2の電荷転送素子の端部に接続し転送されてきた電荷を蓄積しこれを画像信号として出力する装置とからなる固体撮像素子を二種類以上のモードで駆動する方法であって、

第1のモードにおいては、夫々の列について前記第一の電荷転送素子に蓄積された電荷を複数画素分転送して、これらの和を前記第二の電荷転送素子に蓄積してから順次列方向転送を行うことによって一行分の画像信号を得、この動作を繰り返して一枚分の画像信号の形成が為され、

第2のモードにおいては、予め決められた一部の連続する行に関して、夫々の行について前記第一の電荷転送素子に蓄積された電荷を、前記光電変換装置の行全体の長さと全体連続列の長さの比に対応して、前記複数画素分よりも少ない画素分転送し前記第二の電荷転送素子に蓄積してから順次行方向転送を行うことによって一行分の画像信号を得、この動作を前記連続行分繰り返して一枚分の画像信号の形成が為されることを特徴とする固体撮像素子の駆動方法。

（2）マトリックス状に形成された光電変換素子と、夫々の列について前記光電変換素子で形成された電荷を蓄積しこれを行方向に転送する複数の第一の電荷転送素子と、これら第一の電荷転送素子の夫々の端部に接続し転送されてきた電荷を蓄積しこれを行方向に転送する第二の電荷転送素子と、この第二の電荷転送素子の端部に接続し転送されてきた電荷を蓄積しこれを検出し画像信号として出力する装置とからなる固体撮像素子を二種類以上のモードで駆動する方法であって、

第１のモードでは、前記第二の電荷転送素子で隣接して蓄積された電荷が前記出力装置で加算された後検出される様に、前記第二の電荷転送素子の電荷転送周期を前記出力装置における蓄積電荷検出の周期の整数倍とし、

第２のモードにおいては、第二の電荷転送素子の電荷転送周期を前記出力装置における蓄積電荷検出の周期の前記第１のモードよりも小さい整数倍としたことを特徴とする固体撮像素子の駆動方法。

３．発明の詳細な説明

［発明の目的］

（産業上の利用分野）

本発明は、ＣＣＤ等の固体撮像素子の駆動方式に関し、特に、電子ズームを実現することができる固体撮像素子の駆動方式に関する。

（従来の技術）

現在の家庭用ビデオカメラは、画素数が３０万から４０万画素のＣＣＤ型固体撮像素子が主流となり、電子シャッター付の高機能製品が良く売れている。固体撮像素子は、撮像管に比べて小型、軽量及び高信頼性といった特徴を有するため、次世代の高精細（ＨＤ）ＴＶカメラ用として開発が進められている。画素数も１３０万から２００万画素と多画素化されている。

（発明が解決しようとする課題）

上述の如き固体撮像素子において、画面の一部分を拡大するズーム機能を実現するためには、従来は、固体撮像素子よりの画像信号を拡大処理するしかなく、上記画像信号を拡大する処理する装置が必要となってしまうものであった。

また、固体撮像素子自体に電子ズーム機能を付加しようとした場合、電子ズームを行なわない時の駆動方法や、電子ズーム時の拡大エリアの読み出し方、拡大エリアの処理のやり方等、具体的な方法がなかった。

本発明の目的は多画素化固体撮像素子を用いて電子ズームを実現することのできる固体撮像素子の駆動方法を提供することである。

［発明の構成］

（課題を解決するための手段）

本発明の特徴は、半導体基板に光電変換して得られた信号電荷を蓄える複数の信号電荷蓄積部、各信号電荷蓄積部の信号電荷を読み出す複数列の垂直転送部、これら垂直転送部の信号電荷を読み出す水平転送部を有する固体撮像素子の駆動において、次の様な複数のモードを有する駆動方式を提供することである。すなわち、一つのモードは高感度又は標準モードであり、垂直転送部の信号電荷を映像信号の水平ブランキング期間内に水平転送部に２画素以上読み出す。そして、水平転送部で加算した信号電荷は、水平転送部の最終電極もしくは、信号電荷検出部で水平方向に２画素以上加算して読み出す。

又、別のモードは高解像度又は拡大モードであり、拡大エリアを素子の中心とし垂直転送部の信号電荷を映像信号の水平ブランキング期間に水平転送部へ読み出す画素数を、前記標準モードより少なくする。この時、映像信号の垂直有効期間で転送しない拡大エリアの前と後の信号電荷は、垂直ブランキング期間に高速転送パルスで前と後を重ねて読み出す。また、水平転送部の信号電荷の読出しは、前記標準モードより少ない画素数の信号電荷を信号電荷検出部で検出できるようにする。この時、水平有効期間で転送できない拡大エリアの前と後の信号電荷は、水平ブランキング期間に速い水平転送パルスを印加することで、前と後を重ねて読み出す。これらのモードを適宜選択して用いることによって、ズーム機能が実現される。

（作用）

本発明の固体撮像素子の駆動方式によれば、特別なメモリを用いた演算処理によるズームとも異り、又レンズを用いた光学的ズームとも異る、新規のズーム機能が実現する。

（実施例）

以下、本発明の実施例を説明する。

第１図は、インターライン転送型ＣＣＤ（ＩＴ－ＣＣＤ）撮像素子を示し、本発明による第１の駆動モードを説明する為の図である。

図において、１１は垂直９８２画素、水平１３

００画素のインターライン転送型ＣＣＤ撮像素子であり、１３００×９８２のマトリクス状に形成された光電変換部１２、夫々の列毎に設けられた垂直ＣＣＤ１３、この垂直ＣＣＤ１３の夫々の最終端に接続した水平ＣＣＤ１４、リセットランジスタ１５、及び出力アンプ１６を有する。これらはシリコンチップ上に一体形成されている。

この素子の駆動は、垂直ＣＣＤ１３には、４相のクロックパルスφＶ$_1$，φＶ$_2$，φＶ$_3$，φＶ$_4$を用いて為される。水平ＣＣＤ１４は、２相のクロックパルスφＨ$_1$，φＨ$_2$で駆動し、最終電極φＨ＊は独立駆動となっている。

この第１の駆動モードでは、光電変換部１２で１フィールド期間光電変換された信号電荷がＡフィールドで垂直ＣＣＤ１３に転送される。転送された信号電荷は、水平ブランキング期間にＳｉｇＡ１とＳｉｇＡ２の２画素分の信号電荷を水平ＣＣＤ１４へ転送し、ＳｉｇＡ１＋ＳｉｇＡ２の信号とする。次の水平ブランキング期間にＳｉｇＡ３＋ＳｉｇＡ４として信号電荷を読み出す。以下同様にして、Ａフィールド全体の読み出しが行なわれる。次のＢフィールド期間でも同様の信号読み出しが行なわれるがインタレース動作によって垂直解像度を増加させるために、信号加算の組合せがＡフィールドとはずれている。例えば水平ブランキング期間にＳｉｇＢ２＋ＳｇｂＢ３の加算を行ない水平ＣＣＤ１４で読み出す。

水平ＣＣＤ１４の転送は、２４ＭＨｚで行ない、最終電極φＨ＊と、リセット電極ＲＳは１／２の１４ＭＨｚ駆動とする。従って隣接するＡフィールド又はＢフィールドから転送されてきた電荷はφＨ＊で加算される。すなわち図に示した様に２４ＭＨｚで転送されてきた信号ＳｉｇＨ$_1$とＳｉｇＨ$_2$は、最終電極で加算されＳｉｇＨ$_1$＋ＳｉｇＨ$_2$となり、出力アンプ１６によって電圧として出力される。この第１の駆動モードを用いることによって、実質的に垂直４９１画素、水平６５０画素の約３２万画素の撮像素子となる。第２図、第３図にタイミングチャート図を示す。垂直ブランキング期間にφＶ$_1$，φＶ$_3$にＶＦＳを印加することで、光電変換部１２の信号電荷を垂直ＣＣＤ１３へ読み出す。垂直ＣＣＤ１３の信号電荷は、水平ブランキング期間に、ラインシフトを２回行なうことで、２画素分の信号電荷を水平ＣＣＤ１４へ転送する。第３図の水平の有効期間にφＨ$_1$，φＨ$_2$を２４ＭＨｚで駆動し、φＨ＊，ＲＳは、その１／２の１２ＭＨｚで駆動する。水平ブランキング期間に垂直ＣＣＤ１３のφＶ$_1$，φＶ$_2$，φＶ$_3$，φＶ$_4$は２回のラインシフト動作を行なう。尚、第２図で、φＨ$_1$，φＨ$_2$，φＨ＊，ＲＳは簡単のため信号の存在する区間のみをハッチングで示した。夫々の区間の信号の詳細は第３図から明らかである。

第４図は、この実施例の第２の駆動モードを説明する為の図である。

このモードでは、拡大エリア垂直４９１画素、水平６５０画素のみを有効期間で読み出し、それ以外の高速ラインシフト（ＬＳ）エリア１とエリア２は、垂直のブランキング期間に読出し、高速水平転送エリア１とエリア２は、水平のブランキング期間に読み出す。垂直ブランキング期間に光電変換部１２で光電変換された信号電荷が垂直ＣＣＤ１３に読み出される。そして、高速のラインシフトパルスでφＶ$_1$，φＶ$_2$，φＶ$_3$，φＶ$_4$を駆動し、高速ＬＳエリア１の２４６画素分の信号電荷を水平ＣＣＤで読み出す。そして、有効期間に拡大エリア４９１画素の信号電荷を読み出す。Ａフィールドでは、水平ブランキング期間に例えばＳｉｇＡ１の１画素分が水平ＣＣＤ１４へ転送される。Ｂフィールドでは、水平ブランキング期間にＳｉｇＢ１の１画素分が水平ＣＣＤ１４へ転送される。水平ＣＣＤ１４へ転送された信号電荷は、まず水平ブランキング期間内に高速転送エリア１の３２５画素の信号を３０ＭＨｚ～６０ＭＨｚの高速で読み出す。この不要な電荷は適宜リセットトランジスタＲＳを経て掃出される。次に有効期間に拡大エリア６５０画素を夫々水平転送パルス１２ＭＨｚでφＨ$_1$，φＨ$_2$，φＨ＊，ＲＳを駆動し読み出す。この時水平方向の加算は行なわない。有効期間に拡大エリアが読み出されると、高

速水平転送エリア２は、エリア１と重なり、次の高速水平転送エリア１と重ねて読み出す。垂直の有効期間に拡大エリア４９１画素が読み出されると高速ＬＳエリア２は、高速ＬＳエリア１と同じ場所となり、次の高速ＬＳエリア１と同時に信号電荷を垂直ブランキング期間内に読み出す。この第２の駆動方式を用いることによって画面の中心エリアが２倍に拡大できる。また解像度も垂直４９１画素水平６５０画素の約３２万画素と、第１の駆動方式と変わらない。

第５図、第６図にタイミングチャート図を示す。垂直ブランキング期間にφＶ１，φＶ３にＶＦＳを印加して、光電変換部１２の信号電荷を垂直ＣＣＤ１３へ読み出す。そして、高速ＬＳエリア１と一周期前の高速ＬＳエリア２の重なった信号電荷２４６画素をラインシフト１２３回を連続で行ない、水平ＣＣＤ１４で読み出す。第６図の水平ブランキング期間では、まずラインシフト動作φＶ１，φＶ２，φＶ３，φＶ４を１回行ない、水平ＣＣＤ１４へ１ライン分の信号電荷を転送する。

①信号がラインシフト２回動作によってＢＧゲートで加算され、１水平期間蓄積後に水平ＣＣＤ14_1，14_2で読み出される。次に③信号が同じ様にＢＧゲートを経て水平ＣＣＤ14_1，14_2で読み出される。また、Ｂフィールドでは、インタレース動作を行なうために②信号が読み出される。垂直方向は、２画素加算の４９１画素相当になる。水平ＣＣＤ14_1，14_2の転送は、水平ブランキング期間にラインシフト動作後、高速水平転送エリア１を２８ＭＨｚ～６０ＭＨｚで読出し水平有効期間に通常転送エリア１５００画素を１４ＭＨｚで転送し、最終電極$φH_1'$，$φH_2'$，ＲＳＡ，ＲＳＢを７ＭＨｚ駆動とし、水平方向２画素を最終電極$φH_1'$，$φH_2'$で加算して読み出す。高速水平転送エリア２は、次の水平転送時に高速転送エリア１と重ねて読み出す。

第８図にＨＤ－ＴＶ様素子の第２の駆動モードを示す。

第２の駆動モードでは、拡大エリア垂直４９１画素、水平７５０画素のみを有効期間で読出し、次に水平転送パルス$φH_1$，$φH_2$を４０～６０ＭＨｚで駆動し、高速水平転送エリア１＋エリア２の重なった信号電荷を読み出す。次に拡大エリア６５０画素を１２ＭＨｚで読み出す。

第７図に高精細（ＨＤ）ＴＶ用の約２００万画素ＩＴ－ＣＣＤを用いた第２の実施例を示す。この素子には、垂直ＣＣＤの最終電極に、１水平期間蓄積ゲートＢＧがあり、２水平ＣＣＤ読出し、水平分割ゲートＨＧが設けてある。

ＨＤ－ＴＶ用素子は、アスペクト比が垂直：水平＝９：１６で垂直の走査線が少し多いため、ＮＴＳＣ方式で使う場合は、アスペクト比３：４にするために、垂直９８２画素、水平１５００画素の約１５０万画素を用いる。余分な５０万画素は垂直・水平のブランキング期間に読み出す。第１の駆動モードでは光電変換部１２で光電変換された信号電荷は、垂直ブランキング期間に垂直ＣＣＤ１３に転送され、高速ＬＳエリア１の３５画素が水平ＣＣＤ14_1，14_2へ転送され読み出される。水平のブランキング期間にＡフィールドの垂直のブランキング期間に高速ＬＳエリア１とエリア２を重ねて高速のラインシフト動作を読み出す。また、水平のブランキング期間に高速水平転送エリア１とエリア２を重ねて、水平転送パルス$φH_1$，$φH_2$を２８ＭＨｚ～６０ＭＨｚで駆動して読み出す。その後、水平の有効期間に拡大エリア７５０画素を７ＭＨｚで読み出す。

第９図に、第３の実施例を示す。

図において、１１は、垂直７３８画素、水平１３０２画素のインターライン転送型ＣＣＤ撮像素子であり、垂直ＣＣＤは１画素１段の独立読出しを行なうことができる撮像素子である。

第１の駆動モードは、光電変換部１２で光電変換された信号電荷が垂直ブランキング期間に垂直ＣＣＤ１３に読出される。転送された信号電荷は、Ａフィールド期間の水平ブランキング期間内にＳｉｇＡ１とＳｉｇＡ２、更にＳｉｇＡ３を水平ＣＣＤ１４に転送する。またＢフィールド期間では、インターレース動作を行なうために、ＳｉｇＢ２，ＳｉｇＢ３，ＳｉｇＢ４を水平ＣＣＤ１４へ転送し、垂直

3画素を加算する。また、水平CCD14の最終電極φH'で水平方向3画素分を加算して読み出す。すなわち、φH'とRSは、φH1，φH2 24MHzの1／3の周波数8MHzで駆動する。

第10図に、第2の駆動モードである2倍（2.25倍）ズームの実施例を示す。拡大エリア垂直492画素、水平868画素のみを有効期間で読出し、高速LSエリア1の123画素とエリア2の123画素を重ねて、垂直ブランキング期間に読み出す。また高速水平転送エリア1（217画素）とエリア2（217画素）を重ねて水平ブランキング期間に30～60MHzで読み出す。拡大エリアの垂直CCD13の信号電荷は、水平ブランキング期間にAフィールドではSigA1とSigA2を転送し、水平CCD14でSigA1+SigA2として読み出す。Bフィールドでは、インタレース動作を行なうために、SigB2とSigB3を水平CCD14へ転送して読み出す。水平CCD14の転送は、16MHzで行ない、最終電極φH'を8MHz駆動として、水平方向2画素をφH'で加算し読み出す。この駆動によって2倍ズームが行なえる。

第11図に、第3の駆動モードである9倍ズームの実施例を示す。拡大エリア垂直246画素、水平432画素のみを有効期間で読出し、高速LSエリア1（246画素）とエリア2（246画素）を重ねて、垂直ブランキング期間に読み出す。また高速水平転送エリア1（432画素）とエリア2（432画素）を重ねて、水平ブランキング期間に3～60MHzで読み出す。拡大エリアの垂直CCD13の信号電荷は、水平ブランキング期間にAフィールドではSigA1のみを水平CCD14へ転送する。またBフィールドも同じ信号SigB1を水平CCDへ転送する。水平CCD14の転送は、8MHzで行なう。また最終電極のφH'とRSも8MHzで行ない、水平方向の加算は行なわない。この駆動によって9倍ズームが行なえる。

以上好ましい実施例のいくつかを説明したが、この他の多くの実施例、変形例が考えられる。その一部を以下に記す。

①実施例では、インターライン転送型CCD撮像素子で説明したが、フレーム転送方CCDでも、積層型でも、二次元の転送部を有する固体撮像素子であれば、本発明を適用することができる。

②実施例では、垂直と水平の双方についてズームを設定し、しかもそのズーム比を同じにしたが、垂直方向だけのズーム、水平方向のズーム、或いは夫々のズーム比を変えて行なうこともできる。

③HD－TV用素子を用いて、アスペクト比を3：4に圧縮して、全信号をNTSC方式で出画させることもできる。

④実施例では、拡大エリア以外は、ブランキング期間で読出したが、有効期間の一部を使ってもよい。この時、有効期間に読出した信号は、幅の広いブランキングを作り、モニタ上に出画しないようにする。

［発明の効果］

以上述べたように、本発明の駆動方式を用いることによって、固体撮像素子において高機能の電子ズームが実現できる。従って本発明により、被写体によって画素加算による高感度モードと高解像度モードが選択できる。また、ズームレンズで拡大し更に電子ズームで拡大することもできる。また、画像処理によるズームと違い、実時間で実行でき、ズームを行なっても解像度の低下が無く、メモリ等を処理装置を使用せずに実行できる。そのため、計測、監視用として安価なカメラができる。また、レンズのズームと違い、見たい方向だけアスペクト比を変化させ、拡大することもできる。

4．図面の簡単な説明

第1図は、本発明の第1の駆動方式を説明するためのデバイス構成図、

第2図、第3図は第1の駆動モードを説明するためのタイミングチャート図、

第4図は、本発明の第2の駆動モードを説明するためのデバイス構成図、

第5図、第6図は、第2の駆動モードを説明するためのタイミングチャート図、

第７図、第８図は、本発明をＨＤ－ＴＶ素子に実施した例を示す図、

第９図、第１０図、第１１図は、本発明の第３の実施例の説明図である。

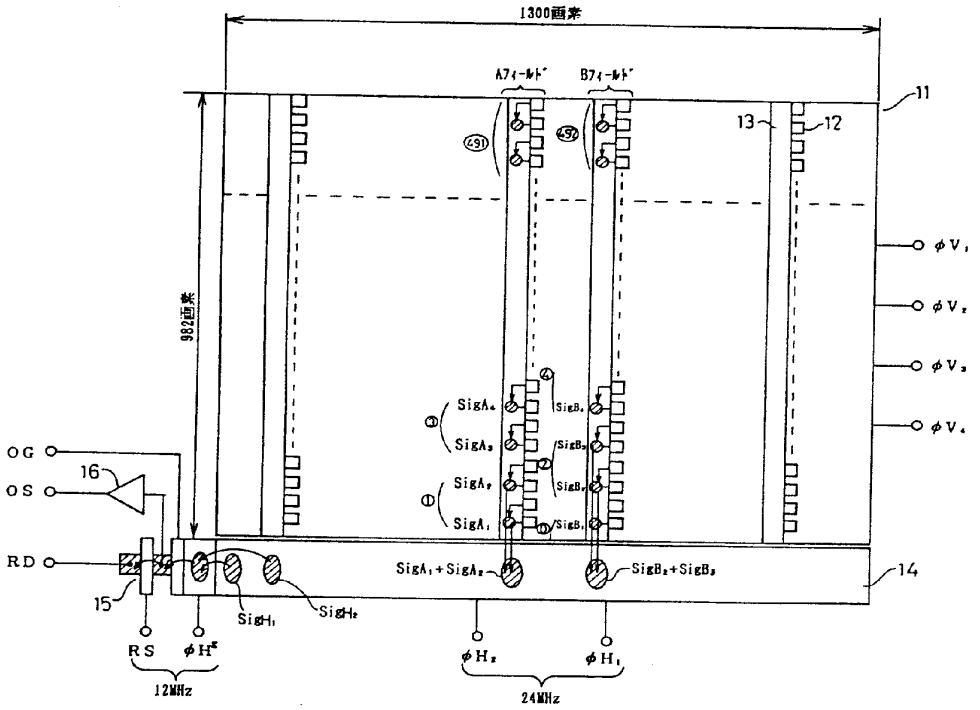
１１…ＣＣＤ撮像素子　１２…光電変換部

１３…垂直ＣＣＤ　１４…水平ＣＣＤ

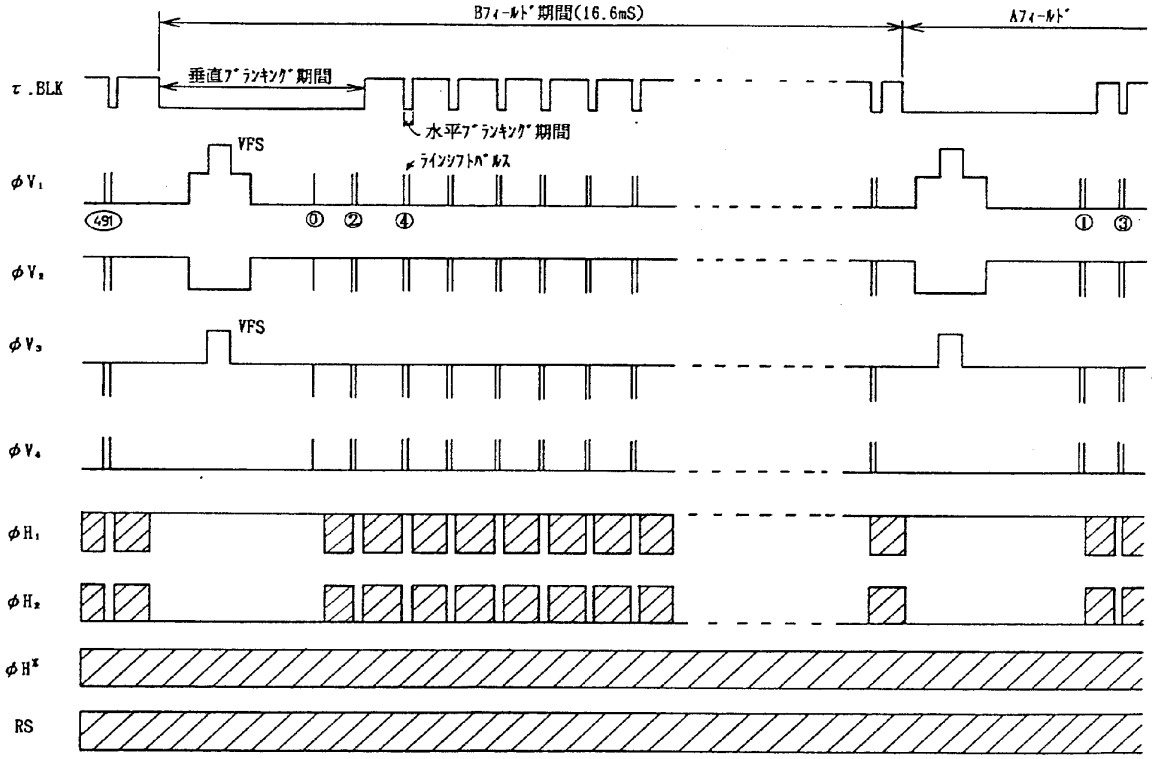
１５…リセットトランジスタ

１６…出力アンプ

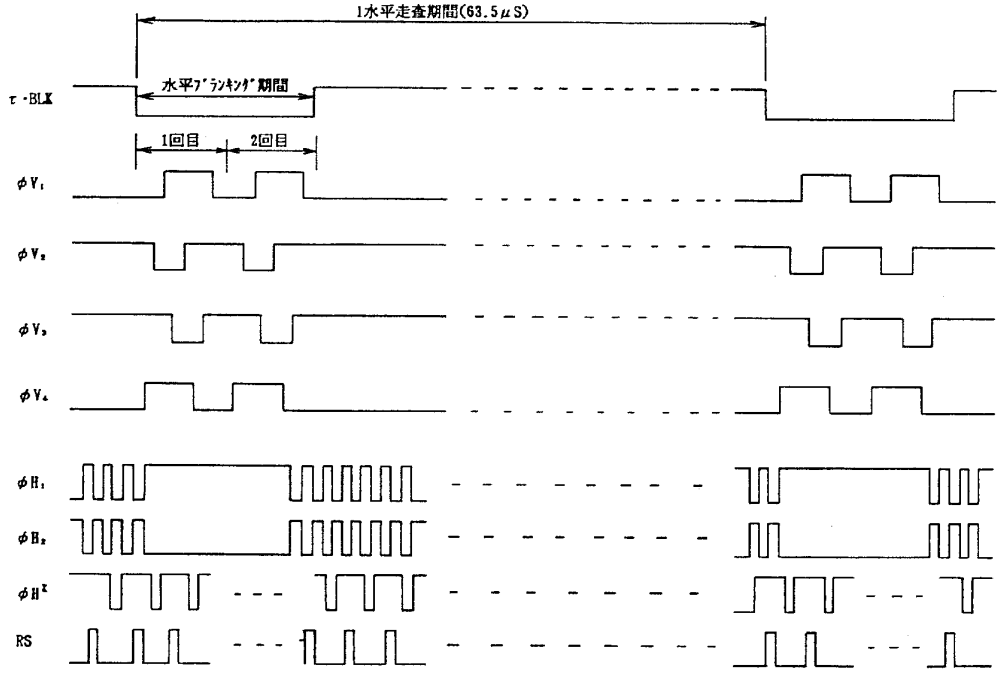
代理人弁理士 三好秀和



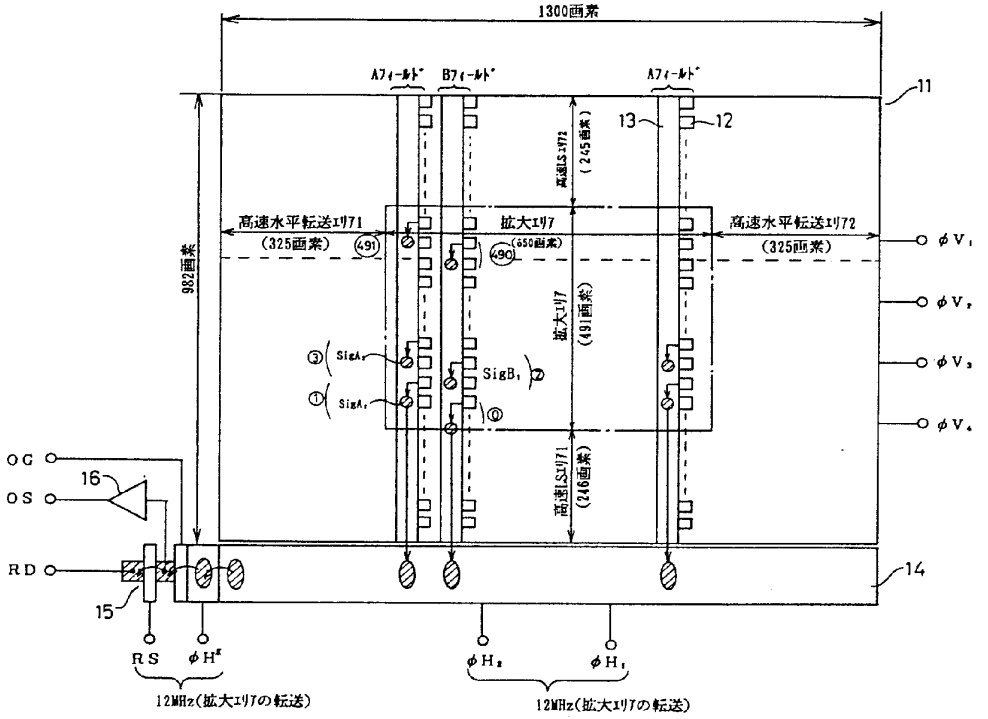
第１図


B7ｨｰﾙﾄﾞ期間(16.6mS)
A7ｨｰﾙﾄﾞ
τ.BLK
垂直ﾌﾞﾗﾝｷﾝｸﾞ期間
水平ﾌﾞﾗﾝｷﾝｸﾞ期間
VFS
ﾗｲﾝｼﾌﾄﾊﾟﾙｽ
φV1
φV2
φV3
φV4
φH1
φH2
φHX
RS
491
①
②
③
④

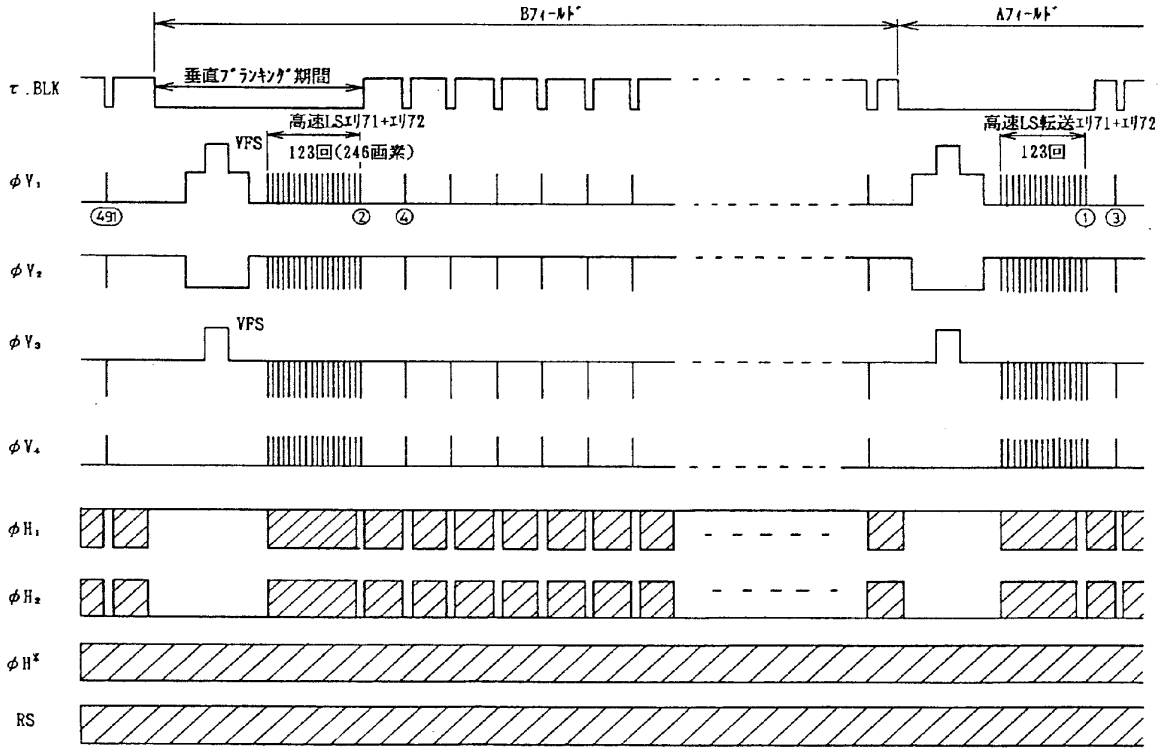
第 2 図


1水平走査期間(63.5μS)
τ-BLK
水平ﾌﾞﾗﾝｷﾝｸﾞ期間
1回目
2回目
φV1
φV2
φV3
φV4
φH1
φH2
φHX
RS

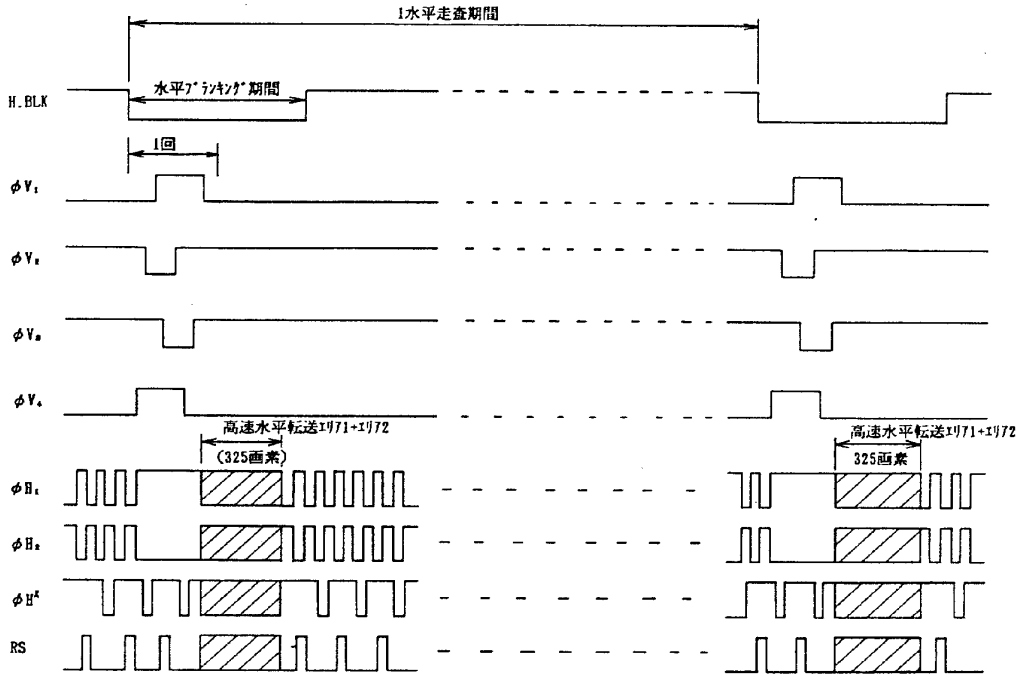
第 3 図


1300画素
A7フィールド
B7フィールド
A7フィールド
11
12
13
14
15
16
高速LS:1/2
(245画素)
高速水平転送エリア1
(325画素)
491
拡大エリア7
650画素
490
高速水平転送エリア2
(325画素)
982画素
拡大エリア7
(491画素)
SigA₂
SigB₁
SigA₁
高速LSエリア1
(246画素)
OG
OS
RD
RS
φH^x
φH₂
φH₁
φV₁
φV₂
φV₃
φV₄
12MHz(拡大エリア7の転送)
12MHz(拡大エリア7の転送)

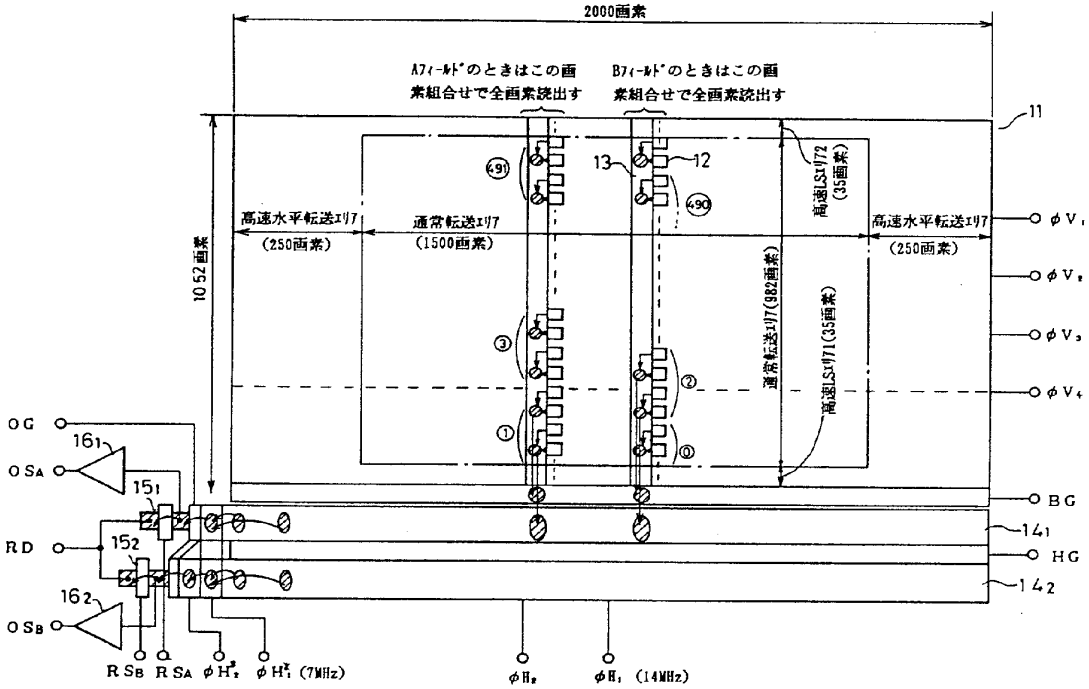
第 4 図


B7フィールド
A7フィールド
τ.BLK
垂直ブランキング期間
高速LSエリア1+エリア2
VFS
123回(246画素)
高速LS転送エリア1+エリア2
123回
φV₁
φV₂
φV₃
φV₄
φH₁
φH₂
φH^x
RS
491
②
④
①
③

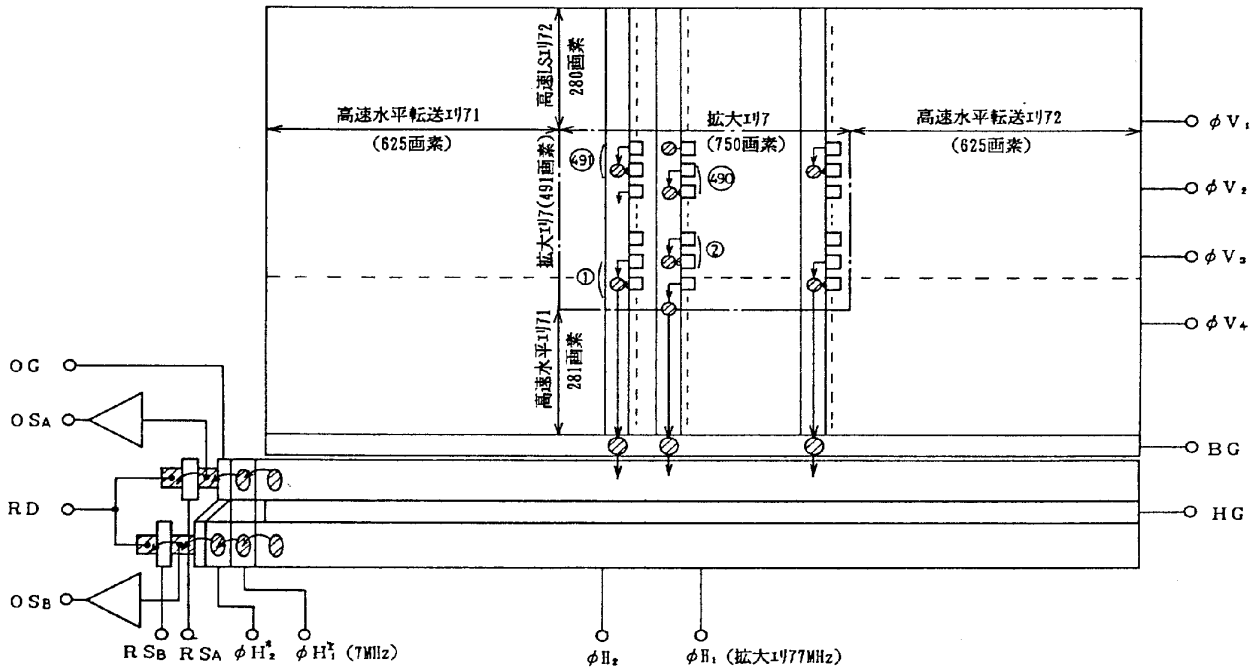
第 5 図


1水平走査期間
H.BLK
水平ブランキング期間
1回
φV1
φV2
φV3
φV4
高速水平転送エリア1+エリア2
(325画素)
高速水平転送エリア1+エリア2
325画素
φH1
φH2
φHX
RS

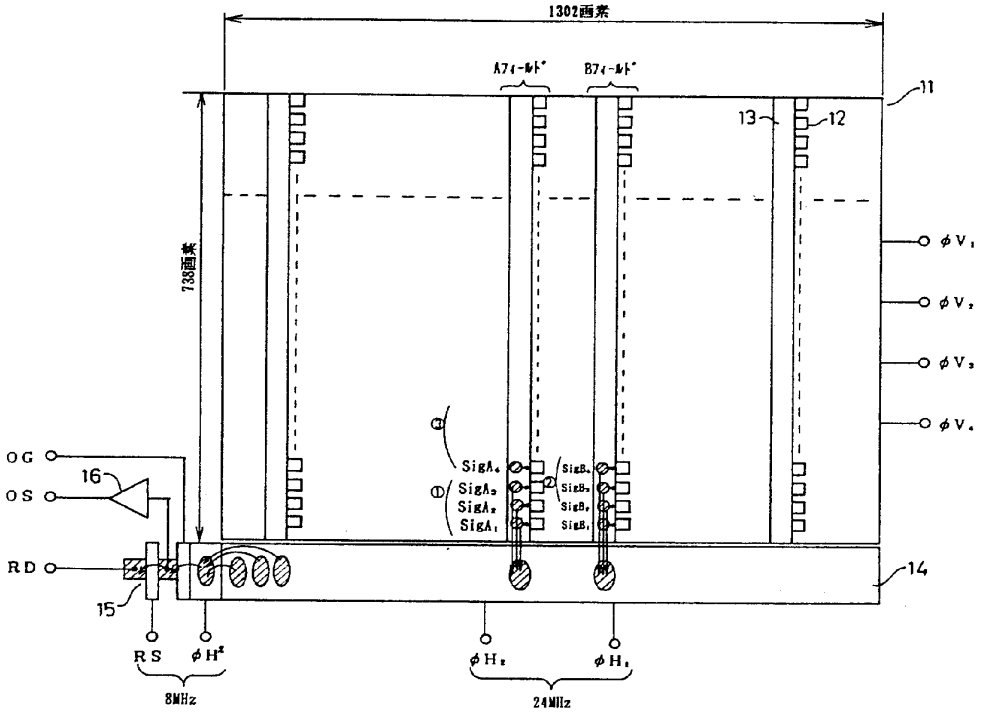
第 6 図


2000画素
A7ィールドのときはこの画素組合せで全画素読出す
B7ィールドのときはこの画素組合せで全画素読出す
11
13
12
491
490
高速LSエリア2 (35画素)
高速水平転送エリア7 (250画素)
通常転送エリア7 (1500画素)
高速水平転送エリア7 (250画素)
1052画素
通常転送エリア7(982画素)
高速LSエリア1(35画素)
φV1
φV2
φV3
φV4
OG
OSA
OSB
RD
161
151
152
162
BG
141
HG
142
RSB
RSA
φHX2
φHX1 (7MHz)
φH2
φH1 (14MHz)

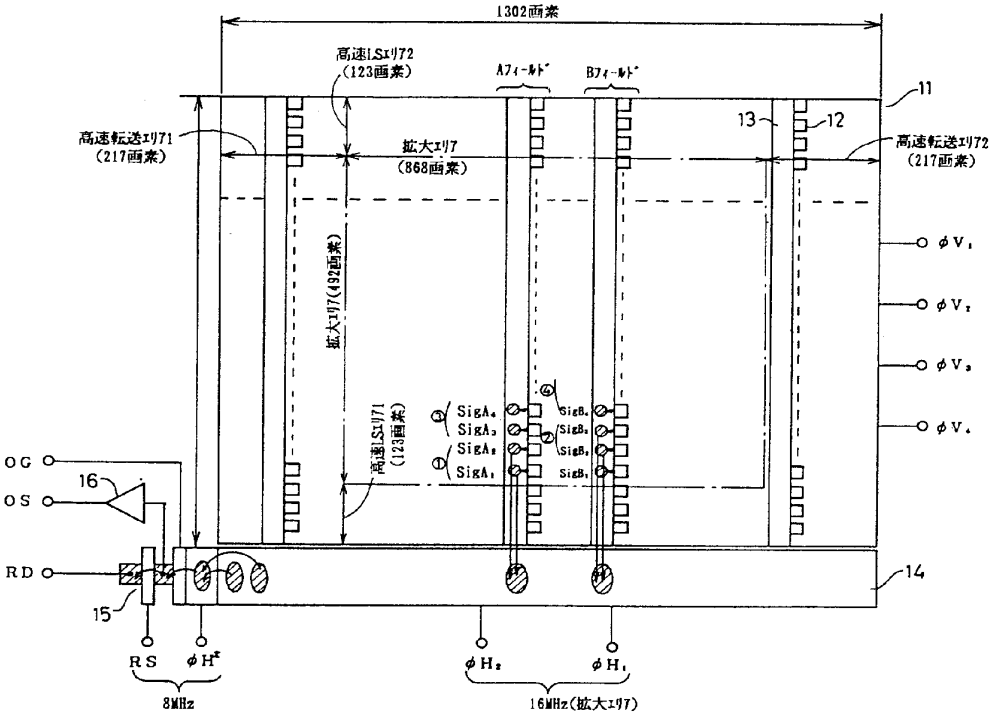
第 7 図


高速水平転送ｴﾘ71
(625画素)
高速LSｴﾘ72
280画素
拡大ｴﾘ7(491画素)
高速水平ｴﾘ71
281画素
拡大ｴﾘ7
(750画素)
高速水平転送ｴﾘ72
(625画素)
φV1
φV2
φV3
φV4
BG
HG
OG
OSA
RD
OSB
RSB
RSA
φH2
φH1 (7MHz)
φH2
φH1 (拡大ｴﾘ77MHz)

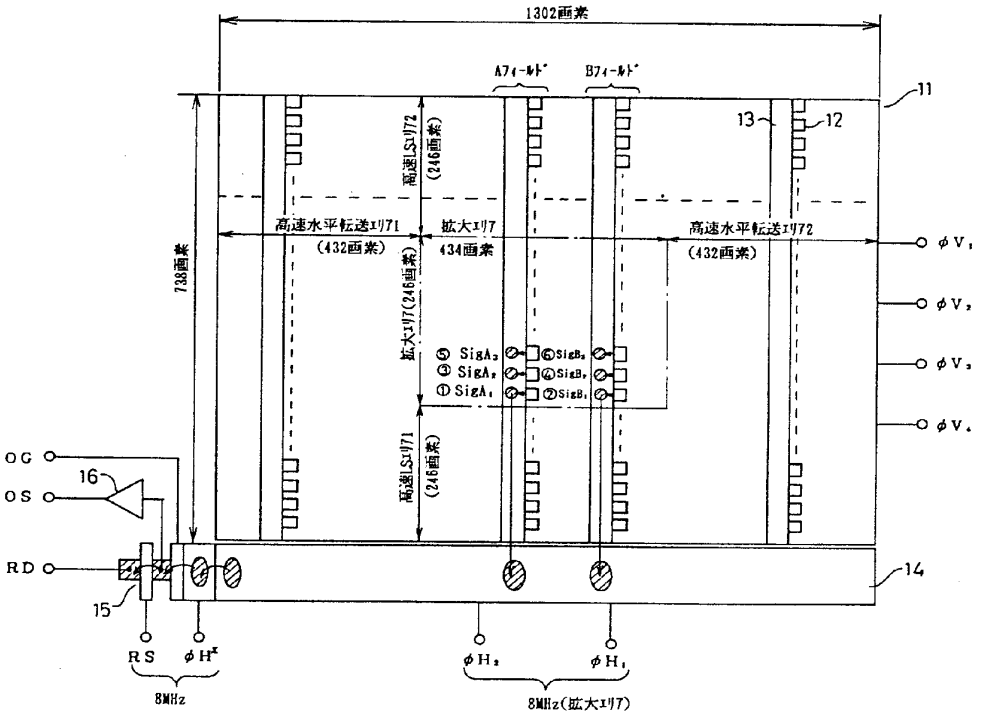
第 8 図


1302画素
A7ｲﾙﾄﾞ
B7ｲﾙﾄﾞ
11
13
12
738画素
φV1
φV2
φV3
φV4
OG
16
OS
RD
15
14
SigA4
SigA3
SigA2
SigA1
SigB4
SigB3
SigB2
SigB1
RS
φH2
8MHz
φH1
24MHz

第 9 図


1302画素
高速LSエリア72
(123画素)
A7ィールド
B7ィールド
11
13
12
高速転送エリア71
(217画素)
拡大エリア7
(868画素)
高速転送エリア72
(217画素)
φV1
φV2
φV3
φV4
拡大エリア7(492画素)
高速LSエリア71
(123画素)
SigA4
SigA3
SigA2
SigA1
SigB4
SigB3
SigB2
SigB1
OG
OS
RD
16
15
14
RS
φH2
φH1
8MHz
16MHz(拡大エリア7)

第 10 図


1302画素
A7ィールド
B7ィールド
11
13
12
高速LSエリア72
(246画素)
高速水平転送エリア71
(432画素)
拡大エリア7
434画素
高速水平転送エリア72
(432画素)
738画素
φV1
φV2
φV3
φV4
拡大エリア7(246画素)
⑤SigA2
③SigA2
①SigA1
⑥SigB2
④SigB2
②SigB1
高速LSエリア71
(246画素)
OG
OS
RD
16
15
14
RS
φH2
φH1
8MHz
8MHz(拡大エリア7)

第 11 図

Espacenet

Bibliographic data: JPH03117985 (A) — 1991-05-20

DRIVING SYSTEM FOR SOLID-STATE IMAGE PICKUP ELEMENT

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Applicant(s): TOSHIBA CORP ± (TOSHIBA CORP)

Classification: **- international:** ***H04N5/335; H04N5/341; H04N5/343; H04N5/347; H04N5/369; H04N5/3725; H04N5/3728; H04N5/374;*** (IPC1-7): H04N5/335

- cooperative:

Application number: JP19890255464 19890930

Priority number (s): JP19890255464 19890930

Also published as: JP2799003 (B2)

Abstract of JPH03117985 (A)

PURPOSE:To enable electronic zooming by using a solid-state image pickup element forming multiple picture elements by transferring a charge accumulated in a first charge transfer element for the picture element less than the plural picture elements corresponding to a ratio between a length for the whole row of a photoelectric converting device and a length for a whole continuous column, accumulating the charge in a second charge transfer element and afterwards, successively transferring the charge in a row direction. CONSTITUTION:At the time of high resolution or an enlarged mode, the number of the picture elements to read the signal charge of a vertical transfer part to a horizontal transfer part with an enlarged area as the center of the element during the blanking period of a video signal is reduced rather than that of a standard mode. At such a time, the signal charges before and behind the enlarged area not to be transferred during the vertical effective period of the video signal are read out during the vertical blanking period while overlapping the preceding and following charges by a high-speed transfer pulse. For reading out the signal charge of the horizontal transfer part, the signal charge with the picture elements, which number is less than that of the standard mode, is detected by a signal charge detection part. At such a time, the signal charges before and behind the enlarged area not to be

transferred during a horizontal effective period are read out by impressing a speedy horizontal transfer pulse during the horizontal blanking period while overlapping the preceding and following charges. Thus, in the solid-state image pickup element, electronic zooming can be executed with high function.

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DESCRIPTION JPH03117985A

[0001]

[Purpose of the Invention] (Industrial Application Field) The present invention relates to a drive method for a solid-state 11i2111 element such as COD, and more particularly to a drive method for a solid-state image sensor capable of realizing electronic zoom. (Conventional Technology) Current home video cameras are mainly CCD-type solid-state image sensors with 300,000 to 400,000 pixels, and high-performance products with electronic shutters are selling well. Since the solid 1111 @ element has features such as small size, light hearing, and high reliability as compared with the in image tube, its development has been approved for the next generation high-definition () -10) TV camera. The number of pixels has also increased from 1.3 million to 2 million. (Problem to be Solved by the Invention) In the solid-state image sensor as described above, in order to realize a zoom function for enlarging a part of a screen, conventionally, there is no choice but to magnify an image signal from a solid-state i1ii image sensor. A device for processing the image signal to be magnified is required. Further, when an attempt is made to add an electronic zoom function to the solid-state Wa image element itself, specific methods such as a driving method when electronic zoom is not performed, a method of reading an enlarged area during electronic zoom, and a method of processing an enlarged area are specified. There was no way. An object of the present invention is to provide a method for driving a solid # M @ element capable of realizing electronic zoom using a multi-pixel solid solid 1141 element. [Construction J of the Invention (Means for Solving the Problem) A feature of the present invention is that a plurality of signal charge storage units that store signal charges obtained by photoelectric conversion on a semiconductor substrate and signal charges of each signal charge storage unit are stored. It is an object of the present invention to provide a driving method having a plurality of modes as follows in driving a solid-state image sensor having a plurality of rows of vertical transfer units to be read and a horizontal transfer unit without reading the signal charges of these vertical transfer units. That is, one mode is a high-sensitivity or standard mode, and the signal charge of the vertical transfer unit is read out to the horizontal transfer unit by two or more pixels within the horizontal blanking period of the video signal. Then, the signal charge added by the horizontal transfer unit is read out by adding two or more pixels in the horizontal direction at the final electrode of the horizontal transfer unit or the signal charge detection unit. Another mode is a high resolution or enlargement mode, in which the number of pixels for reading the signal charge of the vertical transfer unit to the horizontal transfer unit during the horizontal blanking period of the video signal is smaller than that of the standard mode, with the enlargement area as the center of the element. To do. At this time, the signal charges before and after the expansion area that is not transferred during the vertical valid period of the video signal are read out by overlapping the front and the rear with a high-speed transfer pulse during the vertical blanking period.

Further, the reading of the signal charge of the horizontal transfer unit enables the signal charge detection unit to detect a signal charge having a smaller number of pixels than the standard mode. At this time, the signal charges before and after the expansion area that cannot be transferred during the horizontal effective period are not read over the song and the back by applying a fast horizontal transfer pulse during the horizontal blanking period. The zoom function is realized by appropriately selecting and using these modes. (Action) According to the drive method of the solid-state image sensor of the present invention, a new zoom function different from the zoom by arithmetic processing using a special memory and different from the optical zoom using a lens is realized. (Example) Hereinafter, the present invention will be described in detail. FIG. 1 shows an interline transfer type C0D (IT-COD> 1 iii image element, and is a diagram for explaining a first drive mode according to the present invention. In the figure, reference numeral 11 denotes a vertical 982 stroke 1 horizontal 13OO0 pixel interline transfer

type CCD imaging element, a photoelectric conversion unit 12 formed in a matrix of 1300 × 982, a vertical CCD 13 provided for each row, and the vertical CCD 13. It has a horizontal CCD 14, a reset transistor 15, and an output amplifier 16 connected to the final ends of each of the above. These are integrally formed on a silicon chip. This element is driven by using four-phase clock pulses φV +, φV2, φV3, and φV4 for the vertical CCD 13. The horizontal CCD 14 is driven by two-phase clock pulses φH + and φH2, and the final electrode φH1 is independently driven. In this first drive mode, the signal charge photoelectrically converted by the photoelectric conversion unit 12 for one field period is transferred to the vertical CCD 13 in the A field. As for the transferred signal charge, the signal charge for two pixels of S1aA1 and SigA2 is transferred to the horizontal CCD14 during the horizontal blanking period to obtain a signal of SiaA1 + SigA2. During the next horizontal blanking period, the signal charge is read out as SiaA3 + SiaA4. In the same manner, the entire A field is read out. The same signal reading is performed in the next B field period, but the combination of signal crimping is out of the A field in order to increase the vertical resolution by the interlacing operation. For example, during the horizontal blanking period, SigB 2 + S oiB 3 are added and read out by the horizontal CCD 14. The transfer of the horizontal CGD 14 is performed at 24 MHz, and the final electrode φH1 and the reset electrode R8 are driven at 14 MHz, which is 1/2.

Therefore, the electric charge transferred from the adjacent A field or B field is added by φH'. That is, as shown in the figure, the signals 5i (iH + and S1aH2) transferred at 24 MHz are added at the final electrode to become SigH + + S1oi-12, which is output as a voltage by the output amplifier 16. By using this first drive mode, the image sensor has substantially 320,000 pixels, which are 491 pixels vertically and 650 pixels horizontally. The timing charts are shown in FIGS. 2 and 3. By applying VFS to φVl and φV3 during the vertical blanking period, the signal charge of the photoelectric conversion unit 12 is read out to the vertical CCD 13. The signal charge of the vertical CCD 13 transfers the signal charge of two pixels to the horizontal CCD 14 by performing a line shift twice during the horizontal blanking period. During the horizontal effective period of FIG. 3, φ ((1, φH2 is driven by 24 MHz t ", φH ", R8 is driven at 12 MHz, which is half of that. During the horizontal blanking period, φV +, φV2, φV3, and φV4 of the vertical CCD 13 perform the line shift operation twice. In Fig. 2, φH +, φH2, φH "and R3 are I! Since it is a single g, only the section where the signal exists is shown by hatching. The details of the signals in each section are clear from FIG. FIG. 4 is a diagram for explaining a second drive mode of this embodiment. In this mode, only the enlarged area vertical 491 pixels and horizontal 650 pixels are read out during the valid period, and the other high-speed line shift (LS) area 1 and area 2 are read out during the vertical blanking period, and the high-speed horizontal transfer area 1 and Area 2 is read during the horizontal blanking period. The signal charge photoelectrically converted by the photoelectric conversion unit 12 during the vertical blanking period is read out to the vertical CCD 13. Then, φ ⊠ gaze, φV2, φV3, and φV4 are driven by a high-speed line shift pulse, and the signal charge for 246 pixels of the high-speed LSI rear 1 is read out by horizontal COD. Then, the signal charge of the enlarged area 491 pixels is read out during the valid period. In the A field, for example, one pixel of 5ioAl is transferred to the horizontal CCD 14 during the horizontal blanking period. In the B field, one pixel of SigB1 is transferred to the horizontal CCD 14 during the horizontal blanking period. The iζ signal charge transferred to the horizontal CCD 14 first reads out the signal of 325 pixels in the high-speed transfer area 1 at a high speed of 30 MHz to 60 MHz within the horizontal blanking period.

This unnecessary charge is appropriately abandoned via the reset transistor R8. Next, during the valid period, φH +, φH2, φH ", and R8 are driven and read out with horizontal transfer pulses of 12 MHz, respectively, for the expanded area 650 pixels. At this time, horizontal addition is not performed. When the expanded area is read during the valid period, the high-speed horizontal transfer area 2 overlaps with the area 1 and is read as the next high-speed horizontal transfer area 1. When the enlarged area 491 pixels are read out during the vertical valid period, the high-speed LSI rear 2 becomes the same location as the high-speed LSI rear 1, and the signal charge is read out within the vertical blanking period at the same time as the next high-speed LSI rear 1. By using this second drive method, the central area of the screen can be doubled. The resolution is also about 320,000 pixels, which is 491 pixels in the vertical direction and 650 pixels in the horizontal direction, which is the same as the first drive method. The timing charts are shown in FIGS. 5 and 6. During the vertical blanking period, VFS is applied to φV + and φV3, and the signal charge of the photoelectric conversion unit 12 is read out to the vertical CCD 13. Then, the overlapping signal charge 246 pixels of the high-speed LSI rear 1 and the high-speed LSI rear 2 one cycle before is continuously subjected to line shift 123 times and read out by the horizontal CCD 14. In the horizontal blanking period of FIG. 6, first, the line shift operation φVl, φV2, φV3, φV4 @ 10o line 1: t, and the signal charge for one line is transferred to the horizontal CCD14. Next, the horizontal transfer pulse φH1φH2 is driven by 40 to 60 MH2, and the overlapping signal charge of the high-speed horizontal transfer area 1 + area 2 is read out. Next, the enlarged area 650 pixels are read out at 12 MHz. FIG. 7 shows a second embodiment using an IT-COD of about 2 million pixels for a high-definition (1-ID) TV. In this element, the final electrode of the vertical COD is provided with a 1-horizontal period storage gate 8G, a 2-horizontal COD readout, and a horizontal division gate HG. The HD-TV element has an aspect ratio of vertical two-horizontal = 9:16 and a few vertical scanning lines. Therefore, when using the NTSC system, in order to achieve an aspect ratio of 3: 4, it has 982 vertical pixels and 1500500 horizontal. 500,000 pixels are used. The extra 500,000 strokes are read out during the vertical and horizontal blanking period. In the first drive mode, the signal charge photoelectrically converted by the photoelectric conversion unit 12 is transferred to the vertical CCD 13 during the vertical blanking period, and 35 pixels of the high-speed LSI rear 1 are transferred to the horizontal CCD 14+ and 142 for reading. During the horizontal

blanking 191 the ⊠ signal of the A field is added at the BG gate by the line shift twice operation, and is read out at the horizontal COD 141.142 after accumulating for one horizontal period.

Next, ⊠ The signal is similarly read out at horizontal C, CD14t 142 through the BG gate. Further, in the B field, the signal is read out in order to perform the interlacing operation. In the vertical direction, it is equivalent to 491 pixels with 2 pixels added. For the transfer of the horizontal CCD14 + and 142, after the line shift operation during the horizontal blanking period, the high-speed horizontal transfer area 1 is read at 26 MHz to 60 MHz, and the normal transfer area 1500 pixels are transferred at 14 Mf-1z during the horizontal effective period, and the final electrode φF11. φH2R8A and R8B are driven at 7 MHz, and 2 pixels in the horizontal direction are added and read by the final electrodes φH + and φH2m. The high-speed horizontal transfer area 2 is read over the high-speed transfer area 1 at the next horizontal transfer. FIG. 8 shows a second drive mode of the -fD-TV-like element. In the second drive mode, only the enlarged area vertical 491 pixels and horizontal 750 pixels are read in the effective period, and the high-speed LSI rear 1 and the area 2 are overlapped in the vertical blanking period to read the high-speed line shift operation. In addition, the high-speed horizontal transfer area 1 and area 2 are overlapped during the horizontal blanking period, and the horizontal transfer pulses φH + and φH2 are driven by 28 MHz to 60 MH2 to read 1 °. 1 ° FIG. 9 shows a third embodiment. In the figure, reference numeral 11 denotes a vertical 738 pixel, horizontal 1302302 pixel terrain transfer type CCDHia image sensor, and vertical COD is an image sensor capable of independently reading one pixel and one stage. In the first drive mode, the signal charge photoelectrically converted by the photoelectric conversion unit 12 is read out to the vertical CCD 13 during the vertical blanking period. The transferred signal charge transfers 5ioA 1 and 3 igA 2 and further Sia A 3 to the horizontal CCD 14 within the horizontal blanking period of the A field period. In the B field period, Si + JB2,51 gB5.8iaB4 is transferred to the horizontal CCD14 and the vertical 3 pixels are sieved in order to perform the interlacing operation. Further, the final electrode φH1 of the horizontal CCD 14 adds and reads out three pixels in the horizontal direction. In addition, φH1 and R8 are driven at a frequency of 8MH7, which is 1/3 of φHj and φH224MHz. FIG. 10 shows an embodiment of a 2x (225x) zoom, which is a second drive mode. Only the enlarged area vertical 492 pixels and horizontal 868 pixels are read out during the valid period, and the 123 pixels of the high-speed LSI rear 1 and the 123 pixels of the area 2 are overlapped and read out during the vertical blanking period.

Further, the high-speed horizontal transfer area 1 (217 pixels) and the area 2 (217 pixels) are read together at 30 to 60 MHz during the horizontal blanking period. The signal charge of the vertical C0D13 in the expansion area transfers 51 gA1 and SigA2 in the A field during the horizontal blanking period, and is read out as SiaA1 + S + aA2 by the horizontal CCD14. In the B fieki, SioB2 and 51gB5 are transferred to the horizontal CC [) 14 and read out in order to perform the interlacing operation. The transfer of the horizontal CCD 14 is performed at 16 MHz, the final electrode φH'is driven at 8 MHz, and two pixels in the horizontal direction are added and read at φH0. 2x zoom can be performed by this drive. FIG. 11 shows an embodiment of a 9x zoom, which is a third drive mode. Only the enlarged area vertical 246 pixels and horizontal 432 pixels are read out during the valid period, and the high-speed LSI rear 1 (246iii1iii element) and area 2 (246 pixels) are read out during the vertical blanking period. In addition, the high-speed horizontal transfer area 1 (432 pixels) and area 2 (432 pixels) are read out at 3 to 60 MHz during the horizontal blanking period. The signal charge of the vertical CCD 13 in the expansion area transfers only SioA1 to the horizontal CC014 in the A field during the horizontal blanking period. The B field also transfers the same signal SigB1 to the horizontal CCD. The transfer of the horizontal CCD 14 is performed at 8 MHz. Further, φ) -1'and R8 of the final electrodes are also performed at 8 MHz, and horizontal addition is not performed. 9x zoom can be performed by this drive. Although some of the preferred examples have been described above, many other examples and modifications can be considered. Some of them are described below. (3) In the embodiment, the interline transfer type ccom image element has been described, but the present invention can be applied to the frame transfer unit COD or the laminated type as long as it is a solid-state image sensor having a two-dimensional transfer unit. (3) In the embodiment, the zoom is set for both vertical and horizontal, and the zoom ratio is the same, but the zoom can be performed only in the vertical direction, in the horizontal direction, or by changing the respective zoom ratios. (3) Using an HD-TV element, the aspect ratio can be compressed to 3: 4 and all signals can be output by the NTSC method. (3) In the embodiment, the area other than the expanded area is read during the blanking period, but a part of the valid period may be used. At this time, the signal read during the valid period creates a wide blanking so that it does not appear on the monitor.

[Effects of the Invention] As described above, by using the drive method of the present invention, a high-performance electronic zoom can be realized in a solid 11i1 image element. Therefore, according to the present invention, a high-sensitivity mode or a high-resolution mode by pixel crimping can be selected depending on the subject. It can also be magnified with a zoom lens and further magnified with an electronic zoom. Also, unlike zooming by image processing, it can be executed in real time, there is no reduction in resolution even when zooming is performed, and memory and the like can be executed without using a processing device. Therefore, an inexpensive camera can be used for measurement and surveillance. Also, unlike the zoom of a lens, you can change the aspect ratio only in the direction you want to see and enlarge it.

[0002]

A brief description of the drawing

[0003]

FIG. 1 is a device configuration diagram for explaining the first drive method of the present invention, FIGS. 2 and 3 are useless timing jet diagrams for explaining the first drive mode, and FIG. 4 is a useless timing jet diagram. The device configuration diagram for explaining the second drive mode of the present invention, FIGS. 5 and 6, are timing chisate diagrams for explaining the second drive mode, and FIGS. 7 and 8 are. FIGS. 9, 10, and 11 showing an example in which the present invention is applied to an HD-TV element are explanatory views of a third embodiment of the present invention.

11 ... CCD1ll image element 12 ... Photoelectric conversion unit 13 ... Vertical CCD 14 ... Horizontal C0D15 ... Reset transistor 16 ... Output amplifier

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CLAIMS JPH03117985A

1.

A photoelectric conversion element formed in a box shape, a plurality of first charge transfer elements that accumulate the charges formed by the photoelectric conversion elements for each row and transfer the charges in the column direction, and these first charge transfers. A second charge transfer element that is connected to each end of the element and accumulates the transferred charge and transfers it in the row direction, and a charge that is connected to the end of the second charge transfer element and transferred. This is a method of driving a solid-state image sensor consisting of a device for accumulating and outputting the image signal as an image signal in two or more modes. In the first mode, the first charge transfer element is used for each row. The accumulated charges are transferred for a plurality of pixels, the sum of these charges is stored in the second charge transfer element, and then the charges are sequentially transferred in the column direction to obtain an image signal for one row, and this operation is repeated. The image signal for one sheet is formed, and in the second mode, the electric charge accumulated in the first charge transfer element for each row is transferred to the photoelectric with respect to some predetermined continuous rows. Corresponding to the ratio of the total length of the entire row of the conversion device to the length of the entire continuous column, the number of pixels smaller than that of the plurality of pixels is transferred, the charges are accumulated in the second charge transfer element, and then the transfer is performed in the row direction. A method for driving a solid-state image sensor, which comprises obtaining an image signal for one line and repeating this operation for the continuous lines to form an image signal for one sheet. (2) A photoelectric conversion element formed in a matrix, a plurality of first charge transfer elements that accumulate the charges formed by the photoelectric conversion elements for each row and transfer the charges in the row direction, and the first of these. A second charge transfer element that is connected to each end of the charge transfer element to accumulate the transferred charge and transfers it in the row direction, and a second charge transfer element that is connected to the end of the second charge transfer element and transferred. It is a method of driving a solid-state imaging device including a device that accumulates the received charges, detects them, and outputs them as an image signal in two or more modes. In the first mode, the second charge transfer element is used. The charge transfer cycle of the second charge transfer element is set to an integral multiple of the charge detection cycle of the output device so that the adjacently accumulated charges are detected after being added by the output device. In the mode, the method for driving the solid-state imaging device is characterized in that the charge transfer cycle of the second charge transfer element is an integral multiple smaller than that of the first mode of the accumulated charge detection cycle in the output device.

Espacenet

Bibliographic data: JPH0492592 (A) — 1992-03-25

IMAGE PICKUP DEVICE

Inventor(s): SASAKI TAKU [JP] ± (SASAKI TAKU)

Applicant(s): CANON KK [JP] ± (CANON INC)

Classification: **- international:** ***H04N5/225; H04N5/335; H04N5/341; H04N5/343; H04N5/353; H04N5/357; H04N5/363; H04N5/369; H04N5/3728; H04N5/378; H04N9/07;*** (IPC1-7): H04N5/225; H04N5/335; H04N9/07

- cooperative:

Application number: JP19900208244 19900808

Priority number(s): JP19900208244 19900808

Also published as: JP3180191 (B2)

Abstract of JPH0492592 (A)

PURPOSE:To record a frame picture of high resolution and high sensitivity in every mode by inputting the output of an adding means when selecting a still video camera mode, and generating a luminance signal and a color difference signal by a signal processing. CONSTITUTION:When the still video camera mode is selected, a system controller 128 interlaces a CCD 104 through a first system timing generator 126 and a CCD driver 124, and reads only one column in one horizontal scanning period. On the other hand, when a video camera operation is selected, the system controller 128 operates supply to the CCD 104, interlaces the CCD 104, and operates a vertical 2 picture element mixing read-out. Thus, the vertical 2 picture element mixing read-out and the frame picture equivalent to the same can be recorded even in both the video camera mode and the still video camera mode.

⑲日本国特許庁（ＪＰ）　⑪特許出願公開

⑫公開特許公報（Ａ）　平4－92592

⑤1Int. Cl.[5]	識別記号	庁内整理番号	⑬公開　平成4年(1992)3月25日
H 04 N 9/07	A	8943－5C	
5/225	Z	8942－5C	
5/335	Z	8838－5C	

審査請求　未請求　請求項の数 3　（全7頁）

⑤4発明の名称　撮像装置

⑳特　願　平2－208244
㉒出　願　平2(1990)8月8日

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⑦1出願人　キヤノン株式会社　東京都大田区下丸子3丁目30番2号
⑦4代理人　弁理士　丹羽　宏之　外1名

明　細　書

1．発明の名称

撮　像　装　置

2．特許請求の範囲

（1）つぎのａ～ｇの構成要素を備えたことを特徴とする撮像装置。

ａ．撮像素子。

ｂ．ビデオカメラモード、スチルビデオカメラモードのいずれかのモードを選択するモード選択手段。

ｃ．前記モード選択手段でビデオカメラモードを選択したとき、前記撮像素子をインターレース走査で垂直２画素混合読出しするように駆動する第１の駆動手段。

ｄ．前記モード選択手段でスチルビデオカメラモードを選択したとき、前記撮像素子をインターレース走査で一列ずつ読み出すように駆動する第２の駆動手段。

ｅ．前記第２の駆動手段による駆動時に、前記撮像素子の第１フィールド信号及び第２フィールド信号を記録するメモリ。

ｆ．前記メモリの第１フィールド信号とこれに対応する第２フィールド信号とを加算する加算手段。

ｇ．前記モード選択手段で、ビデオカメラモードを選択したとき前記撮像素子の出力を入力し、スチルビデオカメラモードを選択したとき前記加算手段の出力を入力して、信号処理により輝度信号，色差信号を生成する信号処理手段。

（2）撮像素子は、横に２画素、縦に４画素の計８画素上に、４つの異なる色フィルタＡ，Ｂ，Ｃ，Ｄが、第１列にＡ－Ｂ、第２列にＣ－Ｄ、第３列にＡ－Ｂ、第４列にＤ－Ｃと配置されてなるパターンで、縦，横方向にくり返し設けられており、かつ４つの異なる色フィルタが、シアン，マゼンタ，イエロ，グリーンの色フィルタであることを特徴とする請求項１記載の撮像装置。

（3）ビデオカメラモード時には垂直２画素混合読出しをし、スチルビデオカメラモード時には、

フィールドメモリを用い垂直２画素混合読出しと同等の信号を得ることを特徴とする撮像装置。

3．発明の詳細な説明

〔産業上の利用分野〕

本発明は、ビデオムービカメラ（以下ビデオカメラという）動作と、スチルビデオカメラ動作の可能な撮像装置に関するものである。

〔従来の技術〕

従来、スチルビデオカメラの撮像方式は、民生用ビデオカメラの撮像方式を利用したものが多い。民生用ビデオカメラの色フィルタ配置としては、第３図の（ａ），（ｂ）のような純色又は補色のストライプフィルタ方式や、第３図（ｃ）のようなＧ（グリーン）ストライプ，Ｒ（レッド）／Ｂ（ブルー）線順次方式、そして第３図（ｄ）のような補色モザイク方式がすでに実用化されたり、提案されている。

この中で、第３図（ａ），（ｂ）に示すようなストライプ状の色フィルタや第３図（ｃ）に示すような色フィルタ配列を装着した撮像素子を用いた場合は、スチルビデオカメラ動作時にフレーム画も得られ、かつビデオカメラに用いて、ムービ画（動画）を得ることもできるので、第４図に示すように構成することで、ビデオカメラ動作もできるスチルビデオカメラを簡単に構成することができた。

すなわち、ビデオカメラ動作時には、シャッタ２０２を開放にし、撮像素子であるＣＣＤ（charge-coupled device）２０４をビデオ駆動する。ＣＣＤ２０４の出力は、共通のアナログ映像信号処理部２０５で処理され、輝度信号，色差信号が生成される。これをエンコーダ２０６で標準ビデオ信号にする。

また、スチルビデオカメラ動作時には、シャッタ２０２を１回だけ開放し、蓄積された電荷をビデオカメラ動作時と全く同一の方法で読み出し処理すれば、輝度信号，色差信号が得られるので、これを変調してビデオフロッピへ記録できた。

〔発明が解決しようとする課題〕

更に、次に説明するように、第３図（ｄ）の色フィルタを用いて同様に構成すれば、更に高解像度で高感度のビデオカメラ動作可能なスチルビデオカメラが構成できると考えられた。

まず、解像度については、例えば今井邦雄著“民生用ビデオムービーにおける良い画質の現状技術”エレクトロニクス　エッセンシャルズ No.21 July 1989 に述べられているように、撮像素子の水平方向の画素数をＮとすると、ストライプフィルタを用いた場合には、その水平方向解像度は、0.44Ｎ　ＴＶ本にとどまるのに対し、第３図（ｃ）又は第３図（ｄ）のような水平方向に２画素くり返しの構造をもったフィルタを用いた場合は、その水平解像度は0.65Ｎ　ＴＶ本となる。つまり、解像度に関しては、第３図（ｃ）や（ｄ）のような配列が有利である。

また、純色と補色の比較においては、平均的な透過率が補色の場合の方が高く、入射光の有効利用，感度の面で、補色の方が有利である。

信号処理が簡単で、装置がコンパクトになるという点では、ストライプ方式が有利であるが、最近ではＩＣ技術が進歩したため、第３図（ｃ）や（ｄ）の色フィルタを用いた場合でも、装置はそれほど大規模化しない。

また色再現性，色のＳ／Ｎなどの点からは、純色が優れていると考えられているが、信号処理方式の進歩により、補色方式でも、充分な色再現性を得られるようになってきている。

従って、より高解像度で、より感度の高いビデオカメラやスチルビデオカメラを実現するためには、第３図（ｄ）のような補色モザイク型の撮像素子を用いるのが望ましいと考えられる。

実際、現在世の中の民生用ビデオカメラのほとんどがこの第３図（ｄ）の色フィルタ配列を採用するまでになってきているのも事実である。

以上の説明のように、第３図（ｄ）の配列を用いてスチルビデオカメラを構成すると、画質には大きな向上が期待できるが、反対にひとつの大きな問題があった。

第３図（ｄ）のような色フィルタ配列の撮像素

子を用いて、スチルビデオカメラを構成すると、フレーム画が得られず、フィールド画専用カメラになってしまうという問題であった。

この理由を以下に説明する。

第３図（ｄ）のようなフィルタを装着したＣＣＤでは、ビデオ動作の場合、通常第１フィールドの第１の水平走査期間では第１列目と第２列目、第２の水平走査期間では第３列目と第４列目というように、混合加算して読み出してゆくので、奇数番目の水平走査期間では、

（Ｍｇ＋Ｃｙ）と（Ｇｒ＋Ｙｅ）の信号が交互に得られ、

偶数番目の水平走査期間では、

（Ｍｇ＋Ｙｅ）と（Ｇｒ＋Ｃｙ）の信号が交互に得られる。なお、Ｍｇはマゼンタ、Ｃｙはシアン、Ｇｒはグリーン、Ｙｅはイエロを示す。

これらの信号を加算，減算して、輝度信号と色差信号を得るようにすると、

奇数番目の水平走査期間では、

輝度信号Y_{2n+1}＝Ｍｇ＋Ｃｙ＋Ｇｒ＋Ｙｅ

色差信号C_{2n+1}＝（Ｍｇ＋Ｃｙ）－（Ｇｒ＋Ｙｅ）

となり、又、偶数番目の水平走査期間では、

輝度信号Y_{2n}＝Ｍｇ＋Ｙｅ＋Ｇｒ＋Ｃｙ

色差信号C_{2n}＝（Ｍｇ＋Ｙｅ）－（Ｇｒ＋Ｃｙ）

となる。

従って、１Ｈ（水平走査期間）遅延線などを用いて色差信号を同時化することにより、各水平走査期間で、輝度信号と２つの色差信号が得られるため、まず、第１フィールドのフィールド画が形成できることになる。ビデオカメラ動作の場合は、常に光がレンズを通して撮像素子に入射しており、第１フィールドの読出しが行なわれた直後から、電荷の蓄積が開始されているので、次のフィールドで、今度は第２列目と第３列目、第４列目と第５列目を混合加算して読み出し、同様な方法で第２フィールドを形成することができ、フレーム画を得ることができる。

しかし、スチルビデオカメラの場合における露光は、シャッタが開いた１回だけなので、第１フィールドの読出しですでに電荷が読み出されてしまった後は、ＣＣＤに電荷が残っていないので、第２フィールドの形成が不能になり、従ってフレーム画を得ることができない。

このため、第３図（ｄ）の配列を用いて、ビデオカメラ動作が可能で、かつフレーム画の記録できるスチルビデオカメラは、構成できなかった。

本発明は、このような問題を解決するためなされたもので、第３図（ｄ）に示す色フィルタを設けた撮像素子を用いて、ビデオカメラ動作，スチルビデオカメラ動作でフレーム画の得られる撮像装置を提供することを目的とするものである。

〔課題を解決するための手段〕

前記目的を達成するため、本発明では、撮像装置をつぎの（１），（２）のとおりに構成する。

（１）つぎのａ～ｇの構成要素を備えた撮像装置。

ａ．横に２画素、縦に４画素の計８画素上に、４つの異なる色フィルタＡ，Ｂ，Ｃ，Ｄが、第１列にＡ－Ｂ、第２列にＣ－Ｄ、第３列にＡ－Ｂ、第４列にＤ－Ｃと配置されてなるパターンが、縦，横方向にくり返し設けられている撮像素子。

ｂ．ビデオカメラモード，スチルビデオカメラモードのいずれかのモードを選択するモード選択手段。

ｃ．前記モード選択手段でビデオカメラモードを選択したとき、前記撮像素子をインターレース走査で垂直２画素混合読出しするように駆動する第１の駆動手段。

ｄ．前記モード選択手段でスチルビデオカメラモードを選択したとき、前記撮像素子をインターレース走査で一列ずつ読み出すように駆動する第２の駆動手段。

ｅ．前記第２の駆動手段による駆動時に、前記撮像素子の第１フィールド信号及び第２フィールド信号を記録するメモリ。

ｆ．前記メモリの第１フィールド信号とこれに対応する第２フィールド信号とを加算する加算手段。

g．前記モード選択手段で、ビデオカメラモードを選択したとき前記撮像素子の出力を入力し、スチルビデオカメラモードを選択したとき、前記加算手段の出力を入力して、信号処理により輝度信号，色差信号を生成する信号処理手段。

（２）前記（１）において、撮像素子は、横に２画素、縦に４画素の計８画素上に、４つの異なる色フィルタＡ，Ｂ，Ｃ，Ｄが、第１列にＡ－Ｂ、第２列にＣ－Ｄ、第３列にＡ－Ｂ、第４列にＤ－Ｃと配置されてなるパターンで、縦，横方向にくり返し設けられており、かつ４つの異なる色フィルタが、シアン，マゼンタ，イエロ，グリーンの色フィルタである撮像装置。

（３）ビデオカメラモード時には垂直２画素混合読出しをし、スチルビデオカメラモード時には、フィールドメモリを用い垂直２画素混合読出しと同等の信号を得る撮像装置。

（作　用）

前記（１），（２），（３）の構成によれば、第２図（ｄ）に示す色フィルタを設けた撮像素子を用い、ビデオカメラモード，スチルビデオカメラモードのいずれのモードにおいても、垂直２画素読出し又はそれと同等のフレーム画を記録できる。

（実施例）

以下、本発明を実施例で説明する。第１図は本発明の一実施例である"撮像装置"の構成図である。図示装置は，撮像素子であるＣＣＤ１０４に、第３図（ｄ）に示す色フィルタを設けており、不図示のビデオカメラモード／スチルビデオカメラモードの選択スイッチによって、ビデオカメラ動作又は、スチルビデオカメラとしての動作を行うことができるものである。

今、スチルビデオカメラモードが選択されたとする。不図示のシャッタボタンからの信号で、適当な時間だけシャッタ１０２が開かれ、その間にＣＣＤ１０４の各画素にレンズ１０３で形成された光子像に応じて、電荷が蓄積される。もちろん、シャッタ１０２が開かれる前には、画素の電荷はクリヤされ、零であったとする。システムコントローラ１２８は、シャッタドライバ１２３を介してシャッタ１０２を再び閉じたのち、スチルビデオカメラ用の第１のシステムタイミングジェネレータ１２６とＣＣＤドライバ１２４を介してＣＣＤ１０４をインタレースしながら一水平走査期間に一列だけを読み出してゆく。すなわち、第１フィールドでは第１，３，５……列を、第２フィールドでは第２，４，６……列を読み出してゆく。

読み出された信号は、アナログ処理部１２１で、ＣＤＳ（相関２重サンプリング）やプレニーなどの処理をされ、画素ごとのクロックでＡ／Ｄ変換器１０５でＡ／Ｄ変換される。ビット数は、色信号の量子化誤差を考慮して１０ビット以上が望ましい。スチルビデオカメラモードが選択されているときは、システムコントローラ１２８は、スイッチ１２２をＳ側にする。

第１フィールド読出し時は、スイッチ１０６はａに接続されていて、Ａ／Ｄ変換された結果は、第１のフィールドメモリ１０７へ格納される。この場合、第１のフィールドメモリ１０７には、Ｍｇ及びＧｒの信号が格納される。第２フィールド読出し時は、スイッチ１０６はｂ側に接続されていて、Ａ／Ｄ変換された結果は第２のフィールドメモリ１０８へ格納される。この場合、第２のフィールドメモリ１０８にはＣｙ及びＹｅの信号が格納される。

次に、フィールドメモリ１０７と、フィールドメモリ１０８を対応するアドレス走査で順次同時に読み出し、その結果を加算器１１０で加算する。

この結果、加算器１１０の出力は次のようになる。

（２ｎ－１）の奇数番目の水平走査期間は、４ｎ－３列目のＭｇと４ｎ－２列目のＣｙの和と、４ｎ－３列目のＧｒと４ｎ－２列目のＹｅの和が交互に出力される。但し、ｎ＝１，２……２６２である。

（２ｎ）の偶数番目の水平走査期間は、（４ｎ－１）列目のＭｇと４ｎ列目のＹｅの和と、

（４ｎ－１）列目のＧｒと４ｎ列目のＣｙの和が出力される。つまりＣＣＤ１０４を垂直２画素混合読み出しした場合と同様の出力がえられる。

次に、システムコントローラ１２８は、アドレスコントローラ１３１を介して、第１のフィールドメモリ１０７の第２列目及び第２のフィールドメモリ１０８の１列目から順次読み出してゆく。すると、第１のフィールドメモリ１０７の２列目のＭｇすなわち、ＣＣＤ１０４の中では３列目のＭｇが読み出されている時に、第２のフィールドメモリ１０８の１列目のＣｙすなわち、ＣＣＤ１０４の中では２列目のＣｙが読み出されることになる。

この結果、加算器１１０の出力は次のようになる。

（２ｎ－１）の奇数番目の水平走査期間は、４ｎ－２列目のＣｙと４ｎ－１列目のＭｇの和と、４ｎ－２列目のＹｅと４ｎ－１列目Ｇｒの和が交互に出力され、２ｎの偶数番目の水平走査期間は４ｎ列目のＹｅと４ｎ＋１列目のＭｇとの和と４ｎ列目のＣｙと４ｎ＋１列目のＧｒとの和が交互に出力されることになる。

加算器１１０の結果は、Ｄ／Ａ変換器１１１へ接続されているので、Ｄ／Ａ変換器１１１の出力は、次のようになる。

①第１のメモリの読出し時：

ＣＣＤ１０４を垂直２画素混合読み出しした場合の第１フィールドと同様なアナログ出力

②その後のメモリの読出し時：

ＣＣＤ１０４を垂直２画素混合読み出しした場合の第２フィールドと同様なアナログ出力

スイッチ１２２は、Ｓ側に接続されているので、Ｄ／Ａ変換器１１１の出力はアナログ映像信号処理部１１２に入力されて、輝度信号Ｙと２つの色差信号Ｙ－Ｒ，Ｙ－Ｂが生成される。これを変換部１１３で輝度と色度の変調信号に変調し、これらを混合部１１４で混合し、記録アンプ１１５で記録ヘッド１２０を駆動し、フロッピディスク１３０へ画像を記録する。

アナログ映像信号処理１１２の構成は、例えば佐々木著“スチルビデオカメラシステムにおける画像設計ワークショップ・ファインイメージング論文集”Aug.1989に説明されているような、色差処理方式，ＹＲＢ方式，ＲＧＢ原色分離方式のどれでもよい。

以上が、スチルビデオカメラモード時の動作である。

一方、ビデオカメラ動作が選択されると、システムコントローラ１２８は、ビデオカメラ用の第２のタイミングジェネレータ１２７で発生するタイミングパルスをＣＣＤドライバ１２４を介して、ＣＣＤ１０４へ供給し、ＣＣＤ１０４をインタレースで垂直２画素混合読み出しを行なう。

この動作は、従来例の説明の所で説明した通りなので、ここでの説明は省略する。今度はスイッチ１２２は、システムコントローラ１２８によってＭ側へ倒されているので、ＣＣＤ１０４の出力は、直接アナログ映像信号処理部１１２へ入力され、輝度信号Ｙと２つの色差信号Ｙ－Ｒ，Ｙ－Ｂとなる。これらは、エンコーダ１３１へ入力され、標準ビデオ信号として出力される。

尚、ビデオカメラ動作時の場合、システムコントローラ１２８は、シャッタドライバ１２３を駆動して、シャッタ１０２を開放した状態にするようにしておく。

本発明は、色フィルタがＭｇ，Ｇｒ，Ｃｙ，Ｙｅの４色のものに限定されるものでなく、他にも第２図（ａ）に示すようなＷ（ホワイト：透明），Ｇｒ，Ｃｙ，Ｙｅ等第２図（ｃ）に示すような、４つの異なった色フィルタが図示のパターンに配置されているものならばなんでもよく、純色フィルタでもよい。

また、第２図（ｂ）の場合は、Ａからみると、Ｍｇ→Ｇｒ→Ｃｙ→Ｙｅ→Ｇｒ→Ｍｇ→Ｃｙ→Ｙｅであり、Ｂからみると、Ｃｙ→Ｙｅ→Ｇｒ→Ｍｇ→Ｃｙ→Ｙｅ→Ｍｇ→Ｇｒとなるが、これも（ｃ）と同一のパターンとみなす。

〔発明の効果〕

以上説明したように、本発明によれば、第２図（ｄ）に示すタイプの色フィルタを設けた撮像素

子を用いて、ビデオカメラモード，スチルビデオカメラモードのいずれのモードにおいても、高解像度，高感度のフレーム画を記録できる。

4．図面の簡単な説明

第１図は本発明の一実施例の構成図、第２図は本発明で用いる色フィルタの配列を示す図、第３図は色フィルタの配列例を示す図、第４図は従来例の構成図である。

１０４…撮像素子であるＣＣＤ

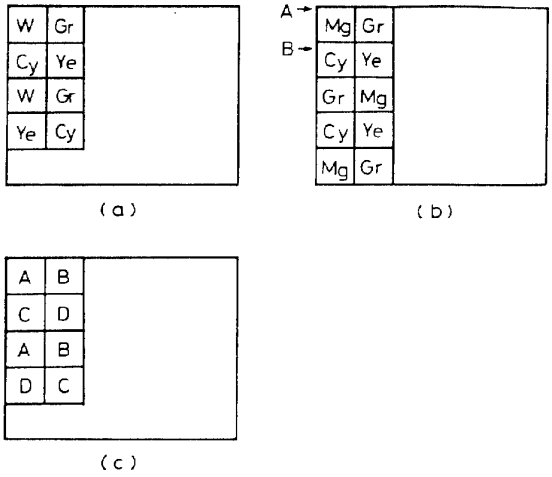
１０６，１２２…スイッチ

１０７，１０８…フィールドメモリ

１１０…加算器

１１２…アナログ映像信号処理部

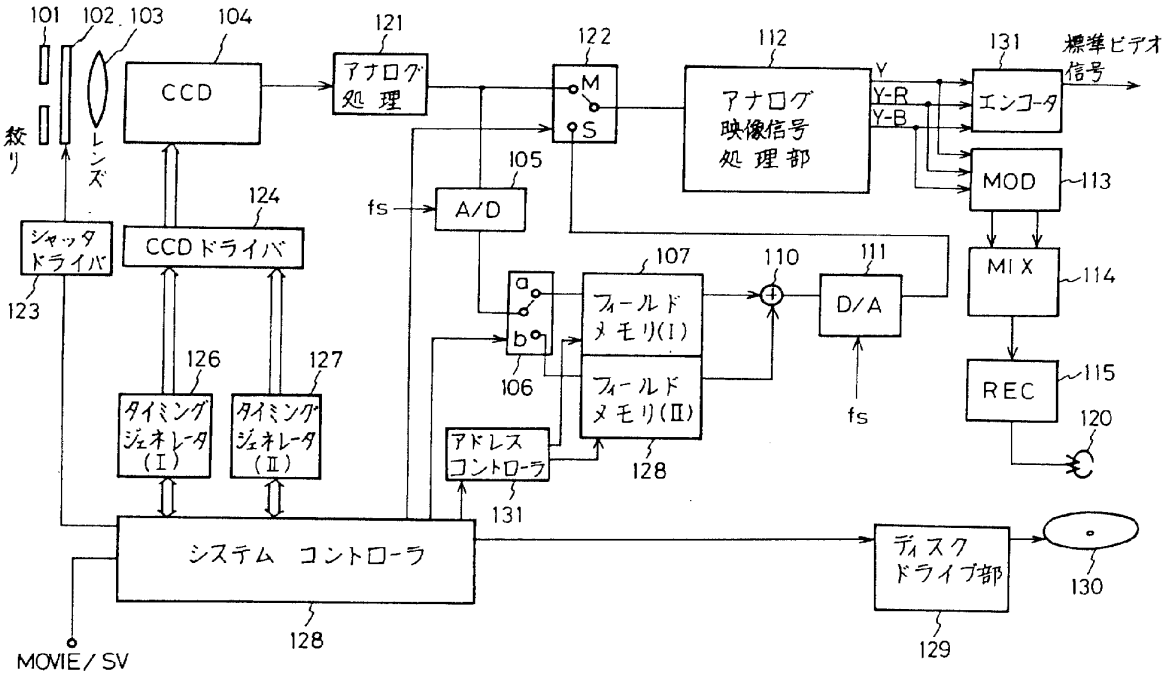
１２６，１２７…タイミングジェネレータ



本発明で用いる色フィルタの配列を示す図

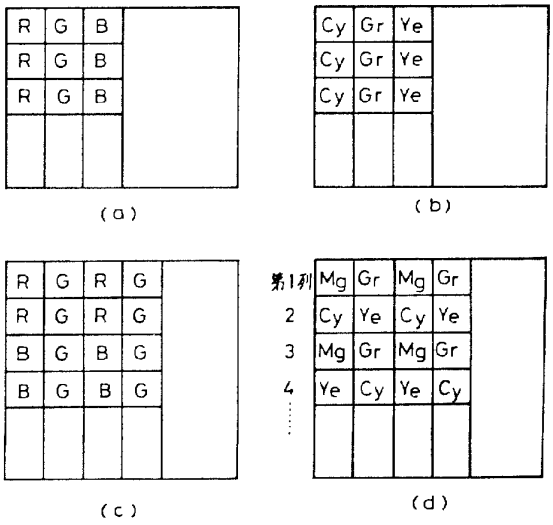
第 2 図

出願人　キヤノン株式会社



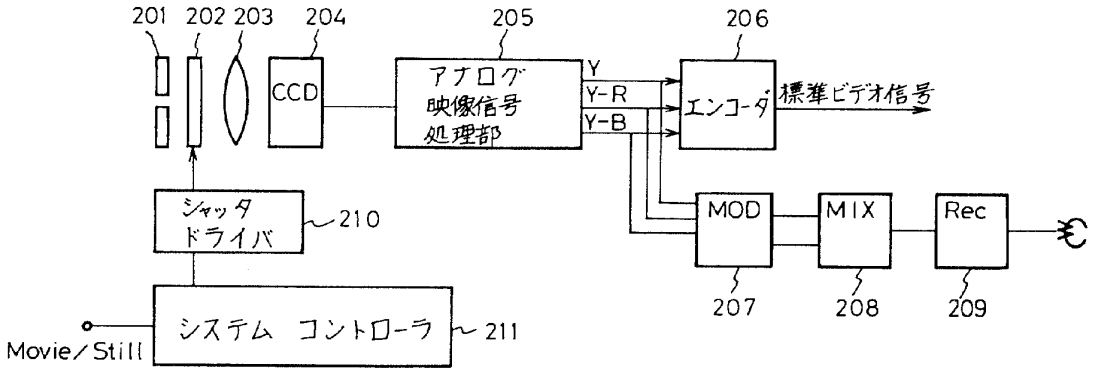
実施例の構成図

第 1 図



色フィルタの配列例を示す図

第 3 図



従来例の構成図

第 4 図

Espacenet

Bibliographic data: JPH0492592 (A) — 1992-03-25

IMAGE PICKUP DEVICE

Inventor(s): SASAKI TAKU [JP] ± (SASAKI TAKU)

Applicant(s): CANON KK [JP] ± (CANON INC)

Classification: **- international:** ***H04N5/225; H04N5/335; H04N5/341; H04N5/343; H04N5/353; H04N5/357; H04N5/363; H04N5/369; H04N5/3728; H04N5/378; H04N9/07;*** (IPC1-7): H04N5/225; H04N5/335; H04N9/07

- cooperative:

Application number: JP19900208244 19900808

Priority number(s): JP19900208244 19900808

Also published as: JP3180191 (B2)

Abstract of JPH0492592 (A)

PURPOSE:To record a frame picture of high resolution and high sensitivity in every mode by inputting the output of an adding means when selecting a still video camera mode, and generating a luminance signal and a color difference signal by a signal processing. CONSTITUTION:When the still video camera mode is selected, a system controller 128 interlaces a CCD 104 through a first system timing generator 126 and a CCD driver 124, and reads only one column in one horizontal scanning period. On the other hand, when a video camera operation is selected, the system controller 128 operates supply to the CCD 104, interlaces the CCD 104, and operates a vertical 2 picture element mixing read-out. Thus, the vertical 2 picture element mixing read-out and the frame picture equivalent to the same can be recorded even in both the video camera mode and the still video camera mode.

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DESCRIPTION JPH0492592A

[0001]

[Industrial Application Field] The present invention relates to an image pickup device capable of operating a video movie camera (hereinafter referred to as a video camera) and a still video camera. [Conventional Technology] Conventionally, most of the imaging methods of still video cameras use the imaging method of consumer video cameras. As the color filter arrangement of the consumer video camera, a pure color or complementary color stripe filter method as shown in FIGS. 3 (a) and 3 (b) and a G (green) stripe as shown in FIG. 3 (C) are used. , R (red) / B (blue) +1! The sequential method and the complementary color mosaic method as shown in FIG. 3D have already been put into practical use or proposed. Among these, when an image pickup device equipped with a stripe-shaped color filter as shown in FIGS. 3A and 3B or a color filter array as shown in FIG. 3C is used, it is still. A frame image can be obtained when the video camera is operating, and a movie image (moving image) can be obtained by using the video camera. Therefore, by configuring as shown in Fig. 4, a still video camera that can also operate the video camera. Could be easily configured. That is, when the video camera is operating, the shutter 202 is opened and the CCD (charge-coupled device) 204, which is an image sensor, is video-driven. The output of the CCD 204 is processed by a common analog video signal processing unit 205 to generate a luminance signal two-color difference signal. This is converted into a standard video signal by the encoder 206. Further, when the still video camera is operated, if the shutter 202 is opened only once and the accumulated charge is read out by the same method as when the video camera is operated, a luminance signal one color difference signal is obtained, so that the stiffness is modulated. I was able to record it on the video floppy. [Problems to be Solved by the Invention] Further, as will be described next, if the same configuration is performed using the color filter shown in FIG. 3D, a still video capable of operating a video camera with higher resolution and higher sensitivity can be operated. It was thought that the camera could be configured. First, regarding the resolution, for example, as described in Kunio Imai, "Current Technology of Good Image Quality in Consumer Video Movies," Electronics Essentials No. 2] July 1989, the number of pixels in the horizontal direction of the image sensor is set to N. Then, when the stripe filter is used, its horizontal resolution is only 0.44 NTV, whereas it is 2 in the horizontal direction as shown in Fig. 3 (c) or Fig. 3 (d). When a filter having a pixel repeating structure is used, the horizontal resolution is 0.65 NTV.

That is, with respect to the resolution, the arrangement as shown in FIGS. 3C and 3D is advantageous. Further, in the comparison between the pure color and the complementary color, the average transmittance is higher in the case of the complementary color, and the complementary color is more advantageous in terms of effective utilization of the incident light y5 + degree. The stripe method is advantageous in that signal processing is easy and the device is compact. However, due to recent advances in IC technology, even when the color filters shown in FIGS. 3C and 3D are used. , The equipment is not so large. Color reproducibility Pure colors are considered to be superior in terms of S / N of one color, but with the progress of the No. 8 processing method, sufficient color reproducibiiily can be obtained even with the complementary color method. Is becoming. Therefore, in order to realize a video camera or a still video camera having higher resolution and higher sensitivity, it is considered desirable to use a complementary color mosaic type image sensor as shown in FIG. 3D. In fact, it is a fact that most of the consumer video cameras in the world today have adopted the color filter array shown in Fig. 3 (d). As described above, when the still video camera is configured by using the arrangement shown in FIG. 3D, a great improvement in image quality can be expected, but on the contrary, there is one big problem. When a still video camera is configured by using an image sensor having a color filter arrangement as shown in FIG. 3D, there is a problem that a frame image cannot be obtained

and the camera becomes a field image dedicated camera. The reason for this will be described below. In a CCD equipped with a filter as shown in FIG. 3D, in the case of video operation, usually in the first horizontal scanning period of the first field, the first and second rows, and in the second horizontal scanning period, Since the signals are mixed and added and read out in the third and fourth columns, the signals of (Mg + Cy) and (Gr + Ye) are alternately obtained in the odd-numbered horizontal scanning period, and the even-numbered horizontal scanning is performed. During the period, (Mg + Ye) and (Gr + Cy) signals are obtained alternately. In addition, Mg indicates macenta, cy indicates cyan, Gr indicates green, and Ye indicates yellow. When these signals are added or subtracted to obtain a luminance signal and a color difference signal, the luminance signal Y 2n + I = Mg + Cy + Gr + Ye color difference signal c2n + I = (in the odd-th horizontal scanning period). Mg "Cy) (Gr + Ye), and in the even-th horizontal scanning period, the luminance signal Y2n = Mg10Ye + Gr + Cy color difference signal C2 = (Mg + Ye)-(Gr + Cy) It becomes.

Therefore, by simultaneously synchronizing the color difference signals using an IH (horizontal scanning period) delay line or the like, a luminance signal and two color difference signals can be obtained in each horizontal scanning period. It will be possible to form. In the case of video camera operation, light is always incident on the image pickup element through the lens, and the eight product of charges starts immediately after the first field is read out, so in the next field, this time. The second and third columns, and the fourth and fifth columns are mixed and added and read out, and the second field can be formed in the same manner to obtain a frame image. However, in the case of a still video camera, the exposure is performed only once when the shutter is opened, so after the charge has already been read by reading the first field, no charge remains in the CCD, so the second The formation of the field becomes impossible, and therefore the frame image cannot be obtained. Therefore, a still video camera capable of operating a video camera and recording a frame image using the arrangement shown in FIG. 3D cannot be configured. The present invention has been made to solve such a problem, and a frame image can be obtained by a video camera operation and a still video camera operation by using an image sensor provided with a color filter shown in FIG. 3D. It is an object of the present invention to provide an image pickup apparatus. [Means for Solving the Problems] In order to achieve the above object, in the present invention, the image pickup apparatus is configured as follows (1) and (2). (1) An imaging device including a-g components with (1). On a total of 8 pixels, 2 pixels horizontally and 4 pixels vertically, 4 different color filters A, B, C, D are arranged in the first row, AB, and in the second row, CD, the third. The pattern in which AB is arranged in the row and DC is arranged in the fourth row is vertical. An image sensor that is repeatedly provided in the horizontal direction. b. Mode selection means for selecting one of the video camera mode and the still video camera mode. c. A first driving means for driving the image sensor so as to read out a mixture of two vertical pixels by interlaced scanning when the video camera mode is selected by the navigation mode selection means. d. A second driving means for driving the image sensor to read out one row at a time by interlaced scanning when the still video camera mode is selected by the mode selecting means. e. A memory that records the first field signal and the second field signal of the image pickup device when driven by the second driving means. f, An adding means for adding the first field signal of the memory and the corresponding second field signal.

g. When the video camera mode is selected by the mode selection means, the output of the image sensor is input, and when the still video camera mode is selected, the output of the addition means is input, and the brightness signal is one color difference by signal processing. A signal processing means that produces a signal. (2) In the above (1), the image sensor has four different color filters A, B, C, and D on a total of eight pixels, two pixels horizontally and four pixels vertically, and AB in the first row. , CD in the 2nd column, AB in the 3rd column, DC in the 4th column, which are repeatedly provided in the vertical and horizontal directions, and four different color filters are cyan. An image sensor that is a color filter for magenta, yellow, and green. (3) An imaging device that obtains a signal equivalent to vertical 2-pixel mixed reading using a field memory in a video camera mode in which vertical 2-pixel mixed continuous output is performed. [Production] According to the configurations of (1), (2), and (3) above, the image sensor provided with the color filter shown in FIG. 2 (d) is used, and the video camera mode and the still video camera mode are used. Even in the mote of Zuwa, it is possible to read out two vertical pixels or record a frame image equivalent to that of Zuwa. [Example] Hereinafter, the present invention will be described with reference to Examples. FIG. 1 is a block diagram of an "imaging apparatus" according to an embodiment of the present invention. The illustrated device is provided with a color filter shown in FIG. 3D on the CCD 104, which is an image pickup element, and a video camera operation or a still video can be operated by a video camera mode / still video camera mode selection switch (not shown). It can operate as a camera. Now suppose the still video camera mode is selected. A signal from a shutter button (not shown) opens the shutter 102 for an appropriate time, and during that time, charges are accumulated in each pixel of the CCD 104 according to the photon image formed by the lens 103. Of course, it is assumed that the charge of the pixel was cleared and was zero before the shutter 102 was opened. The system controller 128 closes the shutter 102 again via the shutter driver 123, and then interlaces the CCD 104 via the first system timing generator 126 for the still video camera and the COD driver 124 in a row in one horizontal scanning period. Only read out. That is, the 1.3.5 .... column is read out in the first field, and the 2.4.6 .... column is read out in the second field. The read signal is processed by the analog processing unit 121 such as CDS (correlation double sampling) and prenj, and is A / D converted by the A / D converter 105 with the clock for each pixel.

The number of bits is preferably 10 bits or more in consideration of the quantization error of the color signal. When the still video camera mode is selected, the system controller 128 sets the switch 122 to the S side. At the time of reading the first field, the switch 106 is connected to a, and the result of the A / D conversion is stored in the first field memory 107. In this case, Mg and Gr No. 15 are stored in the first field memory 107. At the time of reading the second field, the switch 106 is connected to the b side, and the result of the A / D conversion is stored in the second field memory 108. In this case, the Cy and Ye signals are stored in the second field memory 108. Next, the field memory 107 and the field memory 108 are sequentially read at the same time by scanning the corresponding addresses, and the results are added by the adder 110. As a result, the output of the adder 110 is as follows. The odd-numbered horizontal scanning period of (2n-1) is the sum of Mg in the 4n-3rd row and cy in the 40-2nd row, Gr in the 11th row of 4n-3, and Ye in the 40-2nd row. It is output in sum or alternately. However, n = 1.2 ... 262. For the even-numbered horizontal scanning period of (2n), the sum of Mg in the (4n-1) column and Ye in the 4n column, and the sum of Gr in the (4n-1) column and cy in the 4n column are output. Will be done. That is, the output can be returned in the same manner as when the CCD 104 is read out by mixing two vertical pixels. Next, the system controller 128 sequentially reads from the second column of the first field memory 107 and the first column of the second field memory 108 via the address controller 131. Then, when the Mg in the second row of the first field memory 107, that is, the Mg in the third row in the CCD 104 is being read, the cy of the second field memory 108, that is, the CCD 104. In, the second column Cy will be read out. As a result, the output of the adder 110 is as follows. The odd-numbered horizontal scanning period of (2n-1) is the sum of cy in the 4n-2nd column and Mg in the 40-1st column, and the sum of Ye in the 4n-2nd column and Gr in the 40-1st column. It is output alternately, and in the even-numbered horizontal scanning period of 2n, the sum of Ye in the 400th column and Mg in the 4n + 1th column and the sum of cy in the 4nth column and Gr in the 40,000th column are output alternately. Especially Naru. Since the result of the adder 110 is connected to the D / A converter 111, the output of the D / A converter 111 is as follows.

⊠ When reading the first memory: Analog output similar to the first field when the CCD 104 is read in a mixed vertical 2 pixels ⊠ When reading the memory thereafter: Same as the second field when the CCD 104 is read in a mixed vertical 2 pixels Since the analog output switch 122 is connected to the S side, the output of the D / A converter 111 is input to the analog video signal processing unit 112, and the luminance signal Y and the two color difference signals YR, Y- B is generated. This is modulated into a modulated signal of brightness and chromaticity by the conversion unit 113, these are mixed by the mixing unit 114, the recording amplifier 115 drives the recording head 120, and the image is recorded on the floppy disk 130. The configuration of the analog video signal processing 112 includes, for example, a color difference processing method, a YRB method, and an RGB primary color separation method as described in "Image Design Workshop for Still Video Camera Systems, Fine Imaging Proceedings" Aug, I989. Any of them will do. The above is the operation in the still video camera mode. On the other hand, when the video camera operation is selected, the system controller 128 supplies the timing pulse generated by the second timing generator 127 for the video camera to the CCD 104 via the CCD driver 124, and interlaces the CCD 104. Performs vertical 2-pixel mixed reading with. Since this operation is as described in the description of the conventional example, the description here will be omitted. Since the switch 122 is tilted to the M side by the system controller 128 this time, the output of the CCD 104 is directly input to the analog video signal processing unit 112, and the luminance signal Y and the two color difference signals YR and YB It becomes. These are input to the encoder 131 and output as a standard video signal. When the video camera is operating, the system controller 128 drives the shutter triber 123 to open the shutter 102. In the present invention, the color filters are Mg, Gr, Cy. It is not limited to the four colors of Ye, and is also as shown in FIG. 2 (e) such as W (white: transparent), Gr, Cy, Ye as shown in FIG. 2 (a). Any of the four different color filters arranged in the pattern shown may be used, and a pure color filter may be used. Further, in the case of FIG. 2B, when viewed from A, it is Mg- + Gr4 (: y —'i 6-) Qr —› Mg4 Cy- + Ye, and when viewed from B, Cy- + Ye- + G "—› Mg 4 Cy- +'/ 6-) Mg 4 Qr, but this is also regarded as the same pattern as (e).

[Effect of the Invention] As described above, according to the present invention, either the video camera mode or the still video camera mode mode is used by using the image sensor provided with the color filter of the type shown in FIG. 2D. Also, high-resolution and high-sensitivity frame images can be recorded.

[0002]

A brief description of the drawing

[0003]

FIG. 1 is a block diagram of an embodiment of the present invention, FIG. 2 is a diagram showing an arrangement of color filters used in the present invention, FIG. 3 is a diagram showing an arrangement example of color filters, and FIG. 4 is a conventional example. It is a block diagram.

104- ・ ・ CCD 106.122- ・ ・ Switch 107.108- ・ ・ Field memory 110- ・ ・ Adder 112- ・ ・ Analog video signal processing unit

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CLAIMS JPH0492592A

1.

An imaging device including a to g components. a, image sensor. b. Mode selection means for selecting one of the video camera mode and the still video camera mode. c. A first driving means for driving the image sensor so as to read out a mixture of two vertical pixels by interlaced scanning when the video camera mode is selected by the mode selecting means. d. A second driving means for driving the image sensor to read out one row at a time by interlaced scanning when the still video camera mode is selected by the mode selecting means. e, A memory that records a first field signal and a second field signal of the image pickup device when driven by the second driving means. f, An adding means for adding the first field signal of the memory and the corresponding second field signal. g. When the video camera mode is selected by the mode selection means, the output of the image sensor is input, and when the still video camera mode is selected, the output of the addition means is input, and the brightness signal and the color difference signal are processed by signal processing. Signal processing means to generate. (2) The image sensor has four different color filters A, B, C, and D on a total of eight pixels, two pixels horizontally and four pixels vertically, with AB in the first row and C in the second row. -D, AB in the 3rd row, DC in the 4th row, which are repeatedly provided in the vertical and horizontal directions, and four different color filters are cyan, magenta, and yellow. , The image pickup apparatus according to claim 1, wherein the image pickup device is a green color filter. (3) An imaging device characterized in that a vertical two-pixel mixed reading is performed in a video camera mode, and a signal equivalent to a vertical two-pixel mixed reading is obtained by using a field memory in a still video camera mode.

Espacenet

Bibliographic data: JPH09298755 (A) — 1997-11-18

SOLID-STATE IMAGE PICKUP ELEMENT

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Applicant(s): SONY CORP ± (SONY CORP)

Classification: **- international:** ***H01L27/148; H04N5/335; H04N5/341; H04N5/347; H04N5/369; H04N5/3728; H04N9/07;***
(IPC1-7): H01L27/148; H04N5/335; H04N9/07
- cooperative:

Application number: JP19970030179 19970214

Priority number (s): JP19970030179 19970214 ; JP19960078315 19960306

Also published as: JP3948042 (B2)

Abstract of JPH09298755 (A)

PROBLEM TO BE SOLVED: To provide an output of an image pickup signal at a high speed by keeping full picture element read and color sequence in the same relation so as to thin lines. SOLUTION: Color filters are arranged with a period N, and a vertical CCD array 3 is provided in adjacent to a photo sensor array 2. An area A is made up of gates 21, 22, 23 and an area B is made up of gates 31, 32, 33, and m-sets of arrays of the area A and N×a sets of arrays of the area B are alternately arranged. The gates 21, 31, 23, 33 are connected in the same relation to buses 41, 43 to which vertical transfer drive pulses ϕV1 , ϕV2 are applied. The gate 22 is connected to a bus 42 to which vertical transfer drive pulse ϕV2 and a read pulse are applied, and the gate 32 is connected to a bus 42' to which vertical transfer drive pulse ϕV2 ' and a read pulse are applied. There are the full picture element read mode applying the read pulse to both the gates 22, 32 and the line thinning mode applying the read pulse to the gate 22 only.

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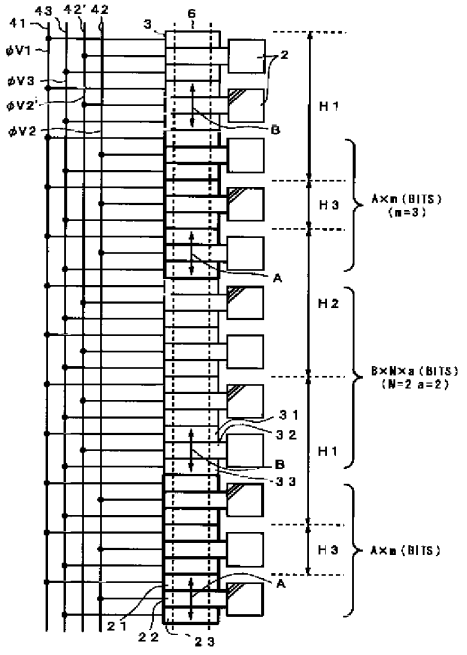
(74)代理人　弁理士　杉浦　正知

(54)【発明の名称】　固体撮像素子

(57)【要約】

【課題】　全画素読出しと色シーケンスを同一の関係に保って、ライン間引きを行い、撮像信号を高速で出力することを可能とする。

【解決手段】　繰り返し周期Ｎの色フィルタの配列がされ、フォトセンサ２の１列と隣接して垂直ＣＣＤの１列が設けられる。領域Ａがゲート２１、２２、２３からなり、領域Ｂがゲート３１、３２、３３からなる。領域Ａのｍ個の配列と領域ＢのＮ×ａ個の配列とが交互に配置される。ϕV_1、ϕV_3が印加されるバス４１および４３に対して、ゲート２１、３１、２３、３３が同一の関係で接続される。ϕV_2、読出しパルスが印加されるバス４２にゲート２２が接続され、ϕV_2´、読出しパルスが印加されるバス４２´にゲート３２が接続される。ゲート２２、３２の両方に読出しパルスを印加する全画素読出しモードと、ゲート２２のみに読出しパルスを印加するライン間引きモードとが可能とされる。



【特許請求の範囲】
【請求項１】　インターライン方式固体撮像素子において、
垂直方向にＮ（Ｎは自然数）画素周期で繰り返される複数の色フィルタを介した光が入射されるマトリクス状に配置された複数のフォトセンサと、
上記複数のフォトセンサから読出された電荷を垂直方向に連なるフォトセンサからの電荷を混合することなく転送する垂直転送部と、
上記垂直転送部と結合され、上記垂直転送部から転送された電荷を１水平期間周期で出力する水平転送部と、
ｍ（ｍは自然数）個の垂直方向に連なる第１のフォトセンサ群と、上記画素周期Ｎのａ倍（ａは自然数）の数からなる垂直方向に連なる第２のフォトセンサ群とで、１単位を構成し、上記第１のフォトセンサ群と、上記第２のフォトンサ群とが垂直方向に交互に配置されるものとし、上記第１のフォトセンサ群に蓄積された電荷を上記垂直転送部に転送させるための第１の信号供給部と、
上記第２のフォトセンサ群に蓄積された電荷を上記垂直転送部に転送させるための第２の信号供給部とからなり、
上記第１の信号供給部と上記第２の信号供給部が互いに独立して設けられていることを特徴とする固体撮像素子。
【請求項２】　請求項１の固体撮像素子において、
上記第１および第２の信号供給部に入力され、上記垂直転送部および上記水平転送部を駆動する駆動信号を生成する駆動信号生成手段をさらに備え、
上記駆動信号生成手段は、水平ブランキング期間に、上記垂直転送部から上記水平転送部へ上記電荷を転送するための上記駆動信号としてラインシフト信号を生成することを特徴とする固体撮像素子。
【請求項３】　請求項２の固体撮像素子において、
上記駆動信号生成手段は、
上記第１および第２の信号供給部に駆動信号を供給することで全画素の電荷を読出す第１の動作モードと、
上記第１の信号供給部のみを駆動する駆動信号を生成する第２の動作モードとを選択的に切り換え可能であることを特徴とする固体撮像素子。
【請求項４】　請求項２の固体撮像素子において、
上記駆動信号生成手段は、（ｍ＋Ｎ×ａ）ライン分の電荷がｍ水平期間で出力されるように、連続するｍ個の水平ブランキング期間において、全体で（ｍ＋Ｎ×ａ）回上記ラインシフト信号を生成することを特徴とする固体撮像素子。
【請求項５】　請求項２の固体撮像素子において、
上記駆動信号生成手段は、或る第１のフォトセンサ群に含まれる１つの画素を第１の画素とした際に、
上記或る第１のフォトセンサ群に含まれ、上または下方向において上記第１の画素に隣接する第２の画素の電荷と、上記第１の画素の電荷とをそれぞれ異なる水平ブランキング期間に上記垂直転送部から上記水平転送部に転送させるように、ラインシフト信号を生成することを特徴とする固体撮像素子。
【請求項６】　請求項５の固体撮像素子において、
上記駆動信号生成手段は、
上記或る第１のフォトセンサ群に含まれ、上方向において上記第１の画素に隣接する画素を上記第２の画素、下方向において上記第１の画素と隣接する画素を第３の画素とした際に、
上記第２および第３の画素のうち、上記第１の画素との物理的距離が長い方の画素に関しては、上記物理的距離が長い方の画素と、上記第１の画素との間に位置する画素の電荷を、上記第１の画素または上記物理的距離が長い方の画素の電荷と加算されるようにするため、上記物理的距離が長い方の画素の電荷を上記垂直転送部から上記水平転送部に転送する水平ブランキング期間に、少なくとも２つのラインシフト信号を生成することを特徴とする固体撮像素子。
【請求項７】　請求項２の固体撮像素子において、
上記駆動信号生成手段は、各水平期間において、同一数のラインシフト信号を生成することを特徴とする固体撮像素子。
【請求項８】　請求項１の固体撮像素子において、
上記Ｎが各単位で異なることを特徴とする固体撮像素子。
【請求項９】　請求項１の固体撮像素子において、
上記Ｎが２単位周期であり、各単位毎に２、４の順であることを特徴とする固体撮像素子。
【請求項１０】　請求項１の固体撮像素子において、
上記Ｎがどの単位においても２で固定であることを特徴とする固体撮像素子。
【請求項１１】　請求項２の固体撮像素子において、
ｍ＝１またはｍ＝２の場合において、
上記駆動信号生成手段は、各水平ブランキング期間に（Ｎ×ａ／ｍ）＋１個のラインシフト信号を生成し、
これにより、信号電荷を含む１ラインの画素の電荷と、信号電荷を含まないＮ×ａ／ｍラインの画素の電荷とが上記水平転送部において混合されることを特徴とする固体撮像素子。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、例えばディジタル記録の電子スチルカメラに使用して好適な固体撮像素子に関する。
【０００２】
【従来の技術】最近、電子スチルカメラが普及しつつある。電子スチルカメラに使用して好適な固体撮像素子例えばＣＣＤとして、正方格子、全画素読出しのものが提案されている。正方格子は、隣接する画素の縦方向の間

隔と横方向の間隔とを等しくするもので、撮像信号をパソコン用モニタに合わせるために採用される。従来のビデオカメラ等に使用されるＣＣＤは、インターレース方式の出力信号を発生するために、図１８に示すように、１／６０秒（１フィールド）蓄積して、隣接する上下２ラインの画素の電荷を読出し、垂直転送用のＣＣＤにおいて読出した２画素の電荷を混合し、また、混合する２つの画素の上下方向の組合せを奇数フィールドおよび偶数フィールドでずらすことによって、インターレース走査を実現していた。

【０００３】かかるＣＣＤは、１／６０秒の蓄積時間のために、１／３０秒の蓄積時間のフレーム蓄積方式と比較して、動画像の撮像を良好に行うことができるが、垂直解像度が低い不利がある。従って、電子スチルカメラの撮像素子として適していない。そこで、図１９に示すように、１／３０秒間蓄積し、全画素の電荷を混合することなく独立に読出す全画素読出し方式が提案されている。この方式によれば、垂直解像度の低下を防止することができるが、撮像素子から撮像信号を出力するためには、画素数が同じで読出しのためのクロックが同じ場合に、上述したビデオカメラ用の撮像素子の２倍の時間を必要とする。より具体的には、１／３０秒周期の撮像信号が発生する。

【０００４】

【発明が解決しようとする課題】電子スチルカメラの場合、撮影時にピントを合わせたり、撮影時のカメラアングルを調整するために、撮像画像を表示するモニタ例えば液晶モニタを設けることが多い。液晶モニタは、１／６０秒のノンインターレース走査で、テレビジョン画像を表示するのが普通である。従って、１／３０秒周期の撮像信号をそのまま液晶モニタに供給すると、図２０に示すようになってしまう。これを避けるためには、図２１に示すように、液晶モニタ６２に対してＶＲＡＭ（ビデオＲＡＭ）６１（あるいはフレームメモリ）によりフレームレートを変換する必要がある。ＶＲＡＭ６１に対しては、１／３０秒周期の撮像信号が供給され、その出力に１／６０秒周期のノンインターレース信号が発生する。

【０００５】このように、全画素読出しの撮像素子は、垂直解像度が高いという点で、電子スチルカメラの撮像素子として好適な反面、通常のテレビジョンモニタに撮像画像を表示するのにフレームレートを変更するためにＶＲＡＭあるいはフレームメモリが必要となり、コストが上昇する問題があった。さらに、電子スチルカメラが自動焦点制御装置、自動アイリス制御装置、自動ホワイトバランス制御装置等の自動制御装置を備えているので、撮像素子の出力信号の周期が長いことは、これらの自動制御の応答を遅くする問題が生じた。さらに、モニタに表示される画像の動きが滑らかでない問題もあった。

【０００６】上述した問題の解決する一つの方法は、撮像素子の出力信号のデータレートを高くすることである。しかしながら、クロック周波数が高いと、消費電力の増大、使用部品のコストの上昇、Ｓ／Ｎの劣化等の問題が生じる。従って、撮像信号のデータレートを上げる方法は、好ましくない。

【０００７】従って、この発明の目的は、高速に撮像信号を出力することができる固体撮像素子を提供することにある。

【０００８】

【課題を解決するための手段】請求項１に記載の発明は、インターライン方式固体撮像素子において、垂直方向にＮ（Ｎは自然数）画素周期で繰り返される複数の色フィルタを介した光が入射されるマトリクス状に配置された複数のフォトセンサと、複数のフォトセンサから読出された電荷を垂直方向に連なるフォトセンサからの電荷を混合することなく転送する垂直転送部と、垂直転送部と結合され、垂直転送部から転送された電荷を１水平期間周期で出力する水平転送部と、ｍ（ｍは自然数）個の垂直方向に連なる第１のフォトセンサ群と、画素周期Ｎのａ倍（ａは自然数）の数からなる垂直方向に連なる第２のフォトセンサ群とで、１単位を構成し、第１のフォトセンサ群と、第２のフォトンサ群とが垂直方向に交互に配置されるものとし、第１のフォトセンサ群に蓄積された電荷を垂直転送部に転送させるための第１の信号供給部と、第２のフォトセンサ群に蓄積された電荷を垂直転送部に転送させるための第２の信号供給部とからなり、第１の信号供給部と第２の信号供給部が互いに独立して設けられていることを特徴とする固体撮像素子である。

【０００９】請求項２に記載の発明は、第１および第２の信号供給部に入力され、垂直転送部および水平転送部を駆動する駆動信号を生成する駆動信号生成手段をさらに備え、駆動信号生成手段は、水平ブランキング期間に、垂直転送部から水平転送部へ電荷を転送するための駆動信号としてラインシフト信号を生成することを特徴とする固体撮像素子である。

【００１０】転送および読出しのための第１および第２の信号供給部が独立に設けられいてる。従って、第１および第２の信号供給部を通じて全画素の読出しを行う第１の動作モードと、その一方を通じて画素の読出しを行う第２の動作モードとが選択的に可能となる。そして、第２の動作モードでは、ライン数が間引かれるので、高速の撮像信号を出力することができる。また、第２の動作モードにおいて出力される撮像信号の色配列のシーケンスが全画素読出しの場合と同一となり、信号処理を変更する必要がない。さらに、第２の動作モードにおいて、垂直転送部から水平転送部に信号電荷を転送する場合に、水平ブランキング期間において、所定回数のラインシフトを行うことによって、信号電荷を含まないパケ

ットが出力信号に含まれないように、圧縮することができる。

【００１１】

【発明の実施の形態】以下、この発明の一実施例について図面を参照して説明する。図１は、この発明によるＣＣＤ１の一実施例の概略を示す。この一実施例例では、インターライン方式を採用し、イメージエリアに２次元配列されたフォトセンサ（例えばフォトダイオード）２と、フォトセンサ２の間に設けられ、フォトセンサ２からの信号電荷を水平ＣＣＤ（水平転送部）４へ転送するための垂直ＣＣＤ（垂直転送部）３と、水平ＣＣＤ４に接続されたバッファアンプ５とを有する。フォトセンサ２には、後述するような配列の色フィルタを通った撮像光が入射する。一つのフォトセンサ２と垂直ＣＣＤ３中の１ビットとが対応するように構成され、各フォトセンサ２からの信号電荷を混合することなく垂直ＣＣＤ３に読出し、全画素の信号を混合することなく順次、水平ＣＣＤ４に転送することが可能とされている。そして、水平ＣＣＤ４を駆動することによって、信号をフローティングディフュージョンエリアであるバッファアンプ５に転送し、順次電圧に変換して出力する。

【００１２】ＣＣＤ１の単位画素の平面図を図２に示し、垂直ＣＣＤ３の構造を図３に示す。垂直ＣＣＤ３は、例えば３層電極３相駆動の構成とされている。図２において、６は、垂直ＣＣＤ３の転送チャンネル、７は、各画素間、並びに画素および転送チャンネル間を分離するためのチャンネルストッパ、８、９および１０は、それぞれ垂直ＣＣＤ３の転送ゲートである。転送ゲート９は、読出しゲートを兼用している。なお、図２では、遮光膜等についての図示が省略されている。転送ゲート８、９、１０は、図３に示すように、第１、第２および第３の多結晶シリコン電極を加工して形成される。これらの転送ゲート８、９、１０に対して、垂直駆動パルスϕV_1、ϕV_2、ϕV_3がそれぞれ印加される。

【００１３】フォトセンサ２から垂直ＣＣＤ３へ信号を読出す場合、フォトセンサ２に隣接した転送ゲート、すなわち、読出しゲートを兼ねる転送ゲート９に対して、垂直転送クロックϕV_2のハイレベルより高いバイアス電圧（読出しパルスと称する）を印加する。ゲート９に読出しパルスを供給すると、１つの画素が垂直ＣＣＤ３の１ビットに対応しているので、全てのフォトセンサ２から信号電荷が垂直ＣＣＤ３に読出される。水平ＣＣＤ４は、転送クロックϕH_1、ϕH_2によって、１ライン分のデータを出力する。なお、水平ＣＣＤ４としては、例えば複合チャンネル水平ＣＣＤ構造を採用することができる。その場合、出力部が２チャンネルの構成とされる。

【００１４】上述したＣＣＤは、全画素の信号を混合することなく順次出力することができるので、電子スチルカメラ、画像取込みに適している。しかしながら、上述したように、インターレース出力を行う同じ画素数のビデオカメラ用撮像素子と比較して、同じクロックで電荷の転送を行うと、１画面（画面の上端から下端まで）の出力時間が倍となる。この発明の一実施例では、モニタ用の信号、自動焦点制御等の自動制御のための撮像信号として、水平ライン数を減少させることによって、１画面の撮像信号を高速に出力するものであり、且つ、このライン間引きの場合に、カラーフィルタの配列で規定される垂直方向の色シーケンスが崩れることがないようにするものである。一方、撮影した画像を半導体メモリ等の媒体に取り込む場合では、フルフレームの撮像信号（ライン数の間引きがされてない撮像信号）を出力する。ライン間引きの場合でも、色シーケンスがフルフレームの場合と同一のため、信号処理回路が複雑となる問題を回避できる。

【００１５】上述した全画素読出し可能なＣＣＤにおいて、ライン数を間引くためには、フォトセンサ２からの信号電荷の読出しに寄与している転送ゲート（第２の多結晶シリコン）９に対する配線を二つに分けることによって可能である。色の繰り返し周期をＮで表す。図４は、上下２画素で１周期となる（Ｎ＝２）の場合にこの発明を適用した撮像素子の一例である。

【００１６】単板式のＣＣＤの色フィルタの配列としては、Ｒ（赤色を通すフィルタ）、Ｇ（緑色を通すフィルタ）、Ｂ（青色を通すフィルタ）を図５Ａに示すように配列したもの（ベイヤ方式）が知られている。全体の半分の画素に感度の高いＧのフィルタを配置する。また、図５Ｂに示す補色市松配置の色フィルタも知られている。図５Ｂにおいて、Ｙｅ、Ｃｙ、Ｍｇは、それぞれ黄色、シアン、マゼンタのフィルタである。図５Ｂに示す補色フィルタは、原色フィルタに比して解像度を高めることができるので、ビデオカメラに採用されることが多い。一方、図５Ａに示す原色フィルタは、色の再現性の点で優れ、電子スチルカメラに採用されることが多い。

【００１７】この発明は、原色フィルタを有する単板式撮像素子、および補色フィルタを有する単板式撮像素子の何れに対しても適用できる。さらに、図示しないが、Ｇのフィルタを備えた撮像素子と、ＲおよびＢのフィルタの配列を備えた撮像素子とからなり、二つの撮像素子の位置関係が水平方向、または水平および垂直方向に画素ピッチの１／２だけずらされた方式の撮像素子（いわゆる空間絵素ずらし方式）に対しても適用することができる。

【００１８】図５Ａの配列は、垂直方向の色の繰り返し周期Ｎが（Ｎ＝２）であり、図５Ｂの配列は、（Ｎ＝４）である。図４は、（Ｎ＝２）であって、垂直方向の１列のフォトセンサ２、垂直ＣＣＤ３および垂直ＣＣＤ３のゲートのバス配線を１列の一部に関して示した模式図である。フォトセンサ２のうちで左上コーナーに斜線部を設けたものが一つの色フィルタ例えばＧのフィルタ

に対応し、斜線部を設けないものが他の色フィルタ、例えばＢのフィルタと対応している。垂直ＣＣＤ３は、上述したように３層電極３相駆動形式のもので、ＣＣＤの開口画素（遮光されていない画素）に隣接して３ビットのゲートを有する。また、垂直ＣＣＤ３は、第１の領域Ａと、第２の領域Ｂを含む。第１の領域Ａは、ゲート２１、２２、２３からなり、第２の領域Ｂは、ゲート３１、３２、３３からなる。ゲート２２および３２が転送兼読出しゲートである。４１、４２、４２´、４３は、垂直転送用の駆動パルスϕV_1、ϕV_2、ϕV_2´、ϕV_3がそれぞれ供給されるバス配線である。

【００１９】ゲート２１および３１がバス配線４１に接続され、ゲート２３および３３がバス配線４３に接続される。これらのバス配線４１、４３には、それぞれ駆動パルスϕV_1、ϕV_3が供給される。駆動パルスϕV_2に関して、２本のバス４２および４２´が設けられる。第１の領域Ａとは、転送兼読出しゲート２２がバス４２と接続されるものを指し、第２の領域Ｂは、転送兼読出しゲート３２がバス４２´と接続されるものを指す。なお、図４では、簡略化のために、バスラインが片側しか描かれていないが、フォトセンサ２の両側にバスラインを配して、両側駆動するのが普通である。

【００２０】この発明では、ライン間引きのために、第１の領域Ａがｍ（ｍ＝１，２，３，・・・）並んだ範囲と、第２の領域ＢがＮ×ａ並んだ範囲とが垂直方向に交互に形成される。図４に示す例は、（Ｎ＝２、ｍ＝３、ａ＝２）の場合である。なお、ｍおよびａの値を任意に選ぶことができるが、ｍおよびａを大きな値としても、（ｍ＋Ｎ×ａ）が有効画素数の垂直画素数より小さいことが必要である。

【００２１】上述したこの発明の一実施例において、第１の動作モード、すなわち、全画素の信号を読出すフルフレームの動作時では、垂直ＣＣＤ３の第１の領域Ａおよび第２の領域Ｂの両者にフォトセンサ２から信号が読出される。そのためには、バス配線４２および４２´を通じてゲート２２および３２の両者に読出しパルスが印加される。この場合、色フィルタの配列の順序と対応する色シーケンス、例えばＧ、Ｂ、Ｇ、Ｂ、・・・のシーケンスでもって色信号が出力される。

【００２２】一方、第２の動作モード、すなわち、ライン間引き動作時では、第１の領域Ａのゲート２２にのみバス配線４２を介して読出しパルスが印加される。従って、ｍの範囲から信号が読出され、Ｎ×ａの範囲からは、信号が読出されない。図４の例では、（ｍ＝３）ラインから信号が発生し、（Ｎ×ａ＝４）ラインから信号が発生しない。間引かれるライン数が色の繰り返し同期Ｎの整数倍であるので、ライン間引きの場合の撮像出力の色信号の順序は、フルフレーム読出しと同一の関係に保たれる。

【００２３】図６Ａ～図６Ｃは、撮像素子を駆動する場合のタイミングを示し、図６Ａがフルフレームの読出しを行う場合のタイミングを示す。各水平ブランキング期間において、ラインシフトパルスＬＳとしての３相の駆動パルスϕV_1、ϕV_2、ϕV_2´、ϕV_3が垂直ＣＣＤ３の第１の領域Ａのゲート２１、２２および２３と、第２の領域Ｂのゲート３１、３２および３３にそれぞれ供給される。また、読出しパルスも１Ｖ毎にゲート２２および３２との両者に対して印加される。この読出しパルスによって、全てのフォトセンサから信号電荷が垂直ＣＣＤ３に読出される。図６Ｂの詳細なタイミングチャートに示すように、水平ブランキング期間内で発生する駆動パルスϕV_1、ϕV_2、ϕV_2´、ϕV_3が３相のものであり、１つのラインシフト期間によって１ライン分電荷のシフトがなされる。フルフレームの読出し時には、各水平ブランキング期間内で、１ラインシフトがなされる。

【００２４】一方、ライン間引きの読出しの場合では、図６Ｃに示すように、第１の領域Ａのゲート２２にのみ読出しパルスが印加される。それによって、第１の領域Ａに隣接したフォトセンサのみから信号電荷が読出される。ライン間引きの場合では、間引かれたラインの垂直ＣＣＤには、信号電荷が読出されず、無信号となる。この無信号期間は、ラインシフト動作を複数回繰り返すことによって除去できる。

【００２５】例えば、図４に示す色配列の場合には、Ｈ１で示される３画素分の電荷、具体的には、ひとつの第１の領域Ａの信号電荷と、２つの第２の領域Ｂの無信号を、図７に示すように、第１の水平期間Ｈ１においてラインシフトパルスＬＳを３回供給することにより、水平ＣＣＤ４において合成する。同様に、第２の水平期間Ｈ２においてラインシフトパルスＬＳを３回供給することにより、ひとつの第１の領域Ａの信号電荷と、２つの第２の領域Ｂの無信号を、水平ＣＣＤ４において合成する。また、第３の水平期間Ｈ３において、ラインシフトパルスＬＳを１回供給することにより、ひとつの第１の領域Ａの信号電荷を１水平期間に水平ＣＣＤ４に供給する。従って、各水平期間において、ひとつの第１の領域からの信号電荷が、色シーケンスが変わることなく出力されることになる。この図７に示す期間の動作が３水平期間毎に繰り返される。

【００２６】図８Ａは、（ｍ＝１，ａ＝１）の場合の垂直ＣＣＤ３のチャンネル６のポテンシャルの模式図である。図面に向かって右側から左側の水平ＣＣＤ４に向かう方向が垂直転送方向である。チャンネル６には、ライン間引き動作時に、信号電荷Ｑｓを含むパケット５１と空パケット５２とが存在する。各ラインから信号電荷Ｑｓを出力するためには、空パケット５２の分、多くラインシフトを行い、それによって信号電荷と無信号とを水平ＣＣＤ４において混合し、無信号の期間を除去する。各水平ブランキング期間内でなされるラインシフトの回

数は、下記の関係を満足するように選定すれば良い。
【００２７】１（：出力する信号電荷Ｑｓを含むパケットの数（この例は１つパケットで考えている））＋Ｘ（前にある信号電荷Ｑｓを含まないパケットの数）以上で、１＋Ｘ＋（Ｎ×ａ）（：後ろにある信号電荷Ｑｓを含まないパケットの数）以下それによって、（Ｘ＝０）の場合では、信号電荷のみを水平ＣＣＤ４に対して転送し、（Ｘ≠０）の場合では、信号電荷を含むパケットと１以上の信号電荷を含まないパケットとを水平ＣＣＤ４に対して転送する。
【００２８】上述の条件によって、信号電荷を水平ＣＣＤ４に対して転送し、また、無信号のラインを圧縮することができる。実際には、空パケットの電荷が０ではなく、スミア信号や暗電流等の不要信号電荷Ｑｎが含まれている。各水平ブランキング期間でなされるラインシフトの数が異なると、不要信号電荷Ｑｎの加算される回数が異なるために、不要信号が含まれる量が実際の出力とされるラインによって異なる。それによって、モニタ上のライン毎に輝度が変わって見えるラインクロール現象や、色ずれなどの画質劣化が発生するおそれがある。
【００２９】この問題を解決するには、各水平ブランキング期間でなされるラインシフトの回数を一定とすれば良い。限定された条件、すなわち、（ｍ＝１、またはｍ＝２）の場合では、垂直ＣＣＤ３のラインシフトの数を（（Ｎ×ａ／ｍ）＋１）とすることによって、各ラインの信号電荷Ｑｓに対して加算される信号電荷Ｑｓを含まないパケットの数を一定とすることができる。これによって、上述した画質劣化の発生を防止することができる。
【００３０】図８Ｂは、（Ｎ＝２、ｍ＝１、ａ＝１）の場合の垂直ＣＣＤ３のチャンネル６のポテンシャルの模式図である。この例では、（Ｎ×ａ／ｍ＝２）となり、ラインシフトの回数を３回とすることによって、実際の出力となる、各ラインにおいて加算される信号電荷Ｑｓを含まないパケットの数を一定とすることができる。また、図８Ｃは、（Ｎ＝２、ｍ＝２、ａ＝１）の場合を示す。この場合では、（Ｎ×ａ／ｍ＝１）となり、ラインシフトの回数を２回とすれば良い。さらに、ｍ＞２の場合でも、スミア信号や暗電流のレベルを充分に小さくすることができれば、問題は生じない。
【００３１】上述したこの発明によるＣＣＤは、実際の出力となるライン数を減少することができるので、垂直ＣＣＤ３の第１の領域Ａの並ぶ数ｍ、第２の領域Ｂの並ぶ数Ｎ×ａの値を選ぶことによって、１フィールドのテレビジョンの水平走査線数以下に出力撮像信号のライン数を抑えることができる。ベイヤ方式の色フィルタ配列のような（Ｎ＝２）の場合を例に出力ライン数のいくつかの例を説明する。
【００３２】図９に示すように、有効画素数（：垂直×水平）が（４８０×６４０）のＶＧＡ(Video Graphics Array)対応の撮像素子に対してこの発明を適用した場合では、（ａ＝１、ｍ＝２）とされる。従って、ライン間引きモードでは、出力ライン数を半分の２４０ラインとできる。図１０に、図９に示す撮像素子の場合の垂直１列の垂直ＣＣＤの構造を、図１１に図１０に示す撮像素子を第２の動作モードで駆動するための駆動パルスのタイミングチャートを示す。尚、図４と対応する部分には、同一の符号を付してその説明を省略する。この場合、各水平期間において、２回ラインシフトパルスＬＳが供給される。また、第２の動作モードにおいて、第１の水平期間Ｈ１には、Ｒのみの信号が、第２の水平期間Ｈ２には、Ｇのみの信号が読出される。この図１０に示す例では、各水平期間に加算されるライン数が同じなので、色ずれの問題などが生じない。
【００３３】図１２に示すように、有効画素数が（７６８×１０２４）の撮像素子では、（ｍ＝１、ａ＝１）とすることによって、出力ライン数を２５６ラインとできる。図１３に、図１２に示す撮像素子の場合の垂直１列の垂直ＣＣＤの構造を、図１４に図１３に示す撮像素子を第２の動作モードで駆動するための駆動パルスのタイミングチャートを示す。尚、図４と対応する部分には、同一の符号を付してその説明を省略する。この場合、各水平期間において、３回ラインシフトパルスＬＳが供給される。また、第２の動作モードにおいて、第１の水平期間Ｈ１には、Ｒのみの信号が、第２の水平期間Ｈ２には、Ｇのみの信号が読出される。また、第１の水平期間Ｈ１’に、Ｒのみの信号を、第２の水平期間Ｈ２’に、Ｇのみの信号を読出すようにしても良い。この図１３に示す例では、各水平期間に加算されるライン数が同じなので、色ずれの問題などが生じない。
【００３４】図１５に示すように、有効画素数が（１０２４×１２８０）の撮像素子では、（ｍ＝１、a_1＝１、a_2＝２）とすることによって、出力ライン数を２５６ラインとできる。a_1 およびa_2 は、交互に使用される。図１６に、図１５に示す撮像素子の場合の垂直１列の垂直ＣＣＤの構造を、図１７に図１６に示す撮像素子を第２の動作モードで駆動するための駆動パルスのタイミングチャートを示す。尚、図４に対応する部分には、同一の符号を付してその説明を省略する。この場合、各水平期間において、４回ラインシフトパルスＬＳが供給される。また、第２の動作モードにおいて、第１の水平期間Ｈ１には、Ｇのみの信号が、第２の水平期間Ｈ２には、Ｒのみの信号が読出される。また、第１の水平期間Ｈ１’に、Ｒのみの信号を、第２の水平期間Ｈ２’に、Ｇのみの信号を読出すようにしても、第１の水平期間Ｈ１”に、Ｒのみの信号を、第２の水平期間Ｈ２”に、Ｇのみの信号を読出すようにしても良い。この図１６に示す例では、各水平期間に加算されるライン数が同じなので、色ずれの問題などが生じない。
【００３５】図９、図１２および図１５にそれぞれ示す

何れの場合でも、出力ライン数を例ばＮＴＳＣ方式の１フィールドのライン数（２６２．５）より少なくすることができる。従って、色シーケンスおよび画角をフルフレーム読出しモードと同一の関係を保持して、ライン間引きモードの撮像信号をより短時間で出力することができる。それによって、ＶＲＡＭ、あるいはフレームメモリを使用することなしに、液晶モニタに撮像画面を表示することができる。

【００３６】なお、上述した一実施例における撮像素子の具体的構成は、一例であって、この発明は、これ以外の固体撮像素子に対しても適用できる。例えば垂直ＣＣＤが２層電極４相駆動の構造でも良い。さらに、固体撮像素子を駆動するモードとして、読出しパルスϕV_2 ´を印加し、読出しパルスϕV_2を印加しない第３の動作モードを設定するようにしても良い。

【００３７】

【発明の効果】以上説明したように、この発明によれば、全画素を読出すフルフレームの動作モードと、色シーケンスを同一の関係に保って、ライン数の少ない撮像信号を選択的に得ることができ、撮像信号を高速に出力することができる。従って、ライン数の多い撮像素子でも、出力ライン数をテレビジョンの走査線数以下とすることができ、フレームメモリ、ＶＲＡＭ等の大容量メモリを使用しなくても、撮像信号をモニタに表示することができる。また、高速で撮像信号を出力できることにより、オートフォーカス等の自動制御装置の応答を速くすることができる。さらに、コマ数が多くなるので、モニタ画像の動きが滑らかになる利点がある。

【図面の簡単な説明】

【図１】この発明の一実施例の概略的構成を示す略線図である。

【図２】この発明の一実施例の１画素の部分の拡大平面図である。

【図３】この発明の一実施例の垂直ＣＣＤの構造を示す略線図である。

【図４】この発明の一実施例の垂直１列のバス配線を示す略線図である。

【図５】この発明を適用することができる色フィルタの一例および他の例を示す略線図である。

【図６】この発明の一実施例を駆動するための駆動パルスのタイミングチャートである。

【図７】図４に示す撮像素子の駆動パルスのタイミングチャートである。

【図８】この発明の一実施例における垂直ＣＣＤのポテンシャルを模式的に示す略線図である。

【図９】この発明の具体的な一例を示す略線図である。

【図１０】図９に示す撮像素子の垂直１列のバス配線を示す略線図である。

【図１１】図９に示す撮像素子の駆動パルスのタイミングチャートである。

【図１２】この発明の具体的な他の例を示す略線図である。

【図１３】図１２に示す撮像素子の垂直１列のバス配線を示す略線図である。

【図１４】図１２に示す撮像素子の駆動パルスのタイミングチャートである。

【図１５】この発明の具体的なさらに他の例を示す略線図である。

【図１６】図１５に示す撮像素子の垂直１列のバス配線を示す略線図である。

【図１７】図１５に示す撮像素子の駆動パルスのタイミングチャートである。

【図１８】従来の撮像素子の説明に用いる略線図である。

【図１９】先に提案されている撮像素子の説明に用いる略線図である。

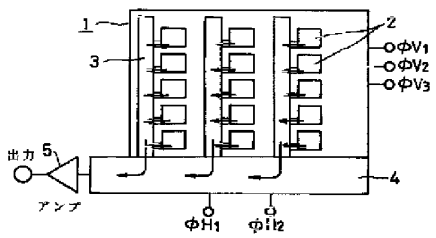
【図２０】撮像素子の出力と液晶モニタの表示との関係を示す略線図である。

【図２１】撮像素子から発生した撮像信号を液晶モニタに供給する場合の構成を示すブロック図である。

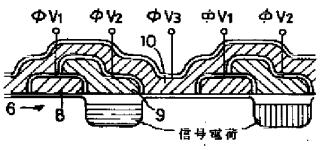
【符号の説明】

２・・・フォトセンサ、３・・・垂直ＣＣＤ、４・・・水平ＣＣＤ、６・・・垂直ＣＣＤのチャンネル、８，９，１０・・・垂直ＣＣＤのゲート、２１，２２，２３・・・垂直ＣＣＤの第１の領域Ａのゲート、３１，３２，３３・・・垂直ＣＣＤの第２の領域Ｂのゲート、４１，４２，４２´，４３・・・駆動パルスを供給するためのバス配線

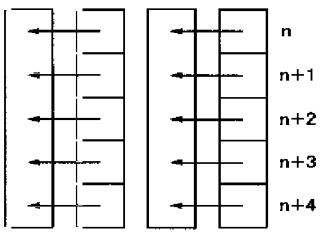
【図１】



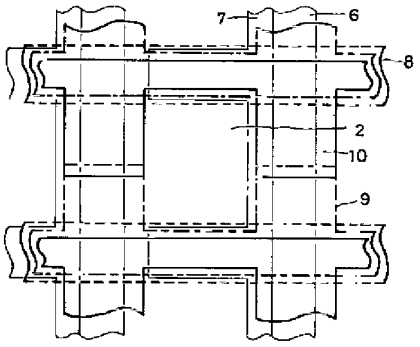
【図３】



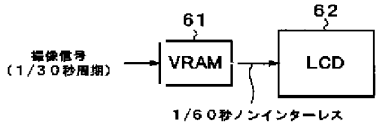
【図１９】



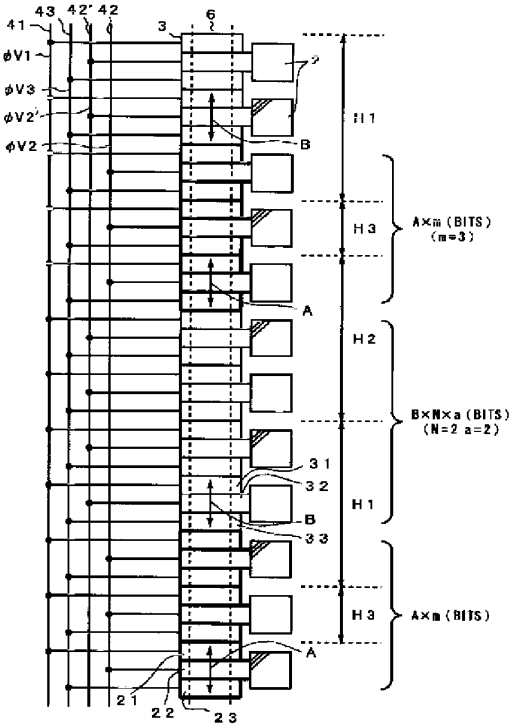
【図2】



【図21】



【図4】



【図5】

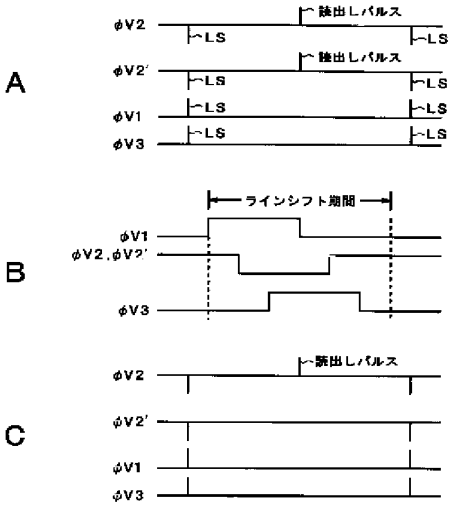
A

G	R	G	R
B	G	B	G
G	R	G	R
B	G	B	G

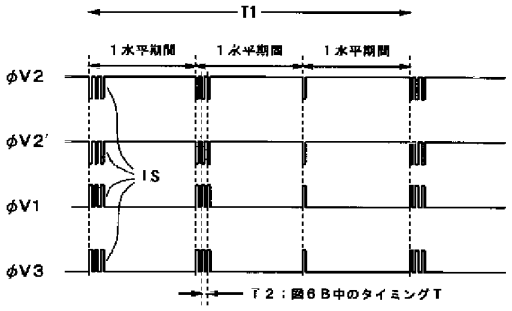
B

Mg	G	Mg	G
Cy	Ye	Cy	Ye
G	Mg	G	Mg
Cy	Ye	Cy	Ye

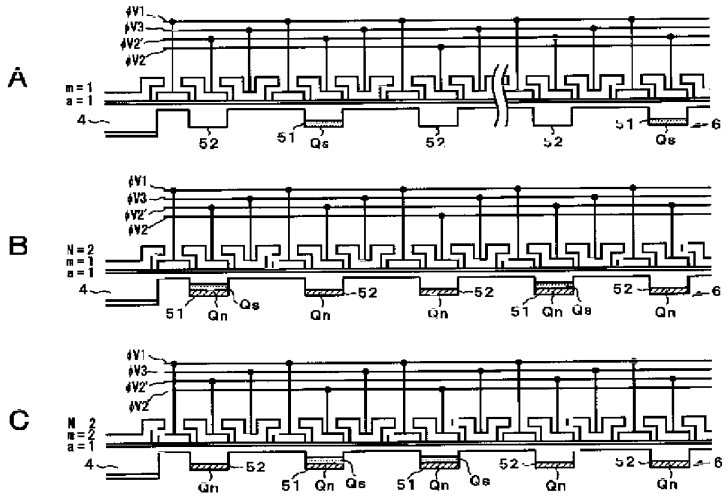
【図6】



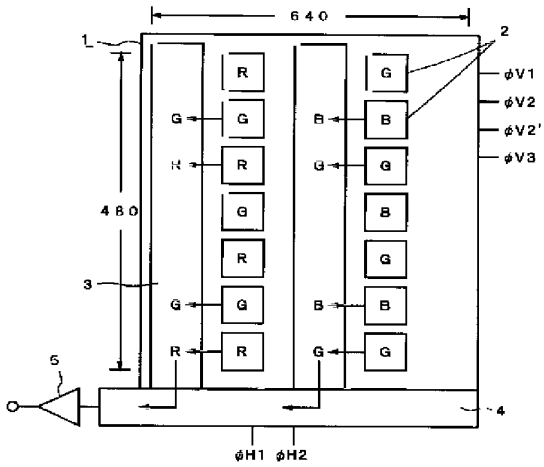
【図７】



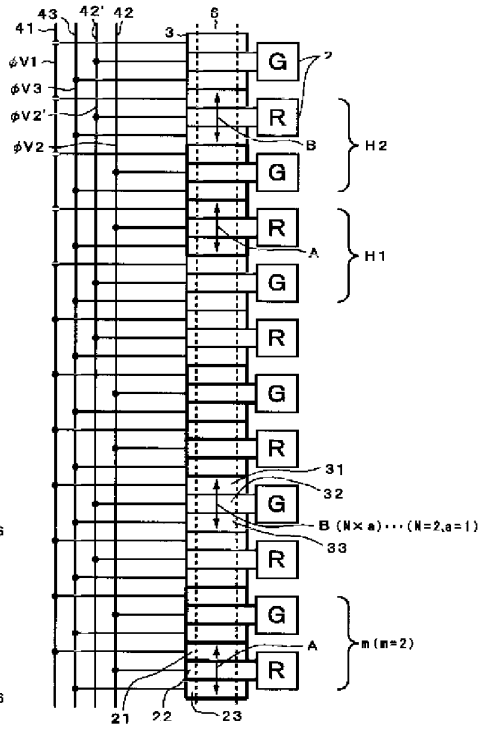
【図８】



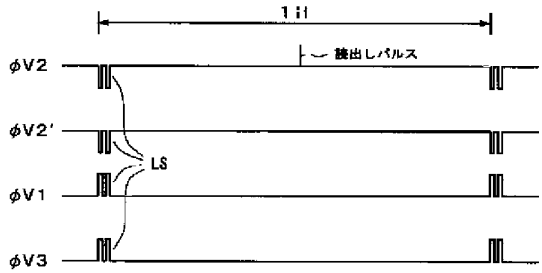
【図９】



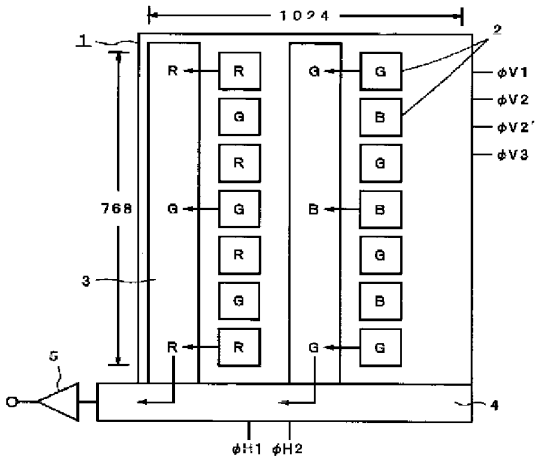
【図１０】



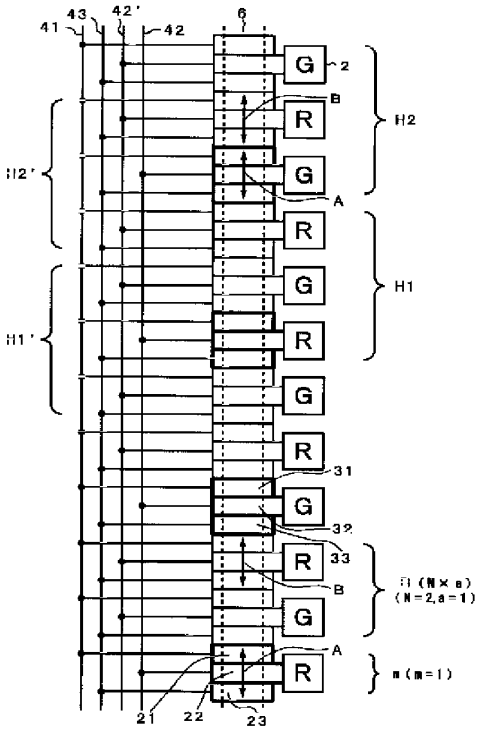
【図１１】



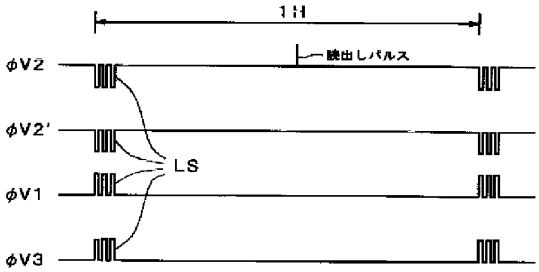
【図１２】



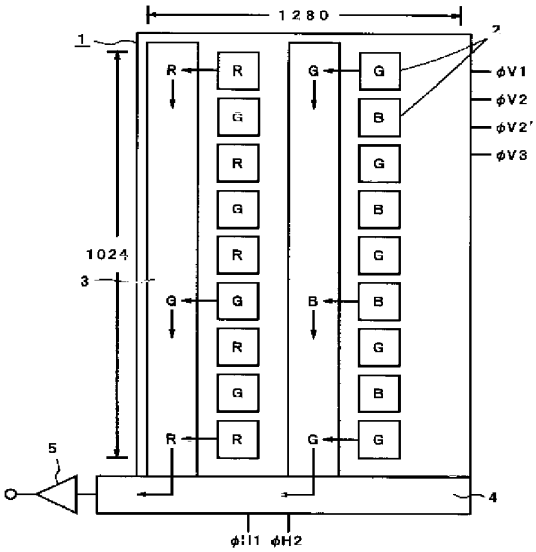
【図１３】



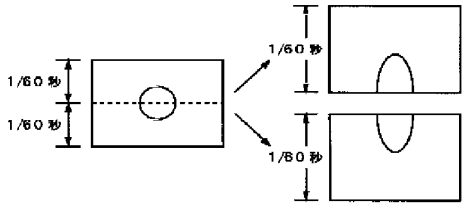
【図１４】



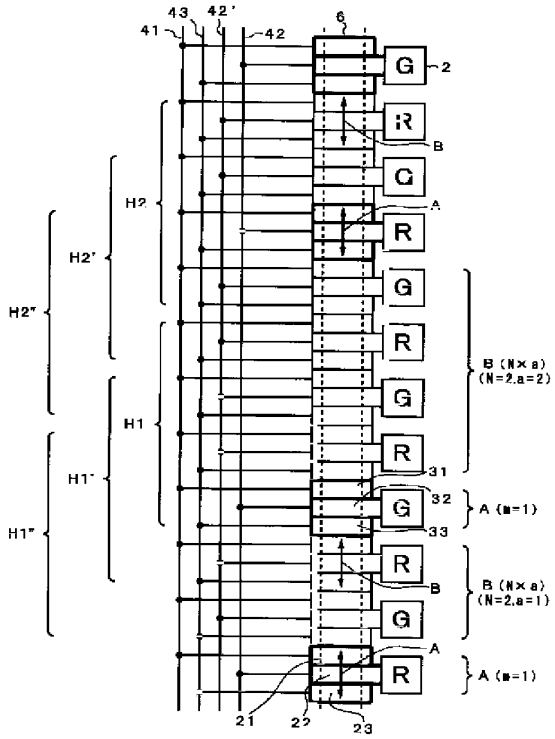
【図１５】



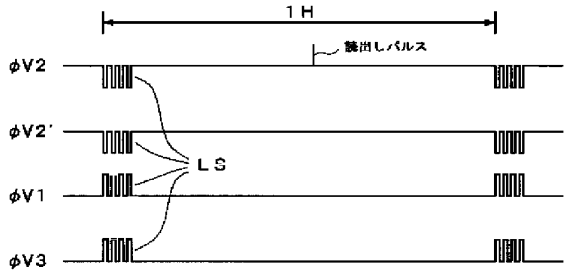
【図２０】



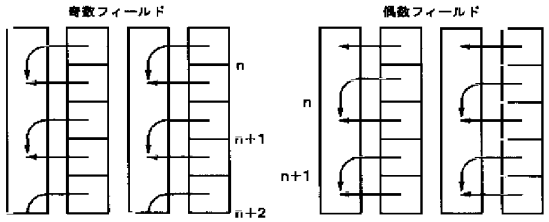
【図１６】


43
42'
41
42
6
G
2
R
B
G
A
R
G
R
G
R
31
32
33
B
A
R
G
A
R
21
22
23
H2
H2'
H2"
H1
H1'
H1"
B (N×a)
(N=2,a=2)
A (a=1)
B (N×a)
(N=2,a=1)
A (a=1)

【図１７】


1H
読出しパルス
φV2
φV2'
φV1
φV3
LS

【図１８】


奇数フィールド
偶数フィールド
n
n+1
n+2
n
n+1

Espacenet

Bibliographic data: JPH09298755 (A) — 1997-11-18

SOLID-STATE IMAGE PICKUP ELEMENT

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Classification: **- international:** ***H01L27/148; H04N5/335; H04N5/341; H04N5/347; H04N5/369; H04N5/3728; H04N9/07;***
(IPC1-7): H01L27/148; H04N5/335; H04N9/07
- cooperative:

Application number: JP19970030179 19970214

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Abstract of JPH09298755 (A)

PROBLEM TO BE SOLVED: To provide an output of an image pickup signal at a high speed by keeping full picture element read and color sequence in the same relation so as to thin lines. SOLUTION: Color filters are arranged with a period N, and a vertical CCD array 3 is provided in adjacent to a photo sensor array 2. An area A is made up of gates 21, 22, 23 and an area B is made up of gates 31, 32, 33, and m-sets of arrays of the area A and N×a sets of arrays of the area B are alternately arranged. The gates 21, 31, 23, 33 are connected in the same relation to buses 41, 43 to which vertical transfer drive pulses ϕV1 , ϕV2 are applied. The gate 22 is connected to a bus 42 to which vertical transfer drive pulse ϕV2 and a read pulse are applied, and the gate 32 is connected to a bus 42' to which vertical transfer drive pulse ϕV2 ' and a read pulse are applied. There are the full picture element read mode applying the read pulse to both the gates 22, 32 and the line thinning mode applying the read pulse to the gate 22 only.

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DESCRIPTION JPH09298755A

[0001]

INDUSTRIAL APPLICABILITY The present invention relates to a solid-state image sensor suitable for use in, for example, an electronic still camera for digital recording.

[0002]

[Conventional Technology] Recently, electronic still cameras are becoming widespread.

As a solid-state image sensor suitable for use in an electronic still camera, for example, a CCD, a square lattice and all-pixel readout have been proposed. The square grid equalizes the vertical spacing and the horizontal spacing of adjacent pixels, and is adopted to match the imaging signal with the monitor for a personal computer. As shown in FIG. 18, a CCD used in a conventional video camera or the like accumulates 1/60 seconds (1 field) in order to generate an interlaced output signal, and has two adjacent upper and lower lines of pixels. Interlaced scanning was realized by reading the charge, mixing the charge of the two pixels read in the CCD for vertical transfer, and shifting the vertical combination of the two pixels to be mixed in the odd field and the even field. ..

[0003]

Since such a CCD has a storage time of 1/60 second, it can take a moving image better than a frame storage method having a storage time of 1/30 second, but has a disadvantage of low vertical resolution. is there.

Therefore, it is not suitable as an image sensor for an electronic still camera. Therefore, as shown in FIG. 19, an all-pixel reading method has been proposed in which the charges are accumulated for 1/30 seconds and the charges of all the pixels are read independently without being mixed. According to this method, it is possible to prevent a decrease in vertical resolution, but in order to output an image pickup signal from the image sensor, when the number of pixels is the same and the clock for reading is the same, the above-mentioned video camera It takes twice as long as the image sensor of. More specifically, an imaging signal with a cycle of 1/30 second is generated.

[0004]

PROBLEM TO BE SOLVED: To solve an electronic still camera, in many cases, a monitor for displaying an captured image, for example, a liquid crystal monitor is provided in order to focus at the time of shooting and adjust the camera angle at the time of shooting.

The LCD monitor usually displays a television image with a 1/60 second non-interlaced scan. Therefore, if the imaging signal having a cycle of 1/30 second is supplied to the liquid crystal monitor as it is, it will be as shown in FIG. In order to avoid this, as shown in FIG. 21, it is necessary to convert the frame rate with respect to the liquid crystal monitor 62 by VRAM (video RAM) 61

(or frame memory). An imaging signal having a cycle of 1/30 second is supplied to the VRAM 61, and a non-interlaced signal having a cycle of 1/60 second is generated at the output.

[0005]

As described above, the image sensor for reading all pixels is suitable as an image sensor for an electronic still camera in that it has a high vertical resolution, but on the other hand, it changes the frame rate for displaying the captured image on a normal television monitor. However, there is a problem that VRAM or frame memory is required and the cost increases.

Further, since the electronic still camera is equipped with an automatic control device such as an automatic focus control device, an automatic iris control device, and an automatic white balance control device, a long cycle of the output signal of the image sensor is a response of these automatic controls. There was a problem of slowing down. Further, there is a problem that the movement of the image displayed on the monitor is not smooth.

[0006]

One method of solving the above-mentioned problem is to increase the data rate of the output signal of the image sensor.

However, when the clock frequency is high, problems such as an increase in power consumption, an increase in the cost of used parts, and deterioration of S / N occur. Therefore, the method of increasing the data rate of the imaging signal is not preferable.

[0007]

Therefore, an object of the present invention is to provide a solid-state image sensor capable of outputting an image pickup signal at high speed.

[0008]

According to the first aspect of the present invention, in an interline type solid-state image sensor, light is incident through a plurality of color filters that are repeated in the vertical direction with an N (N is a natural number) pixel period. A plurality of photosensors arranged in a matrix, a vertical transfer unit that transfers charges read from a plurality of photosensors without mixing the charges from the vertically connected photosensors, and a vertical transfer unit are combined. A horizontal transfer unit that outputs the charge transferred from the vertical transfer unit in one horizontal period period, a first group of photosensors connected in the vertical direction of m (m is a natural number), and a times the pixel period N (a times (m is a natural number)). a is a second group of photosensors connected in the vertical direction consisting of a number of natural numbers), which constitutes one unit, and the first group of photosensors and the second group of photosensors are alternately arranged in the vertical direction. In order to transfer the charge accumulated in the first photosensor group to the vertical transfer unit and the first signal supply unit for transferring the charge accumulated in the second photosensor group to the vertical transfer unit. It is a solid-state image pickup device including the second signal supply unit of the above, and the first signal supply unit and the second signal supply unit are provided independently of each other.

[0009]

The invention according to claim 2 further includes a drive signal generation means that is input to the first and second signal supply units and generates a drive signal that drives the vertical transfer unit and the horizontal transfer unit. , A solid-state imaging device characterized in that a line shift signal is generated as a drive signal for transferring a charge from a vertical transfer unit to a horizontal transfer unit during a horizontal blanking period.

[0010]

First and second signal supply units for transfer and reading are provided independently.

Therefore, it is possible to selectively enable a first operation mode in which all pixels are read out through the first and second signal supply units and a second operation mode in which pixels are read out through one of them.

Then, in the second operation mode, the number of lines is thinned out, so that a high-speed imaging signal can be output.

Further, the sequence of the color arrangement of the imaging signal output in the second operation mode is the same as in the case of reading all pixels, and there is no need to change the signal processing.

Further, in the second operation mode, when the signal charge is transferred from the vertical transfer unit to the horizontal transfer unit, a packet containing no signal charge is output as a signal by performing a predetermined number of line shifts in the horizontal blanking period. Can be compressed so that it is not included in.

[0011]

BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

FIG. 1 shows an outline of an embodiment of CCD1 according to the present invention. In this one embodiment, an interline method is adopted, and the signal charge from the photosensor 2 is horizontally provided between the photosensor (for example, a photodiode) 2 arranged two-dimensionally in the image area and the photosensor 2. It has a vertical CCD (vertical transfer unit) 3 for transferring to a CCD (horizontal transfer unit) 4 and a buffer amplifier 5 connected to the horizontal CCD 4. The image sensor 2 is incident with the imaging light that has passed through a color filter arranged as described later. One photosensor 2 and one bit in the vertical CCD3 are configured to correspond to each other, and the signal charges from each photosensor 2 are read into the vertical CCD3 without being mixed, and the signals of all the pixels are sequentially read without being mixed. It is possible to transfer to the horizontal CCD4. Then, by driving the horizontal CCD 4, the signal is transferred to the buffer amplifier 5 which is a floating diffusion area, and the signal is sequentially converted into a voltage and output.

[0012]

The plan view of the unit pixel of the CCD1 is shown in FIG. 2, and the structure of the vertical CCD3 is shown in FIG.

The vertical CCD3 has, for example, a three-layer electrode three-phase drive configuration. In FIG. 2, 6 is a transfer channel of the vertical CCD3, 7 is a channel stopper for separating each pixel and between the pixel and the transfer channel, and 8, 9 and 10 are transfer gates of the vertical CCD3, respectively. The transfer gate 9 also serves as a read gate. In FIG. 2, the illustration of the light-shielding film and the like is omitted. The transfer gates 8, 9, and 10 are formed by processing the first, second, and third polycrystalline silicon electrodes, as shown in FIG. Vertical drive pulses φV1, φV2, and φV3 are applied to these transfer gates 8, 9, and 10, respectively.

[0013]

When reading a signal from the photosensor 2 to the vertical CCD3, the bias voltage (with the read pulse) higher than the high level of the vertical transfer clock φV2 is applied to the transfer gate adjacent to the photosensor 2, that is, the transfer gate 9 which also serves as the read gate.) Is applied.

When a read pulse is supplied to the gate 9, since one pixel corresponds to one bit of the vertical CCD3, the signal charge is read from all the photosensors 2 to the vertical CCD3. The horizontal CCD4 outputs data for one line by the transfer clocks φH1 and φH2. As the horizontal CCD 4, for example, a composite channel horizontal CCD structure can be adopted. In that case, the output unit is configured to have two channels.

[0014]

Since the above-mentioned CCD can sequentially output signals of all pixels without mixing them, it is suitable for an electronic still camera and image capture.

However, as described above, the output time of one screen (from the top to the bottom of the screen) is doubled when the charge is transferred with the same clock as compared with the image sensor for a video camera having the same number of pixels that performs interlaced output. It becomes. In one embodiment of the present invention, the imaging signal on one screen is output at high speed by reducing the number of horizontal lines as a signal for monitoring and an imaging signal for automatic control such as automatic focus control. Moreover, in the case of this line thinning, the color sequence in the vertical direction defined by the arrangement of the color filters is not broken. On the other hand, when the captured image is captured in a medium such as a semiconductor memory, a full-frame imaging signal (an imaging signal in which the number of lines is not thinned out) is output. Even in the case of line thinning, since the color sequence is the same as in the case of full frame, the problem that the signal processing circuit becomes complicated can be avoided.

[0015]

In the above-mentioned CCD capable of reading all pixels, in order to thin out the number of lines, the wiring to the transfer gate (second polycrystalline silicon) 9 contributing to the reading of the signal charge from the photo sensor 2 is divided into two. It is possible by that.

The color repetition period is represented by N. FIG. 4 is an example of an image pickup device to which the present invention is applied in the case where two upper and lower pixels form one cycle (N = 2).

[0016]

As the arrangement of the color filters of the single-plate type CCD, R (filter that passes red), G (filter that passes green), and B (filter that passes blue) are arranged as shown in FIG. 5A (bayer method). Are known.

A highly sensitive G filter is placed in half of the pixels. Further, a color filter having a complementary color checkerboard arrangement shown in FIG. 5B is also known. In FIG. 5B, Ye, Cy, and Mg are yellow, cyan, and magenta filters, respectively. The complementary color filter shown in FIG. 5B is often used in a video camera because it can increase the resolution as compared with the primary color filter. On the other hand, the primary color filter shown in FIG. 5A is excellent in color reproducibility and is often used in electronic still cameras.

[0017]

The present invention can be applied to both a single-plate image sensor having a primary color filter and a single-plate image sensor having a complementary color filter.

Further, although not shown, the image sensor is composed of an image sensor having a G filter and an image sensor having an array of R and B filters, and the positional relationship between the two image sensors is a pixel in the horizontal direction or in the horizontal and vertical directions. It can also be applied to an image sensor (so-called spatial picture element shift method) in which the pitch is shifted by 1/2.

[0018]

The array of FIG. 5A has a vertical color repetition period N of (N = 2), and the array of FIG. 5B has (N = 4).

FIG. 4 is (N = 2) and is a schematic view showing the bus wiring of the gates of the photosensor 2, the vertical CCD3, and the vertical CCD3 in the vertical direction with respect to a pari of the row. Among the photosensors 2, the one provided with the shaded portion in the upper left corner corresponds to one color filter such as G filter, and the one not provided with the shaded portion corresponds to another color filter such as B filter. As described above, the vertical CCD3 is of a three-layer electrode three-phase drive type, and has a 3-bit gate adjacent to the aperture pixels (pixels that are not shaded) of the CCD. Further, the vertical CCD3 includes a first region A and a second region B. The first region A is composed of gates 21, 22, 23, and the second region B is composed of gates 31, 32, 33. Gates 22 and 32 are transfer / read gates. 41, 42, 42', and 43 are bus wirings to which drive pulses φV1, φV2, φV2', and φV3 for vertical transfer are supplied, respectively.

[0019]

The gates 21 and 31 are connected to the bus wiring 41, and the gates 23 and 33 are connected to the bus wiring 43.

Drive pulses φV1 and φV3 are supplied to these bus wirings 41 and 43, respectively. Two buses 42 and 42'are provided for the drive pulse φV2. The first area A refers to the one in which the transfer / read gate 22 is connected to the bus 42, and the second area B refers to the one in which the transfer / read gate 32 is connected to the bus 42'. Although the bus line is drawn on only one side in FIG. 4 for simplification, it is common to arrange the bus lines on both sides of the photosensor 2 and drive them on both sides.

[0020]

In the present invention, for line thinning, the range in which the first area A is lined up in m (m = 1, 2, 3, ...) And the range in which the second area B is lined up in N × a are vertical. It is formed alternately in the direction.

The example shown in FIG. 4 is the case of (N = 2, m = 3, a = 2). The values of m and a can be arbitrarily selected, but even if m and a are large values, it is necessary that (m + N × a) is smaller than the number of vertical pixels of the number of effective pixels.

[0021]

In one embodiment of the present invention described above, in the first operation mode, that is, during the full frame operation of reading the signals of all pixels, the photo is taken in both the first region A and the second region B of the vertical CCD3. A signal is read from the sensor 2.

For that purpose, read pulses are applied to both the gates 22 and 32 through the bus wirings 42 and 42'. In this case, the color signal is output with a color sequence corresponding to the order of the color filter arrangement, for example, a sequence of G, B, G, B, ...

[0022]

On the other hand, in the second operation mode, that is, during the line thinning operation, the read pulse is applied only to the gate 22 of the first region A via the bus wiring 42.

Therefore, the signal is read from the range of m, and the signal is not read from the range of N × a. In the example of FIG. 4, a signal is generated from the (m = 3) line, and no signal is generated from the (N × a = 4) line. Since the number of lines to be thinned out is an integral multiple of the color repetition synchronization N, the order of the color signals of the imaging output in the case of line thinning is maintained in the same relationship as the full frame read.

[0023]

6A to 6C show the timing when the image sensor is driven, and FIG. 6A shows the timing when the full frame is read out.

In each horizontal blanking period, the three-phase drive pulses φV1, φV2, φV2 ', φV3 as the line shift pulse LS are the gates 21, 22 and 23 of the first region A of the vertical CCD3 and the second region B. It is supplied to the gates 31, 32 and 33, respectively. Further, a read pulse is also applied to both the gates 22 and 32 every 1 V. By this read pulse, the signal charge is read from all the photosensors to the vertical CCD3. As shown in the detailed timing chart of FIG. 6B, the drive pulses φV1, φV2, φV2 ', and φV3 generated within the horizontal blanking period are three-phase, and one line shift period shifts the charge by one line. Is done. When reading a full frame, one line shift is made within each horizontal blanking period.

[0024]

On the other hand, in the case of reading the line thinning, as shown in FIG. 6C, the reading pulse is applied only to the gate 22 of the first region A.

As a result, the signal charge is read out only from the photosensor adjacent to the first region A. In the case of line thinning, the signal charge is not read to the vertical CCD of the thinned line, and there is no signal. This no-signal period can be eliminated by repeating the line shift operation a plurality of times.

[0025]

For example, in the case of the color arrangement shown in FIG. 4, the charge for three pixels represented by H1, specifically, the signal charge of one first region A and the no signal of two second regions B. Is synthesized in the horizontal CCD4 by supplying the line shift pulse LS three times in the first horizontal period H1 as shown in FIG.

Similarly, by supplying the line shift pulse LS three times in the second horizontal period H2, the signal charge of one first region A and the no signal of the two second regions B are combined in the horizontal CCD4. To do. Further, in the third horizontal period H3, by supplying the line shift pulse LS once, the signal charge of one first region A is supplied to the horizontal CCD 4 in one horizontal period. Therefore, in each horizontal period, the signal charge from one first region is output without changing the color sequence. The operation of the period shown in FIG. 7 is repeated every three horizontal periods.

[0026]

FIG. 8A is a schematic diagram of the potential of channel 6 of the vertical CCD3 in the case of (m = 1, a = 1).

The direction from the right side toward the horizontal CCD 4 on the left side in the drawing is the vertical transfer direction. Channel 6 includes a packet 51 including a signal charge Qs and an empty packet 52 during the line thinning operation. In order to output the signal charge Qs from each line, a large number of line shifts are performed for the empty packet 52, whereby the signal charge and the no signal are mixed in the horizontal CCD4, and the period of no signal is removed. The number of line shifts made within each horizontal blanking period may be selected so as to satisfy the following relationship.

[0027]

1 + X + (N × a) when I (: number of packets including the signal charge Qs to be output (this example is considered as one packet)) + X (number of packets not including the preceding signal charge Qs) (: Number of packets not including the signal charge Qs behind) Therefore, in the case of (X = 0), only the signal charge is transferred to the horizontal CCD4, and in the case of (X ≠ 0), the signal. A packet containing an electric charge and a packet containing one or more signal charges are transferred to the horizontal CCD4.

[0028]

Under the above conditions, the signal charge can be transferred to the horizontal CCD4 and the non-signal line can be compressed.

Actually, the charge of the empty packet is not 0, and the unnecessary signal charge Qn such as the smear signal and the dark current is included.

If the number of line shifts made in each horizontal blanking period is different, the number of times the unnecessary signal charge Qn is added is different, so that the amount of the unnecessary signal included differs depending on the actual output line. As a result, there is a possibility that a line crawl phenomenon in which the brightness changes for each line on the monitor and image quality deterioration such as color shift may occur.

[0029]

To solve this problem, the number of line shifts made during each horizontal blanking period may be fixed.

In the case of limited conditions, that is, (m = 1, or m = 2), the signal charge Qs of each line is set by setting the number of line shifts of the vertical CCD3 to ((N × a / m) + 1). The number of packets that do not include the signal charge Qs to be added to can be constant. This makes it possible to prevent the above-mentioned deterioration in image quality from occurring.

[0030]

FIG. 8B is a schematic diagram of the potential of channel 6 of the vertical CCD3 in the case of (N = 2, m = 1, a = 1).

In this example, (N × a / m = 2), and by setting the number of line shifts to 3, the number of packets that do not include the signal charge Qs to be added in each line, which is the actual output, is constant. Can be. Further, FIG. 8C shows the case of (N = 2, m = 2, a = 1). In this case, (N × a / m = 1), and the number of line shifts may be two. Further, even in the case of m> 2, if the level of the smear signal and the dark current can be sufficiently reduced, no problem will occur.

[0031]

Since the CCD according to the present invention described above can reduce the number of lines that are the actual output, the values of the number m in which the first region A of the vertical CCD 3 is lined up and the number N × a in which the second area B is lined up are set. By selecting, the number of lines of the output imaging signal can be suppressed to be less than the number of horizontal scanning lines of the television in one field.

Some examples of the number of output lines will be described by taking the case of (N = 2) such as the color filter array of the Bayer method as an example.

[0032]

As shown in FIG. 9, when the present invention is applied to a VGA (Video Graphics Array) compatible image sensor having an effective number of pixels (: vertical × horizontal) (480 × 640), (a = 1, m). = 2).

Therefore, in the line thinning mode, the number of output lines can be halved to 240 lines. FIG. 10 shows the structure of a vertical CCD in a vertical row in the case of the image sensor shown in FIG. 9, and FIG. 11 shows a timing chart of a drive pulse for driving the image sensor shown in FIG. 10 in the second operation mode. .. The parts corresponding to FIG. 4 are designated by the same reference numerals, and the description thereof will be omitted. In this case, the line shift pulse LS is supplied twice in each horizontal period. Further, in the second operation mode, the signal of only R is read out in the first horizontal period H1 and the signal of only G is read out in the second horizontal period H2. In the example shown in FIG. 10, since the number of lines added to each horizontal period is the same, the problem of color shift does not occur.

[0033]

As shown in FIG. 12, in the image sensor having the number of effective pixels (768 × 1024), the number of output lines can be set to 256 by setting (m = 1, a = 1).

FIG. 13 shows the structure of a vertical CCD in a vertical row in the case of the image sensor shown in FIG. 12, and FIG. 14 shows a timing chart of the drive pulse for driving the image sensor shown in FIG. 13 in the second operation mode. .. The parts corresponding to FIG. 4 are designated by the same reference numerals, and the description thereof will be omitted. In this case, the line shift pulse LS is supplied three times in each horizontal period. Further, in the second operation mode, the signal of only R is read out in the first horizontal period H1 and the signal of only G is read out in the second horizontal period H2. Further, the signal of only R may be read out in the first horizontal period H1', and the signal of only G may be read out in the second horizontal period H2'. In the example shown in FIG. 13, since the number of lines added to each horizontal period is the same, the problem of color shift does not occur.

[0034]

As shown in FIG. 15, in the image sensor having the number of effective pixels (1024 × 1280), the number of output lines can be set to 256 by setting (m = 1, a1 = 1, a2 = 2).

a1 and a2 are used alternately. FIG. 16 shows the structure of a vertical CCD in a vertical row in the case of the image sensor shown in FIG. 15, and FIG. 17 shows a timing chart of a drive pulse for driving the image sensor shown in FIG. 16 in the second operation mode. .. The parts corresponding to FIG. 4 are designated by the same reference numerals, and the description thereof will be omitted. In this case, the line shift pulse LS is supplied four times in each horizontal period. Further, in the second operation mode, the signal of only G is read out in the first horizontal period H1 and the signal of only R is read out in the second horizontal period H2. Further, even if the signal of only R is read in the first horizontal period H1'and the signal of only G is read in the second horizontal period H2', only the signal of R is read in the first horizontal period H1'. The signal may be read out only in G during the second horizontal period H2 ". In the example shown in FIG. 16, since the number of lines added to each horizontal period is the same, the problem of color shift does not occur.

[0035]

In any of the cases shown in FIGS. 9, 12 and 15, the number of output lines can be made smaller than the number of lines in one field of the NTSC system (262.5), for example.

Therefore, the color sequence and the angle of view can be maintained in the same relationship as the full frame readout mode, and the image pickup signal in the line thinning mode can be output in a shorter time. Thereby, the image pickup screen can be displayed on the liquid crystal monitor without using VRAM or frame memory.

[0036]

The specific configuration of the image pickup device in the above-described embodiment is an example, and the present invention can be applied to other solid-state image pickup devices.

For example, the vertical CCD may have a structure in which a two-layer electrode is driven by four phases. Further, as a mode for driving the solid-state image sensor, a third operation mode in which the read-out pulse φV2 ' is applied and the read-out pulse φV2 is not applied may be set.

[0037]

INDUSTRIAL APPLICABILITY As described above, according to the present invention, an image pickup signal having a small number of lines is selectively obtained by keeping the same relationship between the full frame operation mode for reading all pixels and the color sequence. It is possible to output the imaging signal at high speed.

Therefore, even with an image sensor having a large number of lines, the number of output lines can be set to be less than or equal to the number of scanning lines of the television, and the image pickup signal is displayed on the monitor without using a large-capacity memory such as a frame memory or VRAM. be able to. Further, since the image pickup signal can be output at high speed, the response of the automatic control device such as autofocus can be speeded up. Further, since the number of frames is increased, there is an advantage that the movement of the monitor image becomes smooth.

[0038]

A brief description of the drawing

[0039]

FIG. 1 is a schematic diagram showing a schematic configuration of an embodiment of the present invention.

[0040]

FIG. 2 is an enlarged plan view of a pixel portion of an embodiment of the present invention.

[0041]

FIG. 3 is a schematic diagram showing a structure of a vertical CCD according to an embodiment of the present invention.

[0042]

FIG. 4 is a schematic diagram showing a vertical row of bus wiring according to an embodiment of the present invention.

[0043]

FIG. 5 is a schematic diagram showing an example and another example of a color filter to which the present invention can be applied.

[0044]

FIG. 6 is a timing chart of a drive pulse for driving an embodiment of the present invention.

[0045]

FIG. 7 is a timing chart of the drive pulse of the image pickup device shown in FIG.

[0046]

FIG. 8 is a schematic diagram schematically showing the potential of a vertical CCD in an embodiment of the present invention.

[0047]

FIG. 9 is a schematic diagram showing a specific example of the present invention.

[0048]

10 is a schematic diagram showing a vertical row of bus wiring of the image sensor shown in FIG. 9. FIG.

[0049]

11 is a timing chart of the drive pulse of the image pickup device shown in FIG.

[0050]

FIG. 12 is a schematic diagram showing another specific example of the present invention.

[0051]

FIG. 13 is a schematic diagram showing a vertical row of bus wiring of the image pickup device shown in FIG.

[0052]

14 is a timing chart of the drive pulse of the image pickup device shown in FIG.

[0053]

FIG. 15 is a schematic diagram showing still another specific example of the present invention.

[0054]

16 is a schematic diagram showing a vertical row of bus wiring of the image pickup device shown in FIG.

[0055]

FIG. 17 is a timing chart of the drive pulse of the image pickup device shown in FIG.

[0056]

FIG. 18 is a schematic diagram used for explaining a conventional image sensor.

[0057]

FIG. 19 is a schematic diagram used for explaining the image pickup device proposed above.

[0058]

FIG. 20 is a schematic diagram showing the relationship between the output of the image sensor and the display on the liquid crystal monitor.

[0059]

FIG. 21 is a block diagram showing a configuration when an imaging signal generated from an imaging element is supplied to a liquid crystal monitor.

[0060]

Code description

[0061]

2 ... Photosensor, 3 ... Vertical CCD, 4 ... Horizontal CCD, 6 ... Vertical CCD channel, 8, 9, 10 ... Vertical CCD gate, 21, 22, 23 ... The gate of the first region A of the vertical CCD, 31, 32, 33 ... The gate of the second region B of the vertical CCD, 41, 42, 42', 43 ... The bus for supplying the drive pulse. wiring

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CLAIMS JPH09298755A

1.

In the interline type solid-state image sensor, a plurality of photosensors arranged in a matrix in which light is incident through a plurality of color filters repeated in the vertical direction with an N (N is a natural number) pixel period, and the plurality of photos. A vertical transfer unit that transfers the charge read from the sensor without mixing the charge from the photosensors that are connected in the vertical direction, and a charge that is combined with the vertical transfer unit and transferred from the vertical transfer unit for one horizontal period period. The horizontal transfer unit output in (m is a natural number), the first photosensor group connected in the vertical direction of m (m is a natural number), and the second photosensor group connected in the vertical direction consisting of a times (a is a natural number) of the pixel period N. 1 unit is composed of the photosensor group of the above, and the first photosensor group and the second photosensor group are alternately arranged in the vertical direction, and are accumulated in the first photosensor group. A first signal supply unit for transferring the charged charge to the vertical transfer unit, and a second signal supply unit for transferring the charge accumulated in the second photosensor group to the vertical transfer unit. A solid-state image sensor comprising the first signal supply unit and the second signal supply unit, which are provided independently of each other.

2.

The solid-state image sensor according to claim 1 further includes a drive signal generation means that is input to the first and second signal supply units and generates a drive signal that drives the vertical transfer unit and the horizontal transfer unit. The signal generation means is a solid-state image pickup device that generates a line shift signal as the drive signal for transferring the charge from the vertical transfer unit to the horizontal transfer unit during the horizontal blanking period.

3.

In the solid-state image sensor according to claim 2, the drive signal generation means has a first operation mode in which charges of all pixels are read out by supplying drive signals to the first and second signal supply units, and the first operation mode. A solid-state image sensor characterized in that it can selectively switch between a second operation mode that generates a drive signal that drives only one signal supply unit.

4.

In the solid-state image sensor according to claim 2, the drive signal generation means has (m + N × a) lines of electric charge output in m horizontal periods as a whole in m consecutive horizontal blanking periods (m + N × a). A solid-state image sensor characterized by generating the line shift signal m + N × a) times.

5.

In the solid-state image sensor according to claim 2, when one pixel included in a certain first photosensor group is used as the first pixel, the drive signal generation means becomes the first photosensor group. The charge of the second pixel included and adjacent to the first pixel in the upward or downward direction and the charge of the first pixel are transferred from the vertical transfer unit to the horizontal transfer unit during different horizontal blanking periods. A solid-state image sensor characterized by generating a line shift signal so as to be transferred.

6.

In the solid-state image sensor according to claim 5, the drive signal generation means is included in the first photosensor group, and a pixel adjacent to the first pixel in the upward direction is a second pixel and a downward direction. In the above, when the pixel adjacent to the first pixel is set as the third pixel, the pixel having the longer physical distance from the first pixel among the second and third pixels is described above. The charge of the pixel located between the pixel having the longer physical distance and the first pixel is added to the charge of the first pixel or the pixel having the longer physical distance. Therefore, the solid-state image sensor is characterized in that at least two line shift signals are generated during the horizontal blanking period in which the charge of the pixel having the longer physical distance is transferred from the vertical transfer unit to the horizontal transfer unit.

7.

The solid-state image sensor according to claim 2, wherein the drive signal generation means generates the same number of line shift signals in each horizontal period.

8.

The solid-state image sensor according to claim 1, wherein the N is different for each unit.

9.

The solid-state image sensor according to claim 1, wherein N has a period of 2 units, and each unit is in the order of 2 or 4.

10.

The solid-state image sensor according to claim 1, wherein N is fixed at 2 in any unit.

11.

In the solid-state image sensor according to claim 2, when m = 1 or m = 2, the drive signal generation means generates (N × a / m) + 1 line shift signal during each horizontal blanking period. As a result, the solid-state image sensor is characterized in that the charge of one line of pixels including the signal charge and the charge of the N × a / m line of pixels not including the signal charge are mixed in the horizontal transfer unit.

Espacenet

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ELECTRONIC IMAGE-PICKUP DEVICE

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Abstract of JPH10210367 (A)

PROBLEM TO BE SOLVED: To provide the output of the multiple number of frames per unit time from a solid-state image-pickup element, without using a high drive frequency by providing a mode for taking out the image element signals for the whole lines of the solid-state image-pickup element and a mode for taking out the image signals for k-lines, where a part continues in a vertical direction. SOLUTION: The arrays (lines) of pixels constituting a solid-state image- pickup element in a horizontal direction are arranged for L-lines in a vertical direction. A mode (static image mode) for taking out the pixel signals for all the pixels by sequentially scanning all the lines and the mode (dynamic image mode) for taking out the pixel signals for only k-lines in the vertical direction are provided. At the time of photographing the still image, it is executed at the still image mode. The processing of automatic focusing and the like are

executed at the dynamic image mode and a system provides for next photographing in a standby state, where photographing is not executed. At the time of the dynamic image mode, a frame rate can be improved to L/k-times as much as that at the time of the still image mode. Then, the precision of automatic focusing can be improved.

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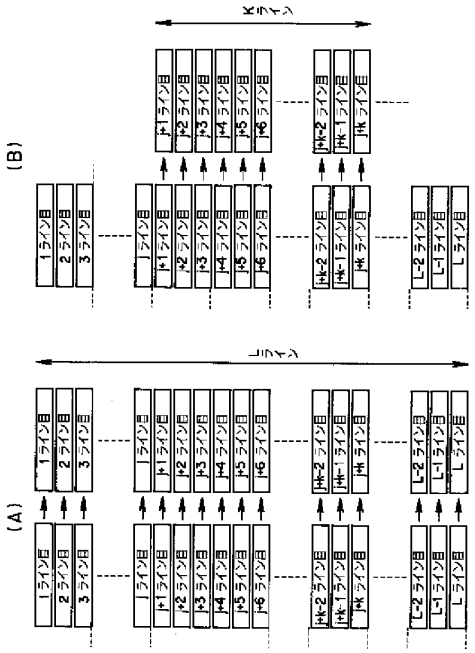
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(54)【発明の名称】　電子的撮像装置

(57)【要約】

【課題】　高い駆動周波数を用いることなく高画素の固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる、色信号が欠落することのない電子的撮像装置を提供する。

【解決手段】　光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成されているＣＣＤと、このＣＣＤを順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出す（Ａ）に示すようなモードと、静止画を記録しまたは動画処理するべく上記ＣＣＤから垂直方向の一部連続するｋ（ｋは正の整数）ラインに係る画素信号を取り出す（Ｂ）に示すようなモードと、を選択的に制御するＣＰＵとを備えた電子的撮像装置。



【特許請求の範囲】
【請求項１】　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、
上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の一部連続するｋ（ｋは正の整数）ラインに係る画素信号を取り出すモードとを選択的に制御する制御手段と、
を具備することを特徴とする電子的撮像装置。
【請求項２】　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、
上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、
を具備することを特徴とする電子的撮像装置。
【請求項３】　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、
上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、
を具備することを特徴とする電子的撮像装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電子的撮像装置、より詳しくは、２次元状に配列された画素を有する固体撮像素子から画素信号を取り出して静止画を記録しまたは動画処理を行う電子的撮像装置に関する。
【０００２】
【従来の技術】近年の微細加工技術の進歩に伴い、光学的な画像を電気的な画像信号に変換するＣＣＤ等の固体撮像素子も高画素化が進んでいる。
【０００３】こうした高画素のＣＣＤとして、例えば１００万画素相当のインターライン型の固体撮像素子を考えると、該固体撮像素子を２０ＭＨｚ（メガヘルツ）以下の周波数により順次走査駆動させた場合には、画素数の関係から、通常は毎秒１０～１５フレーム程度の画像が得られることになる。
【０００４】このフレーム数は、動画データとして用いるには十分なコマ数とはいえず、該固体撮像素子を有する電子的撮像装置に動画データを必要とするような制御系がある場合には、例えばオートフォーカス（ＡＦ）や自動露出制御（ＡＥ）やオートホワイトバランス（ＡＷＢ）などの処理を高速に行うことができないという不都合があった。
【０００５】これについて、図２４を参照して詳細に説明する。図２４は、従来のＣＣＤ駆動手段により得られるＣＣＤ出力データおよび液晶表示データを示すタイムチャートである。
【０００６】図２４中、１／６０ＶＤと記載されているのが、１／６０秒周期の垂直同期信号であり、これに対して、ＣＣＤからの出力データが図示の符号Ａ，Ｂ，Ｃ，Ｄ，Ｅに示すように秒１０コマの割合で得られる。
【０００７】これに対して、例えばシステムに液晶表示装置が設けられている場合には、液晶表示を行うに際して１秒あたりに６０コマ程度の駆動を行わないと、液晶の反応等の理由により良好な表示を行うことができないために、例えばメモリ等の手段を用いてＣＣＤの出力データを記憶させておき、該メモリに記憶された同一のコマのデータを何度か出力することにより、コマ数を多くして表示を行うことができるように対応していた。
【０００８】つまり、図２４に示すように、例えば、ＣＣＤからＡというデータが出力されると、そのデータＡを一旦メモリに記憶させて、データＡが全てメモリに記憶されたところで、液晶表示データとして、該メモリからデータＡを６回繰り返して出力するようにしている。ここではデータＡは上述したように秒１０コマの割合で出力されるために、液晶表示データとしては秒６０コマの割合で出力されることになる。
【０００９】このような駆動手段を用いる場合には、必ずメモリ等の手段が必要となるが、表示用にコマ数を調整するためだけに高価なメモリを用いるのは、コスト的に効率が良いとはいえなかった。
【００１０】また、上述したようなＣＣＤ出力データを、高速な動画データを用いて処理をしたい制御用のデータとして、例えば図２４のＣＣＤ出力データに（）書きで示したようなＡＦデータや、その他にもＡＥデータあるいはＡＷＢデータとして用いる必要がある場合がある。
【００１１】例えばオートフォーカスを行う場合に、１コマ分のＣＣＤデータを用いて必ず合焦させることができるとは限らないために、複数コマを用いてオートフォーカスを行うことになるが、上述したような１秒間に１０コマ程度しか動画を得ることができない場合には、オートフォーカス動作を行うのに長い時間を要するという不都合があった。

【００１２】特に、電子的撮像装置が電子スチルカメラである場合には、静止画の撮影を行うものであるために、シャッタチャンス等を逃がさないことが大変に重要であり、ＡＦ，ＡＥ，ＡＷＢ等に時間を要するのはこの点において大きな不都合となっていた。

【００１３】しかも、上述のように秒１０コマ程度のフレームレートしか得られない場合には、ＡＦ，ＡＥ，ＡＷＢを同時に平行処理しなければ制御が間に合わないために、上述したようにメモリが必要であったり、回路規模が大きくなったりして、コスト的に不利となっていた。

【００１４】そこで、メモリを設けることなくコマ数を上げるために、間引き読み出しを行う手段が考えられる。図２５，図２６を参照して従来の間引き読み出しについて説明する。

【００１５】図２５は従来の固体撮像素子の色フィルタの構成例を示す図である。

【００１６】この図２５に示すような線順次のフィルタ構成は、原色のベイヤー配列として公知のものであり、１ライン目がレッド（Ｒ）とグリーン（Ｇ）の繰り返し、２ライン目がグリーン（Ｇ）とブルー（Ｂ）の繰り返しとなっていて、その後の奇数ラインは上記１ライン目と、偶数ラインは上記２ライン目とそれぞれ同様に構成されている。一般的に全画素読み出しと呼ばれるＣＣＤでは、このような原色のベイヤー配列という色差線順次形式のフィルタ配列が一般的となっている。

【００１７】一般的にＣＣＤにおいて、間引き処理を行うことにより単位時間当たりのフレーム数を上げようとすると、図２６に示すように、単純に１ラインずつ間引く走査が考えられる。

【００１８】しかし、このような間引き読み出しを行うと、例えば１ライン目，３ライン目，５ライン目，…などの奇数ライン目が読み出されることになるために、上記図２５に示したようなベイヤー配列のフィルタ構成のＣＣＤでは、ＲＧのライン（赤色情報を含むラインであるために、図２６において（ＣＲ）と表示してある。）のみが読み出されてグリーン（Ｇ）とレッド（Ｒ）の色信号が得られるデータのみが出てきてしまい、偶数ラインに存在するブルー（Ｂ）の信号（同図２６において、青色情報を含むラインは（ＣＢ）と表示してある。）が得られないことになってしまう。

【００１９】こうして、コマ数を上げるために単純に１ラインを飛ばして間引き走査を行っても、必ずＧ，Ｒ，Ｂの全ての信号を得られるとは限らないために、液晶表示用のカラーデータとして用いることはできず、液晶表示装置が設けられている電子スチルカメラに使用するには適さなかった。

【００２０】

【発明が解決しようとする課題】上述したように、高画素のインターライン型の固体撮像素子を動画信号処理を行うに適した単位時間当たりのコマ数で駆動するためには、高い駆動周波数が必要であり、２０ＭＨｚ以下の周波数で順次走査駆動させると、単位時間当たりのコマ数が少なくなってしまった。

【００２１】これに対応するために、間引き走査を行うと、上述したように全画素読み出し方式のＣＣＤイメージセンサでは、従来より一般的にベイヤー配列などの色差線順次形式の配列の色フィルタが用いられているために、色信号が欠落して必要なカラー信号が得られないことがあった。

【００２２】本発明は上記事情に鑑みてなされたものであり、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置を提供することを目的としている。

【００２３】

【課題を解決するための手段】上記の目的を達成するために、第１の発明による電子的撮像装置は、光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の一部連続するｋ（ｋは正の整数）ラインに係る画素信号を取り出すモードとを選択的に制御する制御手段とを備えたものである。

【００２４】また、第２の発明による電子的撮像装置は、光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段とを備えたものである。

【００２５】さらに、第３の発明による電子的撮像装置は、光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段とを備えたものである。

【００２６】従って、第１の発明による電子的撮像装置は、固体撮像素子が光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成され、制御手段が上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の一部連続するｋ（ｋは正の整数）ラインに係る画素信号を取り出すモードとを選択的に制御する。

【００２７】また、第２の発明による電子的撮像装置は、固体撮像素子が光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成され、制御手段が上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する。

【００２８】さらに、第３の発明による電子的撮像装置は、固体撮像素子が光を受けて電気信号に変換する画素を２次元状に配列して有し該画素の水平方向の一並びをラインとしてそのラインが垂直方向に複数並設されて構成され、制御手段が上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する。

【００２９】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。図１から図６は本発明の第１の実施形態を示したものであり、図１は電子的撮像装置の構成を示すブロック図である。

【００３０】この電子的撮像装置は、基本的には静止画を撮像して記録することを主目的としたものであり、図１に示すように、レンズおよび絞り１７を介して入射した被写体像を電気信号に変換する２次元配列の固体撮像素子たるＣＣＤ１と、このＣＣＤ１の出力からリセット雑音などを取り除くための相関二重サンプリング回路（ＣＤＳ）２と、この相関二重サンプリング回路２の出力のゲインを調節するゲインコントロールアンプ（ＡＭＰ）３と、このゲインコントロールアンプ３の出力信号をデジタル信号に変換するアナログデジタル変換器（Ａ／Ｄ）４と、デジタル信号に変換された映像信号に各種の処理を施すプロセス処理回路５と、上記ＣＣＤ１を駆動するための転送パルスを出力するとともに、上記相関二重サンプリング回路２用のサンプルホールドのパルスを出力し、さらに上記アナログデジタル変換器４によりＡ／Ｄ変換を行うためのタイミングパルスを出力するタイミングジェネレータ（ＴＧ）６と、このタイミングジェネレータ６と後述するＣＰＵ８との同期をとるための信号を発生するシグナルジェネレータ（ＳＧ）７と、この電子的撮像装置全体についてタイミング等を含む各種の制御を行う例えばマイクロコンピュータでなるＣＰＵ８と、上記プロセス処理回路５から出力された上記ＣＣＤ１の画素データを蓄積するメモリたるＤＲＡＭ９と、上記レンズおよび絞り１７によるオートフォーカス用の演算を行う制御回路でなるオートフォーカス回路（ＡＦ）１０と、上記ＣＣＤ１上に結像される被写体像の測光を行うための制御回路でなる自動露出制御回路（ＡＥ）１１と、ホワイトバランスを自動的に制御するための制御回路であるオートホワイトバランス回路（ＡＷＢ）１２と、この電子的撮像装置に設けられているモニタである液晶表示装置１３と、該電子的撮像装置の外部のモニタ等でなる外部表示装置へ出力を行うための出力端子を有してなる外部表示用端子１４と、上記ＤＲＡＭ９に蓄積された１画面分の画素データを後述する記録媒体１６にデータ量を減らして記録するために圧縮し、または該記録媒体１６から読み出した圧縮データの伸長を行う圧縮伸長回路１５と、静止画データを記録する記録媒体１６とを有して構成されている。

【００３１】このような電子的撮像装置において、画像を記録する際には次のような動作を行う。

【００３２】上記ＣＣＤ１からＣＤＳ２，ＡＭＰ３，Ａ／Ｄ４，プロセス処理回路５を介して出力された画像信号が、例えば液晶表示装置１３により表示される。撮影者は、この液晶表示装置１３を見ながら被写体の構図等を決定して、図示しない撮影ボタンを押す。

【００３３】すると、上記プロセス処理回路５の出力がＤＲＡＭ９を介して圧縮伸長回路１５により圧縮され、記録媒体１６に記録される。

【００３４】また、上記電子的撮像装置において、記録した画像の再生を行う場合には、次のような動作を行う。

【００３５】上記記録媒体１６に蓄えられている圧縮データを読み出して、圧縮伸長回路１５により伸長処理をし、その伸長されたデータがＤＲＡＭ９に書き込まれる。

【００３６】このデータを再びプロセス処理回路５を介して液晶表示装置１３や外部表示用端子１４から外部表示装置に出力することにより、静止画として再生される。

【００３７】次に、上述したような構成において、上記ＣＣＤ１を駆動して画像データを得る手段について説明する。図２はＣＣＤを構成するラインからの画像データの読み出し方法を示す図である。

【００３８】図２において、この２次元配列の固体撮像素子であるＣＣＤ１を構成する画素の水平方向の並びをラインと呼び、このラインが垂直方向に１ラインからＬラインまで並んでいて、これらがこのＣＣＤ１の垂直方向に並ぶ全てのラインであるとする。

【００３９】図２（Ａ）は、上記ＣＣＤ１を１ラインからＬラインまで順次走査することによって、全画素に係る画素信号を取り出して、静止画を記録するモードを示している。

【００４０】つまり、いわゆるプログレッシブと呼ばれる方法により、図４において外側の大きな矩形枠で示すようなフル画面エリアについて順次走査を行い、全画素に係る情報を出力しているために、静止画として高解像度の画像を得ることができるモードである。

【００４１】これに対して、図２（Ｂ）は、上記ＣＣＤ１から図４において斜線で示すような垂直方向の一部連続するｋ（ｋは正の整数）ライン、つまりｊ＋１ラインからｊ＋ｋライン（ｊは０以上の整数）の画素信号を取り出して、動画処理するモードを示している。なお、このモードの出力を静止画として記録することも可能である。

【００４２】このような連続するｋラインの部分のみを読み出す手段を用いれば、全Ｌラインを読み出す場合に比べてフレームレートをＬ／ｋ倍に向上することができるために、動画処理を行う場合に大変有効であり、早いフレームレートの動画データを得ることが可能となる。

【００４３】ここに、上記連続するｋラインは、例えばＣＣＤ１のフル画面エリアの中央部を取るようにすると良い。このモードにより読み出した画像データは、後述するように、例えばオートフォーカス（ＡＦ）や自動露出制御（ＡＥ）やオートホワイトバランス（ＡＷＢ）等の処理に用いられるが、こうした処理においては中央重点処理が行われることが多いからである。

【００４４】次に、上記図２（Ａ）に示したようなモードと図２（Ｂ）に示したようなモードとがどのように実行されるかを図３を参照して説明する。図３は電子的撮像装置におけるＣＣＤの読み出しモードを示すタイムチャートである。

【００４５】図３において、１／６０ＶＤと記載された部分は、１／６０秒周期の垂直同期信号であり、上記従来例において図２４に示したものと同様に、垂直同期信号を例えば１／６０秒周期にした例を示すものである。

【００４６】また、図３において、上記１／６０ＶＤの下側にはＣＣＤ１から読み出す信号のモードを示している。

【００４７】静止画用の高画質な画像を取り込む以外のときは、上記図２（Ｂ）に示したようなモードにより連続するｋライン部分を読み出すことにより、フレームレートを向上して上記垂直同期信号ＶＤに同期させ、例えば動画処理を行うことを可能としている。こうして出力された画像データは、図６に示すように、ＡＥ，ＡＦ，ＡＷＢなどの制御用データを算出する処理に、例えば１フレームずつ順に繰り返して用いられる。

【００４８】なお、このようなフレーム毎に異なる処理を繰り返して行う場合には、例えば制御用データを蓄積することが考えられるが、この場合には、蓄積するデータを各々の処理内容に合わせて同一の蓄積系により蓄積して処理することも可能となる。

【００４９】上述のような処理を行っている最中に、図示しない撮影ボタンが押されるなどによりトリガが発せられると、それまでの動画処理により露光やピントが適切に合った状態に既に制御されているために、トリガが入力されたフレームの次から直ちに静止画を撮影することができる。

【００５０】この静止画の撮影は、上記図２（Ａ）に示したようなモードにより、ＣＣＤ１を１ラインからＬラインまで順次走査することによって行われる。この全ラインの走査が例えば１／１０秒の時間を要するとすると、１／６０秒周期の垂直同期信号ＶＤによりカウントする場合には、静止画の全データを出力するのに、６コマ分の時間が必要となる。

【００５１】この静止画データの出力が終了すると、該電子的撮像装置は、再び動画処理を行うモードに入って、連続するｋライン部分を読み出して出力し、ＡＥ，ＡＦ，ＡＷＢ等の処理を行って、次の撮影に備える。

【００５２】また、図５は、上記図４の変形例を示したものであり、上記連続するｋラインを１つのブロックとして、複数のブロックを取り出す例を示す図である。

【００５３】すなわち、上記図４においては、連続するｋラインをＣＣＤ１のフル画面エリアの例えば中央部から１つだけ取るようにしていた。

【００５４】これに対して、図５は、連続するｋラインをＣＣＤ１のフル画面エリアの例えば中央の上下部に２つ取るようにするものである。

【００５５】このように複数ブロックを取り出すことにより、ＡＥやＡＦの情報を得る範囲が広くなるとともに、いわゆる多分割方式のＡＥやＡＦを行うことが可能になって、ＡＦ精度やＡＥ精度を高めることができるという利点を有する。

【００５６】なお、連続するｋラインのブロックを複数読み出す場合には、１つのブロックだけ読み出す場合に比べてフレームレートが低下するが、依然として全画素を読み出す場合に比べて高いフレームレートを得ることができるために、制御を高速化するという効果は得られる。あるいは、フレームレートを低下させないためには、連続するライン数ｋを、１つのブロックだけ読み出す場合よりも小さくすることも考えられる。

【００５７】また、上述では読み出すブロック数として２の場合を示したが、これに限定されるものではなく、例えば中央部分をブロックとして加えて３つ程度にすれ

ば、より精度の高い制御を行うことが可能となる。

【００５８】このような実施形態によれば、オートフォーカスやＡＥやオートホワイトバランスなどの制御を行うために早いフレームレートが必要な場合には一部連続するｋラインを読み出し、静止画用の高解像度の画像出力が必要な場合にのみ全ラインの順次走査を行うことにより、レリーズタイムラグが短く、高画質の画像を得ることができる、シャッタチャンスを逃すことのない電子的撮像装置となる。

【００５９】また、図６はＡＦ，ＡＥ，ＡＷＢの制御のためのタイミングを示す図であり、フレームレートを向上しているために、ＡＦ，ＡＥ，ＡＷＢなどの制御を図６に示すように平行して処理する必要がなくなり、メモリが不要になるとともに、制御回路を共通に用いることができるために、回路規模を小さくすることが可能となる。

【００６０】さらに、このようにＡＦ，ＡＥ，ＡＷＢなどの制御を１フレームずつ順番に行うことにより、各々のデータに対してフリッカの影響を低減することができるという利点がある。

【００６１】図７から図１２は本発明の第２の実施形態を示したものであり、図７はＣＣＤを構成するラインからの画素データの読み出し方法を示す図である。この第２の実施形態において、上述の第１の実施形態と同様である部分については説明を省略し、主として異なる点についてのみ説明する。

【００６２】この第２の実施形態の電子的撮像装置の主要な構成は、上記図１に示したものと同様である。

【００６３】次に、この実施形態は、図７に示すように、垂直方向のｍ（ｍ≧３、ｍは整数）ラインについてｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出す処理を行うようにしたものである。

【００６４】より詳しくは、ＣＣＤ１から画素データを読み出す場合に、上記図２（Ａ）に示したような１ラインからＬラインまでの全ラインを順次走査し読み出して高画質撮影を行うための静止画記録モード以外に、図８（Ａ）に示すようなｍラインについてｎラインの画素信号を取り出すモードと、図８（Ｂ）に示すようなｍラインについてｎラインの画素信号を一部連続するｋラインにおいて取り出すモードとを有していて、これらを選択することができるようになっている。

【００６５】この図８においては、一例として、ｍ＝３，ｎ＝１としており、これにより３ラインについて１ラインの信号が得られることになる。

【００６６】それゆえに、図８（Ａ）に示すモードでは、フレームレートを３倍に上げることができる。なお、一般的には、全Ｌラインの内、読み出されるラインはＬ×ｎ／ｍとなるために、フレームレートはｍ／ｎ倍となる。

【００６７】また、図８（Ｂ）に示すモードでは、一般的に、全Ｌラインの内、読み出されるラインはｋ×ｎ／ｍとなるために、フレームレートは（ｍ×Ｌ）／（ｎ×ｋ）倍となる。

【００６８】上記図２（Ｂ）や図８（Ｂ）に示すようなＣＣＤ１の一部の画面のデータは、上記液晶表示装置１３や外部表示用端子１４を介した外部表示装置に動画表示を行うには適しておらず、特にフレーミングなどを行うには不適切である。このために、全画面に係る画像データが必要であるが、上述したように、全ラインを読み出すのでは単位時間当たりのコマ数が上がらないという不都合が生じるために、この図８（Ａ）に示すようなフル画面について間引き処理を行って読み出すモードを設けたものである。

【００６９】これにより、メモリを必要とすることなく、上記液晶表示装置１３や外部表示用端子１４を介した外部表示装置に、実際に撮影する静止画と同じフレーミングの全画面の動画を、速いフレームレートにより表示することができる。

【００７０】また、図８（Ｂ）に示すモードでは、３ラインにつき１ラインを間引いて読み出したものを用いてｋラインを出力するようにしているために、上述した第１の実施形態と同様の割合でフレームレートを向上させる場合には、図９の斜線部に示すようなｋラインの読み出し範囲となって、上記図４の斜線部に示したｋラインの読み出し範囲に比して３倍のエリアを有することになる。

【００７１】これにより、フレームレートを落とすことなく、より広いエリアをＡＦ，ＡＥ，ＡＷＢ等の制御に用いることができるこうして、間引きにより全画面を読むモードと、間引きによりｋラインだけ抜き出すモードとを両方有することにより、ＡＦ等の高速処理を行う場合と液晶表示を行う場合とにモードを使い分けることができる。

【００７２】さらに、上述したようなｍ＝３，ｎ＝１の場合、つまり、３ラインを１つの単位として順番に間引き読み出しをしていく場合には、図１１に示すように、３ライン目がＲ信号の得られるライン（ＣＲ）、６ライン目がＢ信号の得られるライン（ＣＢ）となる（上記図２５に示すような線順次のフィルタ構成を参照）。

【００７３】このようにＲの情報を含む色信号とＢの情報を含む色信号が線順次データで得られるために、同時化処理を施すことによって全ての色信号を含む動画処理データを得られることになる。このような信号が得られれば、液晶表示装置１３等によりカラー表示することができ、実際に撮影する画像と同じイメージで撮影者がフレーミングを行うことができる。

【００７４】なお、１ライン毎に異なる色フィルタが配列された線順次の色フィルタを用いる場合には、狭い範囲で全ての色データを得ることができ、色に係る解像度

を高めることができるという利点も有する。
【００７５】また、上述ではｍ＝３，ｎ＝１について述べたが、これに限定されるものではなく、その他の数であってもよい。ただし、ベイヤー配列の色フィルタに対して適用する場合には、ｍ＝２α＋１（αは正の整数）、つまりｍは奇数であることが望ましい。これにより、間引いた場合と、順次走査した場合との互換性をとることができるようになるためである。
【００７６】次に、上記図８（Ａ）に示したようなモードと図８（Ｂ）に示したようなモードとがどのように実行されるかを図１２を参照して説明する。図１２は電子的撮像装置におけるＣＣＤの読み出しモード等を示すタイムチャートである。
【００７７】図１２においては、上段に１／６０秒周期の垂直同期信号（１／６０ＶＤ）が、中段にＣＣＤの読み出しモードが、下段に制御用データがそれぞれ示されていて、さらにその下に静止画記録を行う部分が示されている。
【００７８】通常は、例えば上記図８（Ａ）に示したように、全画面においてｍラインにつきｎラインを読み出す間引き走査を行っておくことにより、フレーミングを行うのに適した全画面に係る画像が液晶表示装置１３に表示されるとともに、このときには、ＡＥとＡＷＢの制御を互いに繰り返して行うようにする。
【００７９】ここで、この電子的撮像装置の図示しない撮影ボタンが２段トリガでなり、つまり、操作者が静止画を撮りたいと考えて軽く撮影ボタンを押した状態で発せられる記録の準備段階に相当する第１トリガと、この第１トリガにより制御された状態において静止画像を記録させるべく発せられる第２トリガとを有してなるものとする。
【００８０】そして、図８（Ａ）に示したような全画面についての間引き読み出しを行っている最中に、第１トリガが発せられると、次のフレームからは図８（Ｂ）に示したようなｋライン読み出しに変更される。このｋライン読み出しにおいては、レンズおよび絞り１７のフォーカス位置を被写体に確実に合わせるために、ＡＦ制御が行われる。
【００８１】こうして合焦を行ったところで、第２トリガが発せられると、全画面の全ラインについて、例えば垂直同期信号の１／６０秒の６コマ分となる毎秒１０フレーム等のレートにより順次走査を行い、その静止画像出力を記録媒体１６に記録する。
【００８２】静止画記録を行った後は、次の撮影に備えるために、通常の液晶表示を行うことができるｎライン読み出しのモードに入り、再びＡＥ，ＡＷＢを繰り返して行う。
【００８３】このような動作方法によれば、第１トリガが発せられた段階で既にＡＥおよびＡＷＢは終了しているために、第１トリガから第２トリガまでの期間においてはＡＦのみを行えば良く、しかもｋライン読み出しを行っているために、この期間が一層短くなり、レリーズタイムラグを短縮することができる。
【００８４】なお、上述では第１トリガと第２トリガの間においてはＡＦのみを行ったが、ＡＦおよびＡＥを行うようにしても良い。
【００８５】また、図１０は、上記図９の変形例を示したものであり、ｋラインを１つのブロックとして、複数のブロックを取り出す例を示す図である。
【００８６】この図１０に示す例は、上述の第１の実施形態において図５に示したものと同様にして、ｋラインのブロックをＣＣＤ１のフル画面エリアの例えば中央の上下部に２つ取るようにするものである。この図１０においても、上記図９に示したものと同様に、ｋラインのブロックの幅が、上記図５に示したものよりも広くなっている。
【００８７】こうしてＡＥやＡＦの情報を得る範囲がさらに広くなるために、ＡＦ精度やＡＥ精度をより一層向上することができる。
【００８８】このような第２の実施形態によれば、上述の第１の実施形態とほぼ同様の効果を奏するとともに、より広い範囲の情報を得られるために、ＡＥやＡＦの精度を向上することができる。また、液晶表示装置に表示するのに適した全画面に係るカラー画像を、速いフレームレートで得ることができる。そして、複数のモードを適切に使い分けることにより、レリーズタイムラグの短い、シャッタチャンスを逃すことのない電子的撮像装置となる。
【００８９】図１３から図１７は本発明の第３の実施形態を示したものであり、図１３はＣＣＤを構成するラインからの画素データの読み出し方法を示す図である。この第３の実施形態において、上述の第１，第２の実施形態と同様である部分については説明を省略し、主として異なる点についてのみ説明する。
【００９０】この第３の実施形態の電子的撮像装置の主要な構成は、上記図１に示したものとほぼ同様である。
【００９１】次に、この実施形態は、図１３に示すように、ｍ（ｍ≧３、ｍは整数）ラインにつきｎ（ｎ≧２、ｎは整数）ラインを加算した画素信号を、一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すようにしたものであり、例えば、３ラインにつき１ラインを読み出すという点では上述した第２の実施形態と同様であるが、その読み出す１ラインを、３ラインの内から例えば２つのラインを加算して読み出す点が異なっている。なお、フレームレートは上述した第２の実施形態と同様である。
【００９２】より詳しくは、ＣＣＤ１から画素データを読み出す場合に、上記図２（Ａ）に示したような１ラインからＬラインまでの全ラインを順次走査し読み出して高画質撮影を行うための静止画記録モード以外に、図１

５（Ａ）に示すようなｍラインにつきｎラインを加算した後に画素信号を取り出すモードと、図１５（Ｂ）に示すようなｍラインにつきｎラインを加算したものを一部連続するｋラインにおいて取り出すモードとをさらに有していて、これらを選択することができるようになっている。

【００９３】ここで、図１４を参照して、複数のラインにおける信号の加算について説明する。図１４は、インターライン型のＣＣＤにおいて、信号を転送する際に行われる加算を示す図である。

【００９４】図１４において、GA，GB，GC，BA，BB，BC，RA，RB，RCは、それぞれフォトダイオードを示しており、これらのフォトダイオードの右隣に位置する縦の道が垂直転送路、これら垂直転送路の下端側に水平方向に位置する横の道が水平転送路である。

【００９５】この図１４においては、ｍ＝３，ｎ＝２の場合、つまり３ラインにつき２ラインを加算して１ラインを得る場合を例にとって説明する。

【００９６】露光が終了するタイミングにより、フォトダイオードから垂直転送路へ電荷が移送される。この移送の際には、図に示すように、３ラインのうちの２つフォトダイオード、つまり添え字Ａがついたフォトダイオードと添え字Ｃがついたフォトダイオードから、図中、楕円で示すような電荷が垂直転送路へ移送される。

【００９７】その後に、垂直転送路内において、水平転送路に向かって電荷を転送する動作が行なわれる。この垂直転送は、上述したようにｍ＝３であるために、３回の転送を１単位として行われる。これにより、添え字Ａがついたフォトダイオードからの電荷と添え字Ｃがついたフォトダイオードからの電荷が加算される。

【００９８】例えば、図１４中の一番左下のｍ＝３という部分については、３つのフォトダイオードRA，GB，RC の内のRA とRC の電荷が垂直転送路に送られる。

【００９９】次に、これを垂直方向に１回転送すると、まずRC からの電荷が水平転送路に転送されるとともに、上記RA からの電荷がGB の隣となる垂直転送路内の位置に転送される。

【０１００】そして、垂直方向への２回目の転送を行うと、RC からの電荷は水平転送路内にそのまま止まり、上記RA からの電荷がRC の隣となる垂直転送路内の位置に転送される。

【０１０１】さらに、垂直方向への３回目の転送を行うと、RC からの電荷は水平転送路内にそのまま止まり、上記RA からの電荷も水平転送路内に転送されるために、結局、RA からの電荷とRC からの電荷が加算されることになる。

【０１０２】こうして加算された電荷を、水平転送路から順に読み出して行くことにより、１つのラインの信号を得ることができる。

【０１０３】このように１つのラインの信号を読み出した後には、同様な動作を行うことにより、次の３つのライン内の２ラインの電荷が加算されたものが出力されることになる。

【０１０４】このような加算法を用いると、線順次のベイヤー配列でフィルタ配列が構成されている場合に、図１６に示すように、Ｒの情報を含むＣＲラインである１ライン目と３ライン目が加算して出力され、次に、Ｂの情報を含むＣＢラインである４ライン目と６ライン目が加算して出力され、その後、Ｒの情報を含むライン出力とＢの情報を含むライン出力が繰り返して得られるために、色信号を線順次で得ることができる。

【０１０５】なお、液晶表示装置１３等に表示を行う際には、Ｒの情報を含むラインとＢの情報を含むラインとで同時化を行って補間するが、このときに、例えば上記図２５に示すようなＲの情報を含む３ライン目とＢの情報を含む４ライン目とはＣＣＤ上において互いに隣り合っているために、相関性の高いデータを得ることができ、ライン数が少なくても良好な画質の信号を得ることができる。

【０１０６】また、上記ベイヤー配列の色フィルタを有する固体撮像素子の場合には、ｍ＝２α＋１（αは正の整数）、つまりｍは奇数であることが同一の色信号を加算して、しかも色信号を線順次で取り出すためには望ましい。

【０１０７】図１３，図１５は、上記図１４と同様に、ｍ＝３，ｎ＝２とした例を示すものである。

【０１０８】まず、液晶表示などに用いる全画面に係る画像データを得る場合には、図１５（Ａ）に示すようなモードにより行う。

【０１０９】すなわち、１ライン目からＬライン目までの全ラインにおいて、１ライン目から３ライン目までの３つのラインの内の１ライン目と３ライン目を加算して読み出しを行い、続く４ライン目から６ライン目までの３つのラインの内の４ライン目と６ライン目を加算して読み出しを行う。

【０１１０】同様にして次々と加算読み出しを行い、Ｌ－２，Ｌ－１，Ｌの３つのラインの内のＬ－２ライン目とＬライン目を加算して読み出すまでを行う。このときに、読み出すラインの数はＬ／ｍとなる。

【０１１１】次に、ＡＦ，ＡＥ，ＡＷＢなどの処理を行うために、速いフレームレートの画像データを得る場合には、図１３，図１５（Ｂ）に示すようなモードにより行う。

【０１１２】すなわち、ｊ＋１ライン目からｊ＋ｋライン目までの一部連続するｋラインにおいて、ｊ＋１，ｊ＋２，ｊ＋３の３つのラインの内のｊ＋１ライン目とｊ＋３ライン目を加算して読み出し、次の、ｊ＋４，ｊ＋５，ｊ＋６の３つのラインの内のｊ＋４ライン目とｊ＋６ライン目を加算して読み出す。同様にして、ｊ＋ｋ－

２，ｊ＋ｋ－１，Ｊ＋ｋの３つのラインの内のｊ＋ｋ－２ライン目とｊ＋ｋライン目を加算して読み出すまで行う。このとき、読み出すラインの数はｋ／ｍとなる。

【０１１３】図１７は、電子的撮像装置におけるＣＣＤの読み出しモード等を示すタイムチャートである。

【０１１４】この図１７に示したものは、上記図１２に示したものと基本的には同様であって、通常の液晶表示等に用いる部分において、ＣＣＤ読み出しモードがｎライン加算である点が異なるだけである。

【０１１５】すなわち、通常の場合は、上記図１５（Ａ）に示したようなモードにより、ＡＥとＡＷＢを１フレーム毎に交互に行いつつ液晶表示等を行う。

【０１１６】そして、第１トリガが発せられると、上記図１５（Ｂ）に示したようなｋラインの読み出しモードにより、オートフォーカスの処理を行う。

【０１１７】さらに、第２トリガが発せられたところで、全画面の全ラインについて順次走査を行い、静止画を記録媒体１６に記録する。

【０１１８】なお、本実施形態においても、上記図１０に示したものと同様に、ｋラインで構成されるブロックを複数取り出しても良い。

【０１１９】このような第３の実施形態によれば、上述の第１，第２の実施形態とほぼ同様の効果を奏するとともに、複数のラインの信号を加算して出力するために、ダイナミックレンジを大きくすることができ、また、モアレ等の影響を低減することができる。

【０１２０】図１８から図２３は本発明の第４の実施形態を示したものであり、図１８はＣＣＤを構成するラインからの画素データの読み出し方法を示す図である。この第４の実施形態において、上述の第１から第３の実施形態と同様である部分については説明を省略し、主として異なる点についてのみ説明する。

【０１２１】この第４の実施形態の電子的撮像装置の主要な構成は、上記図１に示したものとほぼ同様である。

【０１２２】次に、この実施形態は、図１８に示すように、一部連続するｋ（ｋ≧６、ｋは整数）ラインについてｑ（ｑ≧３、ｑは整数）ライン毎に該ｑライン全部を加算した画素信号を取り出すようにしたものであり、例えば、３ラインにつき１ラインを読み出すという点では上述した第２，第３の実施形態と同様であるが、その読み出す１ラインを、３ライン全部を加算して読み出す点が異なっている。なお、フレームレートは上述した第２，第３の実施形態と同様である。

【０１２３】より詳しくは、ＣＣＤ１から画素データを読み出す場合に、上記図２（Ａ）に示したような１ラインからＬラインまでの全ラインを順次走査し読み出して高画質撮影を行うための静止画記録モード以外に、図２０（Ａ）に示すようなｍラインにつきｎラインの画素信号を取り出すモードと、図２０（Ｂ）に示すような一部連続するｋラインにおいてｑラインを加算した画素信号を取り出すモードとをさらに有していて、これらを選択することができるようになっている。

【０１２４】ここで、図１９を参照して、複数のラインにおける信号の加算について説明する。図１９は、インターライン型のＣＣＤにおいて、信号を転送する際に行われる加算を示す図である。

【０１２５】図１９において、Ａ，Ｂ，Ｃは、それぞれフォトダイオードを示しており、その他の垂直転送路や水平転送路については上記図１４に示したものと同様である。

【０１２６】この図１９においては、ｑ＝３の場合、つまり３ラインを加算する場合を例にとって説明する。

【０１２７】露光が終了するタイミングにより、フォトダイオードから垂直転送路へ電荷が移送される。この移送の際には、図に示すように、全てのフォトダイオード、つまり全てのフォトダイオードＡ，Ｂ，Ｃから、図中、楕円で示すような電荷が垂直転送路へ移送される。

【０１２８】その後に、垂直転送路内において、水平転送路に向かって電荷を垂直転送する動作が行なわれる。この垂直転送は、上述したようにｑ＝３であるために、３回の転送を１単位として行われる。これにより、３つのフォトダイオードＡ，Ｂ，Ｃの電荷が水平転送路内において加算される。

【０１２９】このようにして加算された３つのフォトダイオードＡ，Ｂ，Ｃの電荷を、水平転送路から順に読み出して行くことにより、１つのラインの信号を得ることができる。

【０１３０】１つのラインの信号を読み出した後には、同様な動作を次々と行うことにより、３つのラインの電荷が加算されたものが順次出力されることになる。

【０１３１】ここで、線順次のベイヤー配列でフィルタ配列が構成されている場合に、ｑ＝４としたときに得られる信号について説明する。

【０１３２】図２２に示すように、ＲおよびＧの情報よりなるＣＲラインである１ライン目および３ライン目とＢおよびＧの情報よりなるＣＢラインである２ライン目および４ライン目とが加算されると、（Ｒ＋２Ｇ＋Ｂ）×２の信号が算出されることになる。

【０１３３】このような信号は、いわゆる輝度信号に非常に近い出力信号であり、しかも複数ラインを加算したことによって、ダイナミックレンジを大きくすることができるとともに、モアレ等の影響を低減することができる信号となっている。

【０１３４】従って、オートフォーカスや測光等の、必ずしも色信号を必要としない制御を行う場合には、この加算された信号を利用することにより、非常に有効な信号として用いることができる。

【０１３５】図２３は、電子的撮像装置におけるＣＣＤの読み出しモード等を示すタイムチャートである。

【０１３６】この図２３に示したものは、上記図１２に

示したものと基本的には同様であって、第１トリガが発せられた後のＡＦ制御を行う部分において、ＣＣＤ読み出しモードがｑ加算したｋライン読み出しである点が異なるだけである。

【０１３７】すなわち、通常の場合は、上記図２０（Ａ）に示したようなモードにより、ＡＥとＡＷＢを１フレーム毎に交互に行いつつ液晶表示等を行う。この図２０（Ａ）に示すモードは色信号が線順次で得られるモードであるために、ＡＷＢ等の制御を行うのに適した信号が得られる。

【０１３８】そして、第１トリガが発せられると、上記図２０（Ｂ）に示したようなｑ加算したｋライン読み出しモードにより、オートフォーカスの処理を行う。この図２０（Ｂ）に示すモードは輝度信号に近い信号が得られるモードであるために、ＡＦ等の制御を行うのに適した信号が得られる。

【０１３９】さらに、第２トリガが発せられたところで、全画面の全ラインについて順次走査を行い、静止画を記録媒体１６に記録する。

【０１４０】図２１は、上記図２０の変形例を示したものであり、ＣＣＤ１から画素データを読み出す場合に、上記図２（Ａ）に示したような１ラインからＬラインまでの全ラインを順次走査し読み出して高画質撮影を行うための静止画記録モード以外に、ｍ（ｍ≧３、ｍは整数）ラインにつきｎ（ｎ≧２、ｎは整数）ラインを加算するモードと、ｑ（ｑ≧３、ｑは整数）ライン毎に該ｑライン全部を加算するモードとをさらに有し、各々のモードを用途に応じて選択することができるようにしたものである。

【０１４１】従って、ｍライン毎にｎラインを加算するモードの場合には、液晶表示等に適した線順次出力が得られ、一方、ｑラインを加算するモードの場合には、輝度信号に近い信号出力が得られるようになっており、線順次フィルタにおける加算する色フィルタを巧みに組み合わせることにより、用途に合わせて適切なモードを選択することができる。

【０１４２】なお、本実施形態においても、上記図１０に示したものと同様に、ｋラインで構成されるブロックを複数取り出しても良い。

【０１４３】このような第４の実施形態によれば、上述の第１から第３の実施形態とほぼ同様の効果を奏するとともに、第１トリガ後のＡＦ等を行う際に、輝度信号に近い信号が得られ、しかも信号のダイナミックレンジがより大きくなるために、ＡＦの精度やＡＦを行うに必要な最低被写体照度を改善することができる。

【０１４４】［付記］以上詳述したような本発明の上記実施形態によれば、以下のごとき構成および効果を得ることができる。

【０１４５】（１）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の一部連続するｋ（ｋは正の整数）ラインに係る画素信号を取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。

【０１４６】従来は、例えば１００万画素クラスのインターライン型の固体撮像素子を、２０ＭＨｚ以下で順次走査駆動させた場合には、単位時間当たりに得られるフレーム数が１０～１５フレーム／秒となってしまい、例えば動画データが必要となる制御においては処理を高速に行うことができないという難点があった。

【０１４７】これに対して付記（１）に記載の発明によれば、全ラインを順次走査して読み出す場合に比して、フレームレートを（全ライン数）／ｋ倍に向上することができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０１４８】（２）　上記制御手段は、静止画を記録しまたは動画処理するべく、上記ｋラインを１つのブロックとして、全ラインから複数のブロックを取り出すモードを制御するものであることを特徴とする付記（１）に記載の電子的撮像装置。

【０１４９】従来は付記（１）に記載のものと同様の問題点があった。

【０１５０】これに対して付記（２）に記載の発明によれば、付記（１）に記載の発明と同様の効果を奏するとともに、全ラインを順次走査して読み出す場合に比して、フレームレートを（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上することができる。

【０１５１】（３）　上記制御手段は、ｋラインに係る画素信号を取り出して動画処理を行い、その動画処理された信号をＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用いるべく制御を行うものであることを特徴とする付記（１）または付記（２）に記載の電子的撮像装置。

【０１５２】従来は、単位時間当たりに得られるフレーム数が例えば１０～１５フレーム／秒であったために、ＡＦ、ＡＥ、またはＡＷＢの何れの制御を行う場合にも時間を要し、短い時間で静止画撮影に入ることができなかった。

【０１５３】これに対して付記（３）に記載の発明によれば、付記（１）または付記（２）に記載の発明と同様の効果を奏するとともに、フレームレートを（全ライン数）／ｋ倍または（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上して、ＡＦ、ＡＥ、またはＡＷＢの制御を行うことができるために、より短い時間で静止画撮影に入ることができる。さらに、

ＡＦ、ＡＥ、またはＡＷＢの制御を行うに必要なエリアに係る画素信号のみを高速に得ることができる。

【０１５４】（４）　上記制御手段は、ｋラインに係る画素信号を取り出して動画処理を行い、その動画処理した信号をＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用いるべく制御を行い、その際に、ＡＦ、ＡＥ、またはＡＷＢの制御用データの何れかを１フレームに一つずつ算出して、該データの算出を、順番に繰り返して行うものであることを特徴とする付記（１）または付記（２）に記載の電子的撮像装置。

【０１５５】従来は、フレームレートが遅かったために、ＡＦ、ＡＥ、またはＡＷＢを同時に平行して処理する必要があり、回路規模が大きくなってしまっていた。

【０１５６】これに対して付記（４）に記載の発明によれば、付記（１）または付記（２）に記載の発明と同様の効果を奏するとともに、ＡＦ、ＡＥ、またはＡＷＢの制御用データを順番に算出することにより、各々のデータに発生する可能性のあるフリッカの影響を軽減することができる。

【０１５７】（５）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。

【０１５８】従来は、例えば１００万画素クラスのインターライン型の固体撮像素子を、２０ＭＨｚ以下で順次走査駆動させた場合には、単位時間当たりに得られるフレーム数が１０～１５フレーム／秒となってしまい、例えば動画データが必要となる制御においては処理を高速に行うことができないという難点があった。

【０１５９】これに対して付記（５）に記載の発明によれば、全ラインを順次走査して読み出す場合に比して、フレームレートを（ｍ／ｎ）×（全ライン数）／ｋ倍に向上することができる。また、ラインを間引くことにより、フレームレートを落とすことなくより広いエリアに係る画素信号を得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０１６０】（６）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインに係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子からの垂直方向のｍライン毎にｎラインに係る画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。

【０１６１】従来は付記（５）に記載のものと同様の問題点があった。

【０１６２】これに対して付記（６）に記載の発明によれば、フレームレートをｍ／ｎ倍に向上した全画面を間引いたデータと、フレームレートを（ｍ／ｎ）×（全ライン数）／ｋ倍に向上した垂直方向の一部の連続領域を取り出したデータとを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０１６３】（７）　上記制御手段は、静止画を記録しまたは動画処理するべく、上記ｋラインを１つのブロックとして、全ラインから複数のブロックを取り出すモードを制御するものであることを特徴とする付記（６）に記載の電子的撮像装置。

【０１６４】従来は付記（５）に記載のものと同様の問題点があった。

【０１６５】これに対して付記（７）に記載の発明によれば、付記（６）に記載の発明と同様の効果を奏するとともに、フレームレートを（ｍ／ｎ）×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上することができる。

【０１６６】（８）　静止画を記録しまたは動画処理するべく、垂直方向のｍライン毎にｎラインの画素信号を取り出して得られる画像データは、その色信号が線順次データであることを特徴とする付記（５）、付記（６）、または付記（７）に記載の電子的撮像装置。

【０１６７】単板式カメラにおいて、解像度を重視して固体撮像素子のフィルタを構成すると、色線順次にするのが有利である。しかしながら、単純に２ラインに付き１ラインの間引き等を行う従来の手段では、線順次のデータを得ることができないという難点があった。

【０１６８】これに対して付記（８）に記載の発明によれば、付記（５）、付記（６）、または付記（７）に記載の発明と同様の効果を奏するとともに、線順次で色信号を得ることにより、解像度を維持しつつ必要な色信号を得ることができる。

【０１６９】（９）　上記固体撮像素子は、色フィルタが線順次のフィルタにより構成されたものであることを特徴とする付記（５）、付記（６）、または付記（７）

に記載の電子的撮像装置。
【０１７０】従来は付記（８）に記載のものと同様の問題点があった。
【０１７１】これに対して付記（９）に記載の発明によれば、付記（５）、付記（６）、または付記（７）に記載の発明と同様の効果を奏するとともに、順次走査による出力、ｍライン毎の出力ともに、線順次で色信号を得ることができる。
【０１７２】（１０）　ｍ＝２α＋１（αは正の整数）、ｎ＝１であることを特徴とする付記（５）、付記（６）、または付記（７）に記載の電子的撮像装置。
【０１７３】単純に２ラインに付き１ラインの間引き等を行う従来の手段では、線順次のデータを得ることができないという難点があった。
【０１７４】これに対して付記（１０）に記載の発明によれば、付記（５）、付記（６）、または付記（７）に記載の発明と同様の効果を奏するとともに、奇数本のラインであるｍライン毎にｎ＝１ラインを読み出すことにより、線順次フィルタの場合に、そのまま線順次の画像信号を得ることができる。
【０１７５】（１１）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用いることを特徴とする付記（５）、付記（６）、または付記（７）に記載の電子的撮像装置。
【０１７６】従来は、単位時間当たりに得られるフレーム数が例えば１０～１５フレーム／秒であったために、ＡＦ、ＡＥ、またはＡＷＢの何れの制御を行う場合にも時間を要し、短い時間で静止画撮影に入ることができなかった。
【０１７７】これに対して付記（１１）に記載の発明によれば、付記（５）、付記（６）、または付記（７）に記載の発明と同様の効果を奏するとともに、フレームレートを（ｍ／ｎ）×（全ライン数）／ｋ倍、または（ｍ／ｎ）×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上してＡＦ、ＡＥ、またはＡＷＢの処理を行うことができるために、より短い時間で静止画撮影に入ることができる。さらに、ＡＦ、ＡＥ、またはＡＷＢの制御を行うに必要なエリアに係る画素信号のみを高速に得ることができる。
【０１７８】（１２）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用い、その際に、ＡＦ、ＡＥ、またはＡＷＢの制御用データの何れかを１フレームに一つずつ算出して、該データの算出を、順番に繰り返して行うことを特徴とする付記（５）、付記（６）、または付記（７）に記載の電子的撮像装置。
【０１７９】従来は、フレームレートが遅かったために、ＡＦ、ＡＥ、ＡＷＢを同時に平行して処理する必要があり、回路規模が大きくなってしまっていた。
【０１８０】これに対して付記（１２）に記載の発明によれば、付記（５）、付記（６）、または付記（７）に記載の発明と同様の効果を奏するとともに、ＡＦ、ＡＥ、またはＡＷＢの制御用データを順番に算出することにより、各々のデータに発生する可能性のあるフリッカの影響を軽減することができる。
【０１８１】（１３）　上記制御手段は、当該電子的撮像装置に付属して設けられた表示装置に表示させるべく、当該電子的撮像装置の外部の表示装置に供給するべく、またはＡＥ情報もしくはＡＷＢ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインに係る画素信号を取り出すモードを選択し、ＡＦ情報もしくはＡＥ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインに係る画素信号を一部連続するｋラインにおいて取り出すモードを選択するものであることを特徴とする付記（６）に記載の電子的撮像装置。
【０１８２】固体撮像素子の一部分のラインに係る画素のみから出力した画素信号は、そのままでは表示装置の全画面に表示を行うには適した出力ではなかった。
【０１８３】これに対して付記（１３）に記載の発明によれば、付記（６）に記載の発明と同様の効果を奏するとともに、フレームレートを（ｍ／ｎ）×（全ライン数）／ｋ倍、または（ｍ／ｎ）×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上して処理するモードとは別に、表示装置に用いるモードを有することにより、全画面を構成するラインを間引いたデータを用いて、全画面に係る画像を表示することが可能となる。
【０１８４】（１４）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。
【０１８５】従来は、例えば１００万画素クラスのインターライン型の固体撮像素子を、２０ＭＨｚ以下で順次走査駆動させた場合には、単位時間当たりに得られるフレーム数が１０～１５フレーム／秒となってしまい、例えば動画データが必要となる制御においては処理を高速に行うことができないという難点があった。
【０１８６】これに対して付記（１４）に記載の発明によれば、全ラインを順次走査して読み出す場合に比して、フレームレートをｍ×（全ライン数）／ｋ倍に向上

することができる。また、ｎラインを加算することにより、ダイナミックレンジの大きいデータを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０１８７】（１５）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算して取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍライン毎にｎラインを加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。

【０１８８】従来は付記（１４）に記載のものと同様の問題点があった。

【０１８９】これに対して付記（１５）に記載の発明によれば、フレームレートをｍ倍に向上した全画面を間引いたデータと、フレームレートをｍ×（全ライン数）／ｋ倍に向上した垂直方向の一部の連続領域を取り出したデータとを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０１９０】（１６）　上記制御手段は、静止画を記録しまたは動画処理するべく、上記ｋラインを１つのブロックとして、全ラインから複数のブロックを取り出すモードを制御するものであることを特徴とする付記（１４）または付記（１５）に記載の電子的撮像装置。

【０１９１】従来は付記（１４）に記載のものと同様の問題点があった。

【０１９２】これに対して付記（１６）に記載の発明によれば、付記（１４）または付記（１５）に記載の発明と同様の効果を奏するとともに、全ラインを順次走査して読み出す場合に比して、フレームレートをｍ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上することができる。

【０１９３】（１７）　静止画を記録しまたは動画処理するべく、垂直方向のｍライン毎にｎラインを加算した画素信号を取り出して得られる画像データは、その色信号が線順次データであることを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０１９４】固体撮像素子の色フィルタが線順次フィルタである場合には、単純に加算を行ったのでは、色信号が混ざり合ってしまうという難点を有する。

【０１９５】これに対して付記（１７）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、線順次で色信号を得ることにより、解像度を維持しつつ必要な色信号を得ることができる。

【０１９６】（１８）　上記固体撮像素子は、色フィルタが線順次のフィルタにより構成されたものであることを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０１９７】従来は付記（１７）に記載のものと同様の問題点があった。

【０１９８】これに対して付記（１８）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、順次走査による出力、ｍライン毎の出力ともに、線順次で色信号を得ることができる。

【０１９９】（１９）　上記加算するｎラインは、同一の色フィルタにより構成されていることを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０２００】従来は付記（１７）に記載のものと同様の問題点があった。

【０２０１】これに対して付記（１９）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、色信号を混ぜることなく、モアレ等の影響を低減することができる。

【０２０２】（２０）　上記加算するｎラインは、同一の色フィルタにより構成されていて、ｍライン毎に、該加算するｎラインの色フィルタを異ならせることを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０２０３】従来は付記（１７）に記載のものと同様の問題点があった。

【０２０４】これに対して付記（２０）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、ｍライン毎に線順次の色信号を得ることができる。

【０２０５】（２１）　ｍ＝２α＋１（αは正の整数）であることを特徴とする付記（１９）に記載の電子的撮像装置。

【０２０６】従来は付記（１７）に記載のものと同様の問題点があった。

【０２０７】これに対して付記（２１）に記載の発明によれば、付記（１９）に記載の発明と同様の効果を奏するとともに、奇数本のラインであるｍライン毎にｎラインを加算することにより、該ｍライン毎に線順次の色信号を得る場合には、隣接するｍラインのブロックに最も

近いラインのデータを用いることになるために、同時化を行う際に偽色が発生するのを抑制することができる。

【０２０８】（２２）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用いることを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０２０９】従来は、単位時間当たりに得られるフレーム数が例えば１０～１５フレーム／秒であったために、ＡＦ、ＡＥ、またはＡＷＢの何れの制御を行う場合にも時間を要し、短い時間で静止画撮影に入ることができなかった。

【０２１０】これに対して付記（２２）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、フレームレートをｍ×（全ライン数）／ｋ倍、またはｍ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上してＡＦを行うことができるために、より一層の高速化を図ることができる。さらに、ＡＦの制御を行うに必要なエリアに係る画素信号のみを高速に得ることができる。

【０２１１】（２３）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用い、その際に、ＡＦ、ＡＥ、またはＡＷＢの制御用データの何れかを１フレームに一つずつ算出して、該データの算出を、順番に繰り返して行うことを特徴とする付記（１４）、付記（１５）、または付記（１６）に記載の電子的撮像装置。

【０２１２】従来は、フレームレートが遅かったために、ＡＦ、ＡＥ、ＡＷＢを同時に平行して処理する必要があり、回路規模が大きくなってしまっていた。

【０２１３】これに対して付記（２３）に記載の発明によれば、付記（１４）、付記（１５）、または付記（１６）に記載の発明と同様の効果を奏するとともに、ＡＦ、ＡＥ、またはＡＷＢの制御用データを順番に算出することにより、各々のデータに発生する可能性のあるフリッカの影響を軽減することができる。

【０２１４】（２４）　上記制御手段は、当該電子的撮像装置に付属して設けられた表示装置に表示させるべく、当該電子的撮像装置の外部の表示装置に供給するべく、またはＡＥ情報もしくはＡＷＢ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインを加算して画素信号を取り出すモードを選択し、ＡＦ情報もしくはＡＥ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインに係る画素信号を一部連続するｋラインにおいて取り出すモードを選択するものであることを特徴とする付記（１５）に記載の電子的撮像装置。

【０２１５】固体撮像素子の一部分のラインに係る画素のみから出力した画素信号は、そのままでは表示装置の全画面に表示を行うには適した出力ではなかった。

【０２１６】これに対して付記（２４）に記載の発明によれば、付記（１５）に記載の発明と同様の効果を奏するとともに、フレームレートをｍ×（全ライン数）／ｋ倍、またはｍ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上して処理するモードとは別に、表示装置に用いるモードを有することにより、全画面を間引いたデータを用いて、該全画面に係る画像を表示することが可能となる。

【０２１７】（２５）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の連続するｑ（ｑ≧３、ｑは整数）ライン毎に該ｑライン全部を加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。

【０２１８】従来は、例えば１００万画素クラスのインターライン型の固体撮像素子を、２０ＭＨｚ以下で順次走査駆動させた場合には、単位時間当たりに得られるフレーム数が１０～１５フレーム／秒となってしまい、例えば動画データが必要となる制御においては処理を高速に行うことができないという難点があった。

【０２１９】これに対して付記（２５）に記載の発明によれば、全ラインを順次走査して読み出す場合に比して、フレームレートをｑ×（全ライン数）／ｋ倍に向上することができる。さらに、ｑラインを加算することにより、ダイナミックレンジの大きいデータを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０２２０】（２６）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧１、ｎは整数）ラインの画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の連続するｑ（ｑ≧３、ｑは整数）ライン毎に該ｑライン全部を加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とす

る電子的撮像装置。
【０２２１】従来は付記（２５）に記載のものと同様の問題点があった。
【０２２２】これに対して付記（２６）に記載の発明によれば、全ラインを順次走査して読み出す場合に比して、フレームレートをｍ／ｎ倍に向上した全画面を間引いたデータと、フレームレートをｑ×（全ライン数）／ｋ倍に向上した垂直方向の一部の連続領域を取り出したデータとを固体撮像素子の出力として得ることができる。さらに、異なるフィルタ色のデータを加算したデータと、加算しないデータとを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。
【０２２３】（２７）　光を受けて電気信号に変換する画素を２次元状に配列して有し、該画素の水平方向の一並びをラインとして、そのラインが垂直方向に複数並設されて構成されている固体撮像素子と、上記固体撮像素子を順次走査することにより静止画を記録するべく全画素に係る画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向のｍ（ｍ≧３、ｍは整数）ライン毎にｎ（ｎ≧２、ｎは整数）ラインを加算して画素信号を取り出すモードと、静止画を記録しまたは動画処理するべく上記固体撮像素子から垂直方向の連続するｑ（ｑ≧３、ｑは整数）ライン毎に該ｑライン全部を加算した画素信号を一部連続するｋ（ｋ≧６、ｋは整数）ラインにおいて取り出すモードとを選択的に制御する制御手段と、を具備することを特徴とする電子的撮像装置。
【０２２４】従来は付記（２５）に記載のものと同様の問題点があった。
【０２２５】これに対して付記（２７）に記載の発明によれば、フレームレートをｍ倍に向上した全画面を間引いたデータと、フレームレートをｑ×（全ライン数）／ｋ倍に向上した垂直方向の一部の連続領域を取り出したデータとを固体撮像素子の出力として得ることができる。さらに、異なるフィルタ色のデータを加算したデータと、加算しないデータとを固体撮像素子の出力として得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。
【０２２６】（２８）　上記制御手段は、静止画を記録しまたは動画処理するべく、上記ｋラインを１つのブロックとして、全ラインから複数のブロックを取り出すモードを制御するものであることを特徴とする付記（２５）、付記（２６）、または付記（２７）に記載の電子的撮像装置。
【０２２７】従来は付記（２５）に記載のものと同様の問題点があった。
【０２２８】これに対して付記（２８）に記載の発明によれば、付記（２５）、付記（２６）、または付記（２７）に記載の発明と同様の効果を奏するとともに、全ラインを順次走査して読み出す場合に比して、フレームレートをｑ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上することが可能である。
【０２２９】（２９）　上記固体撮像素子は、色フィルタが線順次のフィルタにより構成されたものであることを特徴とする付記（２６）、付記（２７）、または付記（２８）に記載の電子的撮像装置。
【０２３０】従来は、固体撮像素子の色フィルタが線順次フィルタである場合には、単純に加算を行っても色信号が混合されてしまうことがあった。
【０２３１】これに対して付記（２９）に記載の発明によれば、付記（２６）、付記（２７）、または付記（２８）に記載の発明と同様の効果を奏するとともに、加算する色フィルタの組み合わせを、モード毎に異ならせることができる。
【０２３２】（３０）　上記加算するｎラインは、同一の色フィルタにより構成されていることを特徴とする付記（２７）に記載の電子的撮像装置。
【０２３３】従来は付記（２９）に記載のものと同様の問題点があった。
【０２３４】これに対して付記（３０）に記載の発明によれば、付記（２７）に記載の発明と同様の効果を奏するとともに、色信号を混合させることなく、モアレ等の影響を低減することができる。
【０２３５】（３１）　上記加算するｎラインは、同一の色フィルタにより構成されていて、ｍライン毎に加算するｎラインの色フィルタを異ならせたものであることを特徴とする付記（２７）に記載の電子的撮像装置。
【０２３６】従来は付記（２９）に記載のものと同様の問題点があった。
【０２３７】これに対して付記（３１）に記載の発明によれば、付記（２７）に記載の発明と同様の効果を奏するとともに、ｍライン毎に線順次の色信号を得ることができる。
【０２３８】（３２）　ｍ＝２α＋１（αは正の整数）、ｎ＝１であることを特徴とする付記（２６）に記載の電子的撮像装置。
【０２３９】従来は付記（２９）に記載のものと同様の問題点があった。
【０２４０】これに対して付記（３２）に記載の発明によれば、付記（２６）に記載の発明と同様の効果を奏するとともに、奇数本のラインであるｍライン毎にｎ＝１ラインを読み出すことにより、色フィルタが線順次フィルタである場合に、そのまま線順次の画像信号を得ることができる。
【０２４１】（３３）　ｍ＝２α＋１（αは正の整数）であることを特徴とする付記（３０）に記載の電子的撮

像装置。
【０２４２】従来は付記（２９）に記載のものと同様の問題点があった。
【０２４３】これに対して付記（３３）に記載の発明によれば、付記（３０）に記載の発明と同様の効果を奏するとともに、奇数本のラインであるｍライン毎にｎラインを加算することにより、該ｍライン毎に線順次の色信号を得る場合には、隣接するｍラインのブロックに最も近いラインデータを用いることになるために、同時化を行う際に偽色が発生するのを抑制することができる。
【０２４４】（３４）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用いることを特徴とする付記（２５）、付記（２６）、付記（２７）、または付記（２８）に記載の電子的撮像装置。
【０２４５】従来は、単位時間当たりに得られるフレーム数が例えば１０～１５フレーム／秒であったために、ＡＦ、ＡＥ、またはＡＷＢの何れの制御を行う場合にも時間を要し、短い時間で静止画撮影に入ることができなかった。
【０２４６】これに対して付記（３４）に記載の発明によれば、付記（２５）、付記（２６）、付記（２７）、または付記（２８）に記載の発明と同様の効果を奏するとともに、フレームレートをｑ×（全ライン数）／ｋ倍、またはｑ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上してＡＦ、ＡＥ、またはＡＷＢを行うことができるために、より一層の高速化を図ることができる。さらに、ＡＦ、ＡＥ、ＡＷＢの制御を行うに必要なエリアに係る画素信号のみを高速に得ることができる。
【０２４７】（３５）　上記モードの内の何れかのモードにおいて動画処理した信号を、ＡＦ情報、ＡＥ情報、またはＡＷＢ情報として用い、その際に、ＡＦ、ＡＥ、またはＡＷＢの制御用データの何れかを１フレームに一つずつ算出して、該データの算出を、順番に繰り返して行うことを特徴とする付記（２５）、付記（２６）、付記（２７）、または付記（２８）に記載の電子的撮像装置。
【０２４８】従来は、フレームレートが遅かったために、ＡＦ、ＡＥ、ＡＷＢを同時に平行して処理する必要があり、回路規模が大きくなってしまっていた。
【０２４９】これに対して付記（３５）に記載の発明によれば、付記（２５）、付記（２６）、付記（２７）、または付記（２８）に記載の発明と同様の効果を奏するとともに、ＡＦ、ＡＥ、またはＡＷＢの制御用データを順番に算出することにより、各々のデータに発生する可能性のあるフリッカの影響を軽減することが可能である。
【０２５０】（３６）　上記制御手段は、当該電子的撮像装置に付属して設けられた表示装置に表示させるべく、当該電子的撮像装置の外部の表示装置に供給するべく、またはＡＥ情報もしくはＡＷＢ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインの画素信号を取り出すモードを選択し、ＡＦ情報もしくはＡＥ情報として用いるべく、動画処理した信号を得る場合には、垂直方向の連続するｑライン毎に該ｑライン全部を加算した画素信号を一部連続するｋラインにおいて取り出すものであることを特徴とする付記（２６）に記載の電子的撮像装置。
【０２５１】固体撮像素子の一部分のラインに係る画素のみから出力した画素信号は、そのままでは表示装置の全画面に表示を行うには適した出力ではなかった。
【０２５２】これに対して付記（３６）に記載の発明によれば、付記（２６）に記載の発明と同様の効果を奏するとともに、フレームレートをｑ×（全ライン数）／ｋ倍、またはｑ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上して処理するモードとは別に、表示装置に用いるモードを有することにより、全画面を間引いたデータを用いて、該全画面に係る画像を表示することが可能となる。
【０２５３】（３７）　上記制御手段は、当該電子的撮像装置に付属して設けられた表示装置に表示させるべく、当該電子的撮像装置の外部の表示装置に供給するべく、またはＡＥ情報もしくはＡＷＢ情報として用いるべく、動画処理した信号を得る場合には、垂直方向のｍライン毎にｎラインを加算して画素信号を取り出すモードを選択し、ＡＦ情報もしくはＡＥ情報として用いるべく、動画処理した信号を得る場合には、垂直方向の連続するｑライン毎に該ｑライン全部を加算した画素信号を一部連続するｋラインにおいて取り出すものであることを特徴とする付記（２７）に記載の電子的撮像装置。
【０２５４】従来は付記（３６）に記載のものと同様の問題点があった。
【０２５５】これに対して付記（３７）に記載の発明によれば、付記（２７）に記載の発明と同様の効果を奏するとともに、フレームレートをｑ×（全ライン数）／ｋ倍、またはｑ×（全ライン数）／｛ｋ×（ｋラインにより構成されるブロック数）｝倍に向上して処理するモードとは別に、表示装置に用いるモードを有することにより、全画面を間引いたデータを用いて、該全画面に係る画像を表示することが可能となる。
【０２５６】
【発明の効果】以上説明したように、請求項１による本発明の電子的撮像装置によれば、全ラインを順次走査して読み出す場合に比して、フレームレートを（全ライン数）／ｋ倍に向上することができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。
【０２５７】請求項２による本発明の電子的撮像装置に

よれば、全ラインを順次走査して読み出す場合に比して、フレームレートを（ｍ／ｎ）×（全ライン数）／ｋ倍に向上することができる。また、ラインを間引くことにより、フレームレートを落とすことなくより広いエリアに係る画素信号を得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【０２５８】請求項３による本発明の電子的撮像装置によれば、全ラインを順次走査して読み出す場合に比して、フレームレートをｍ×（全ライン数）／ｋ倍に向上することができる。また、ｎラインを加算することにより、ダイナミックレンジの大きいデータを固体撮像素子の出力として得ることができる。そして、フレームレートを落とすことなくより広いエリアに係る画素信号を得ることができる。こうして、高い駆動周波数を用いることなく固体撮像素子から単位時間当たりに多くのコマ数の出力を得ることができる電子的撮像装置となる。

【図面の簡単な説明】

【図１】本発明の第１の実施形態の電子的撮像装置の構成を示すブロック図。

【図２】上記第１の実施形態において、ＣＣＤを構成するラインからの画像データの読み出し方法を示す図。

【図３】上記第１の実施形態の電子的撮像装置におけるＣＣＤの読み出しモードを示すタイムチャート。

【図４】上記第１の実施形態の電子的撮像装置において、読み出しが行われる垂直方向のｋラインを示す図。

【図５】上記第１の実施形態の電子的撮像装置において、読み出しが行われる垂直方向のｋラインを複数とした例を示す図。

【図６】上記第１の実施形態の電子的撮像装置におけるＣＣＤの読み出しモードと制御用データを示すタイムチャート。

【図７】本発明の第２の実施形態の電子的撮像装置において、ＣＣＤを構成するラインからの画像データの読み出し方法を示す図。

【図８】上記第２の実施形態における複数の画像データの読み出しモードを示す図。

【図９】上記第２の実施形態の電子的撮像装置において、読み出しが行われる垂直方向のｋラインを示す図。

【図１０】上記第２の実施形態の電子的撮像装置において、読み出しが行われる垂直方向のｋラインを複数とした例を示す図。

【図１１】上記第２の実施形態の電子的撮像装置において、間引き読み出しにより得られる線順次の色信号を示す図。

【図１２】上記第２の実施形態の電子的撮像装置におけるＣＣＤの読み出しモードと制御用データおよび静止画記録を示すタイムチャート。

【図１３】本発明の第３の実施形態の電子的撮像装置において、ＣＣＤを構成するラインからの画像データの読み出し方法を示す図。

【図１４】上記第３の実施形態の電子的撮像装置における複数のラインの信号電荷の加算を説明するための図。

【図１５】上記第３の実施形態における複数の画像データの読み出しモードを示す図。

【図１６】上記第３の実施形態の電子的撮像装置において得られる線順次の色信号を示す図。

【図１７】上記第３の実施形態の電子的撮像装置におけるＣＣＤの読み出しモードと制御用データおよび静止画記録を示すタイムチャート。

【図１８】本発明の第４の実施形態の電子的撮像装置において、ＣＣＤを構成するラインからの画像データの読み出し方法を示す図。

【図１９】上記第４の実施形態の電子的撮像装置における複数のラインの信号電荷の加算を説明するための図。

【図２０】上記第４の実施形態における複数の画像データの読み出しモードを示す図。

【図２１】上記第４の実施形態における複数の画像データの読み出しモードの他の例を示す図。

【図２２】上記第４の実施形態の電子的撮像装置において、ｑ加算により輝度信号に近い信号が得られることを示す図。

【図２３】上記第４の実施形態の電子的撮像装置におけるＣＣＤの読み出しモードと制御用データおよび静止画記録を示すタイムチャート。

【図２４】従来のＣＣＤ駆動手段により得られるＣＣＤ出力データおよび液晶表示データを示すタイムチャート。

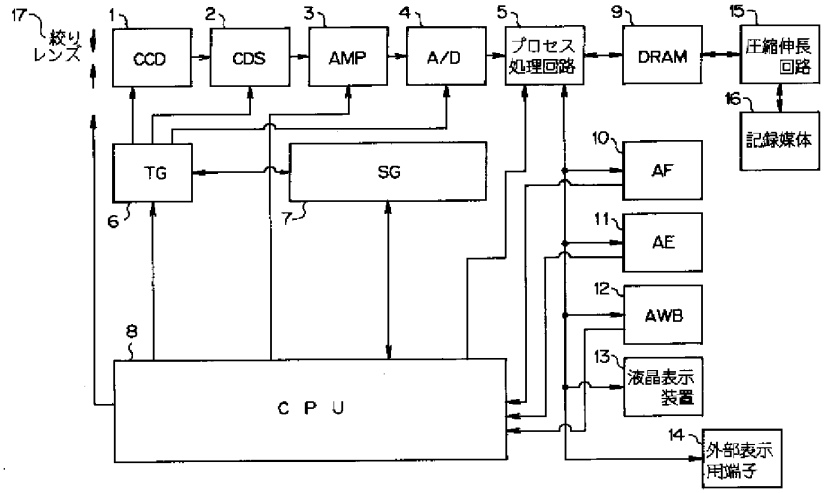
【図２５】従来のＣＣＤにおけるベイヤー配列の色フィルタを示す図。

【図２６】従来の電子的撮像装置におけるＣＣＤの間引き読み出しを示す図。

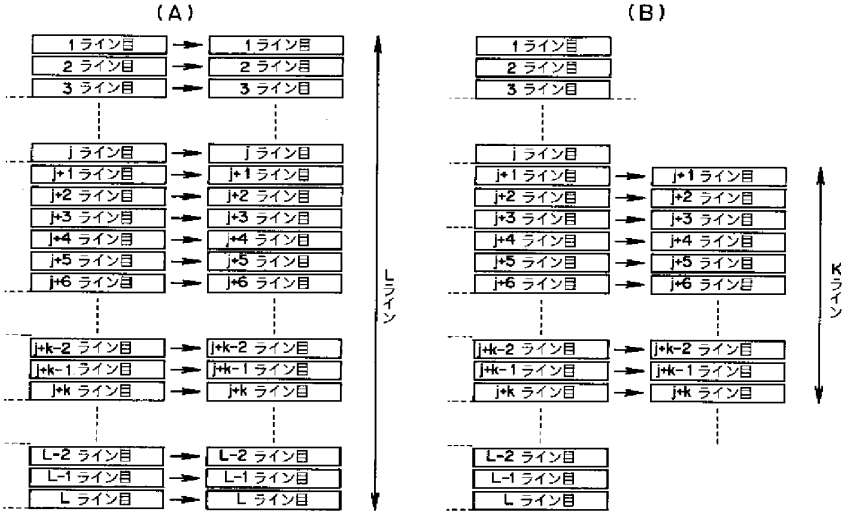
【符号の説明】

１…ＣＣＤ（固体撮像素子）
８…ＣＰＵ（制御手段）
１０…オートフォーカス回路（ＡＦ）
１１…自動露出制御回路（ＡＥ）
１２…オートホワイトバランス回路（ＡＷＢ）
１３…液晶表示装置
１４…外部表示用端子
１６…記録媒体

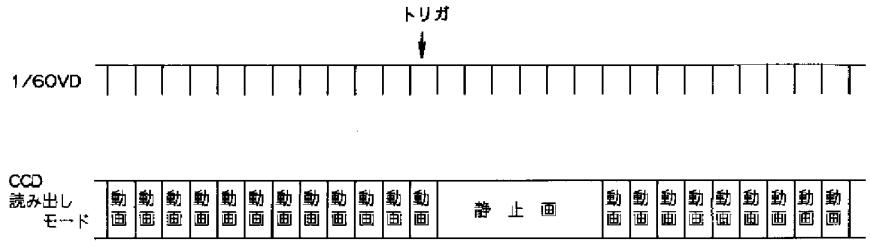
【図１】


17
絞り
レンズ
1
CCD
2
CDS
3
AMP
4
A/D
5
プロセス
処理回路
9
DRAM
15
圧縮伸長
回路
16
記録媒体
10
AF
11
AE
12
AWB
13
液晶表示
装置
14
外部表示
用端子
TG
6
SG
7
8
C P U

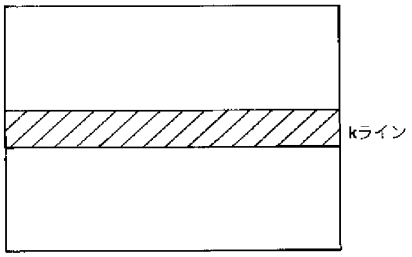
【図２】


(A)
(B)
1ライン目
2ライン目
3ライン目
jライン目
j+1ライン目
j+2ライン目
j+3ライン目
j+4ライン目
j+5ライン目
j+6ライン目
j+k-2ライン目
j+k-1ライン目
j+kライン目
L-2ライン目
L-1ライン目
Lライン目
Lライン
Kライン

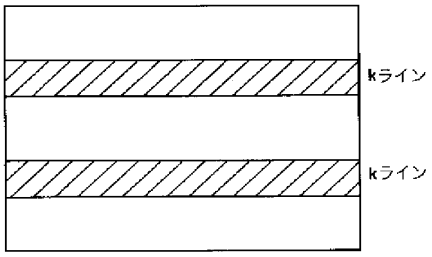
【図３】


トリガ
1/60VD
CCD
読み出し
モード
動画
静止画

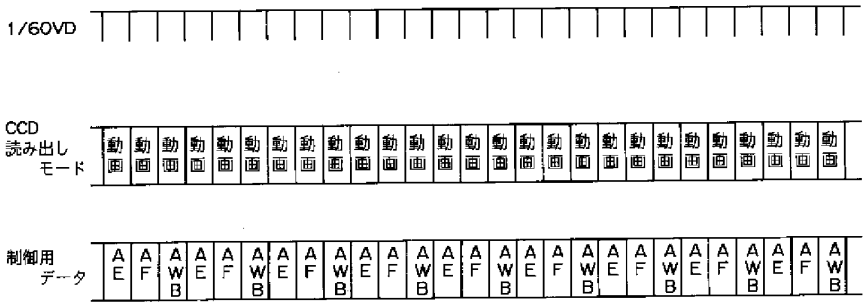
【図４】



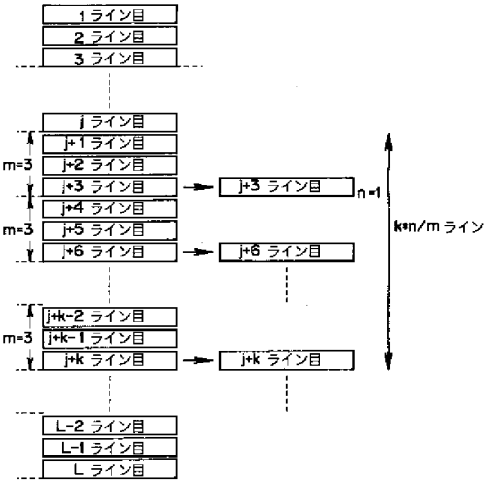
【図５】



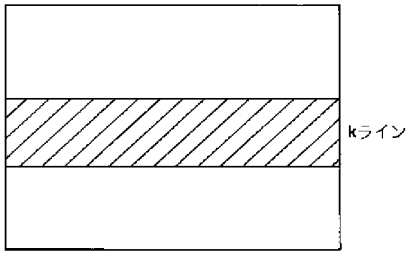
【図６】



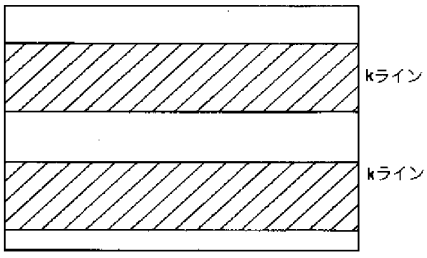
【図７】



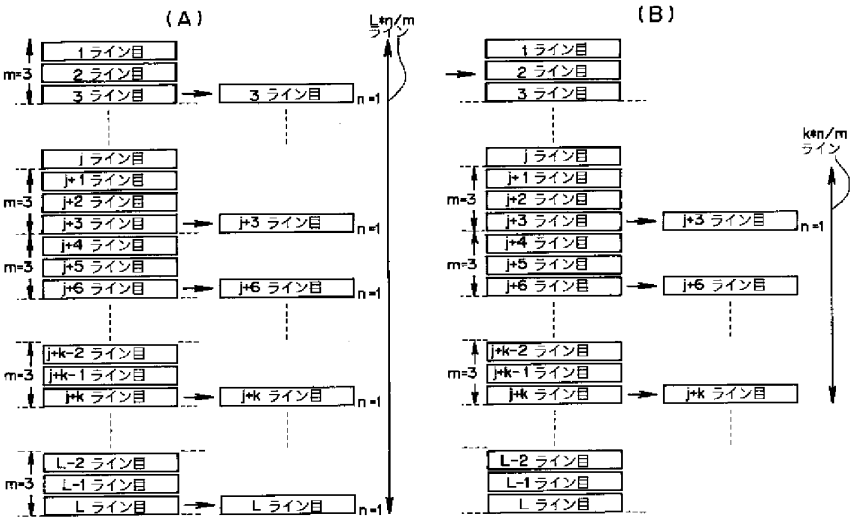
【図９】



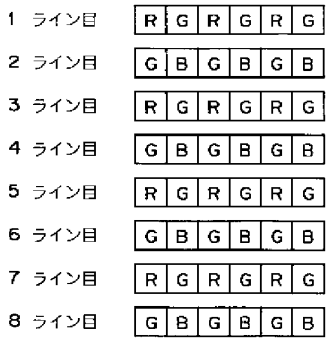
【図１０】



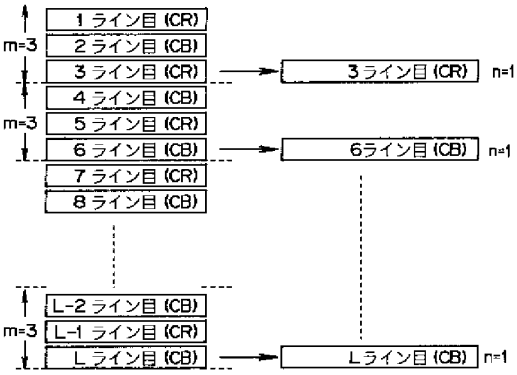
【図８】



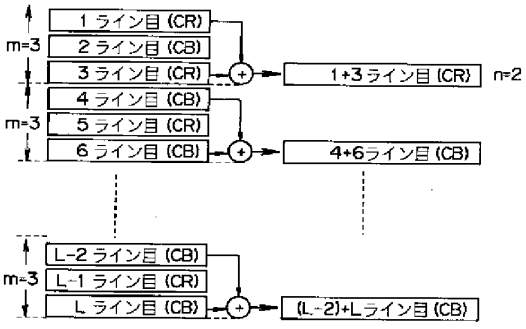
【図２５】



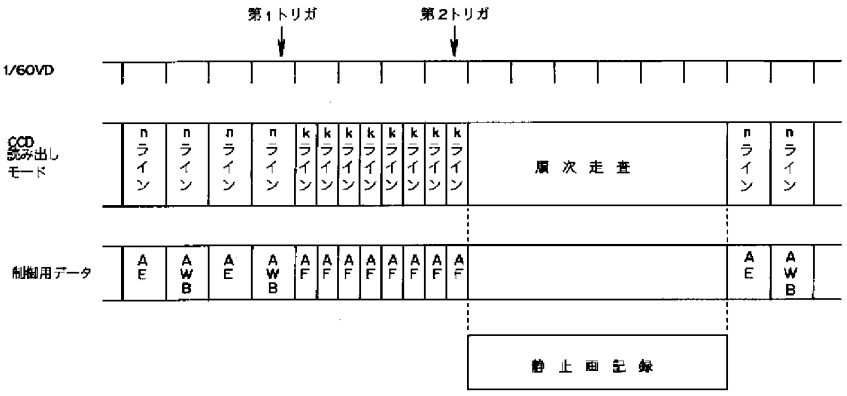
【図１１】



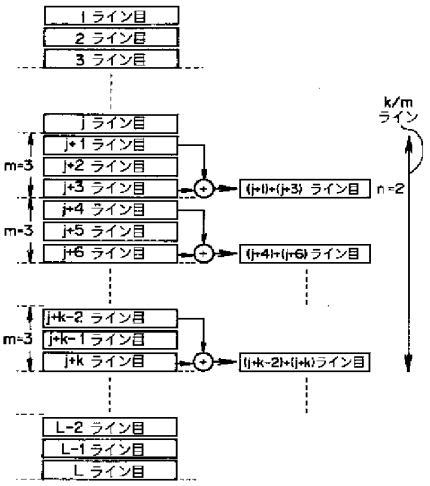
【図１６】



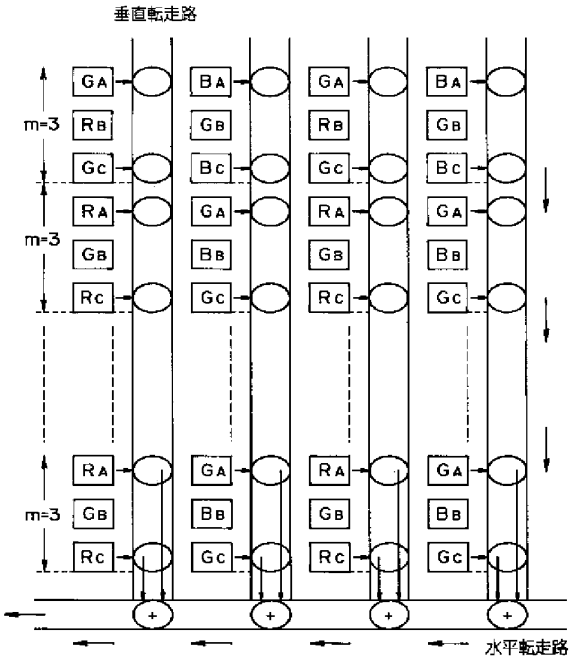
【図１２】



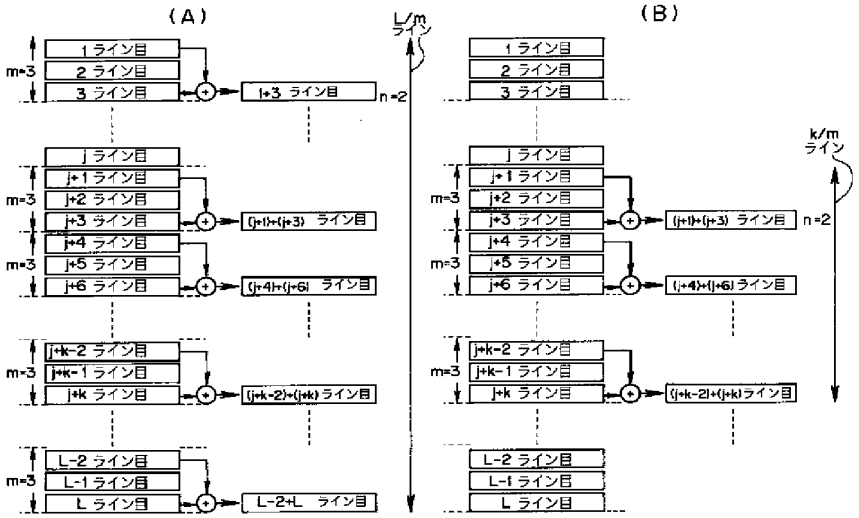
【図１３】


1 ライン目
2 ライン目
3 ライン目
k/m ライン
j ライン目
j+1 ライン目
j+2 ライン目
m=3
j+3 ライン目
(j+1)+(j+3) ライン目
n=2
j+4 ライン目
m=3
j+5 ライン目
j+6 ライン目
(j+4)+(j+6) ライン目
j+k-2 ライン目
m=3
j+k-1 ライン目
j+k ライン目
(j+k-2)+(j+k) ライン目
L-2 ライン目
L-1 ライン目
L ライン目

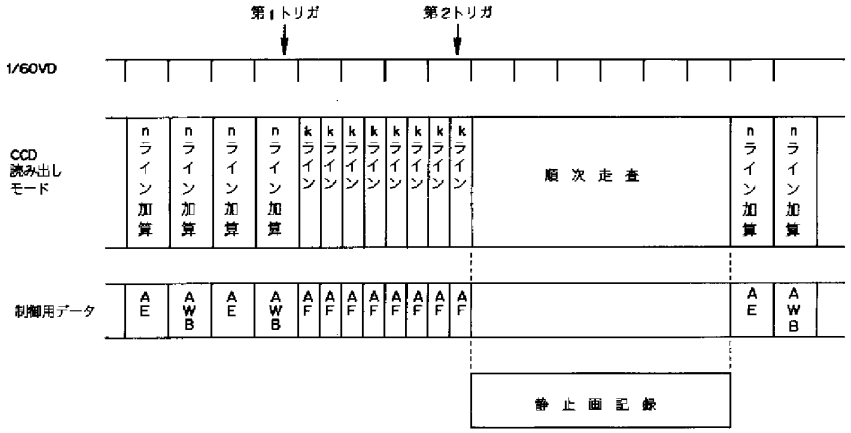
【図１４】


垂直転走路
GA
BA
GA
BA
m=3
RB
GB
RB
GB
Gc
Bc
Gc
Bc
RA
GA
RA
GA
m=3
GB
BB
GB
BB
Rc
Gc
Rc
Gc
RA
GA
RA
GA
m=3
GB
BB
GB
BB
Rc
Gc
Rc
Gc
水平転走路

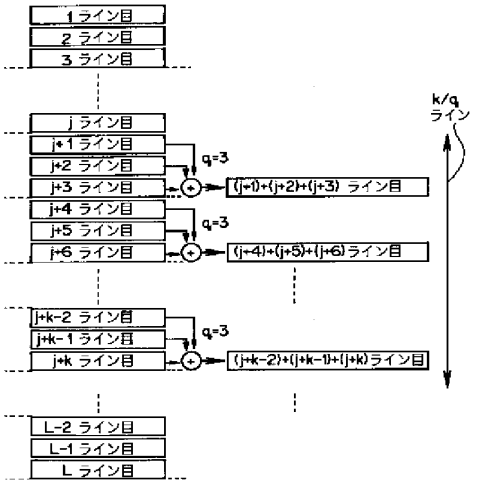
【図１５】


(A)
L/m ライン
1 ライン目
m=3
2 ライン目
3 ライン目
j+3 ライン目
n=2
j ライン目
j+1 ライン目
m=3
j+2 ライン目
j+3 ライン目
(j+1)+(j+3) ライン目
j+4 ライン目
m=3
j+5 ライン目
j+6 ライン目
(j+4)+(j+6) ライン目
j+k-2 ライン目
m=3
j+k-1 ライン目
j+k ライン目
(j+k-2)+(j+k) ライン目
L-2 ライン目
m=3
L-1 ライン目
L ライン目
L-2+L ライン目
(B)
1 ライン目
2 ライン目
3 ライン目
k/m ライン
j ライン目
j+1 ライン目
m=3
j+2 ライン目
j+3 ライン目
(j+1)+(j+3) ライン目
n=2
j+4 ライン目
m=3
j+5 ライン目
j+6 ライン目
(j+4)+(j+6) ライン目
j+k-2 ライン目
m=3
j+k-1 ライン目
j+k ライン目
(j+k-2)+(j+k) ライン目
L-2 ライン目
L-1 ライン目
L ライン目

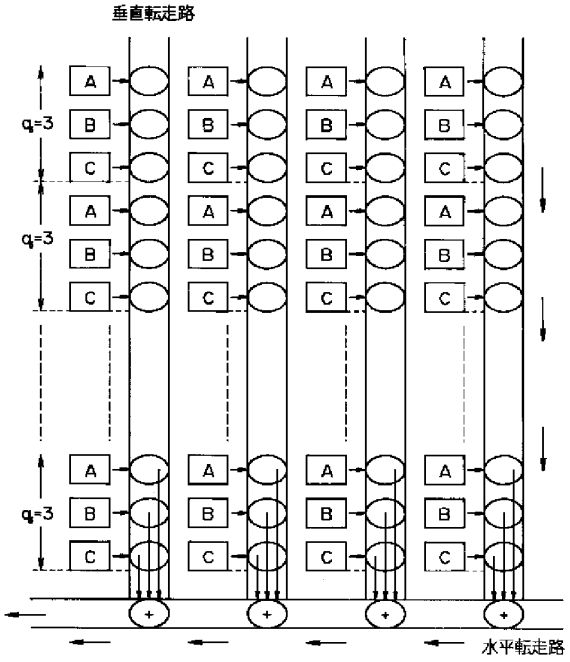
【図１７】



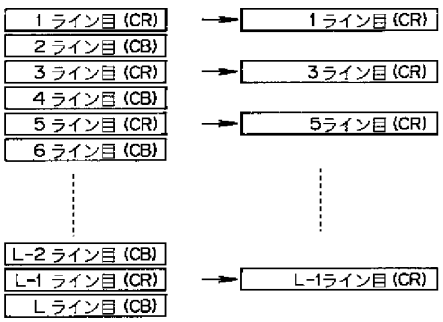
【図１８】



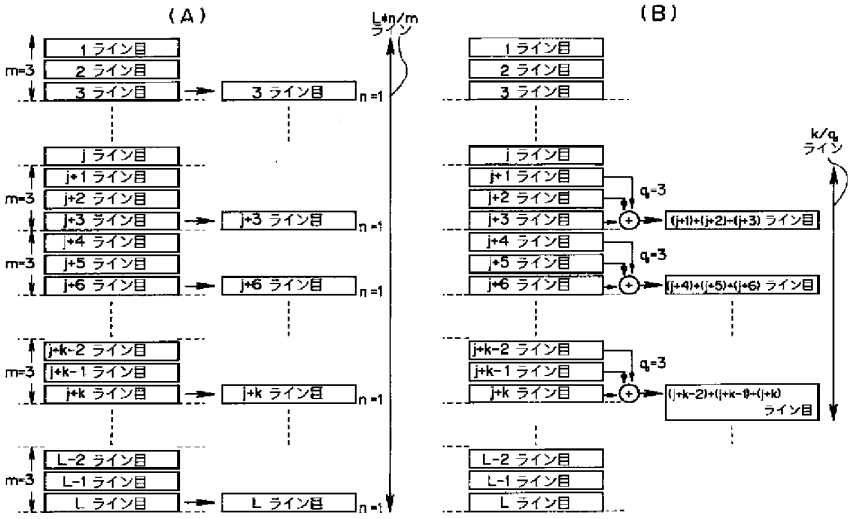
【図１９】



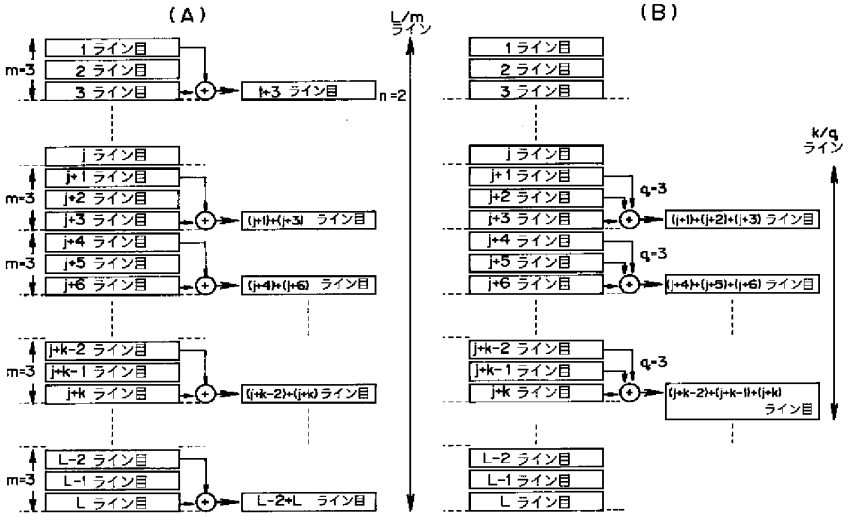
【図２６】



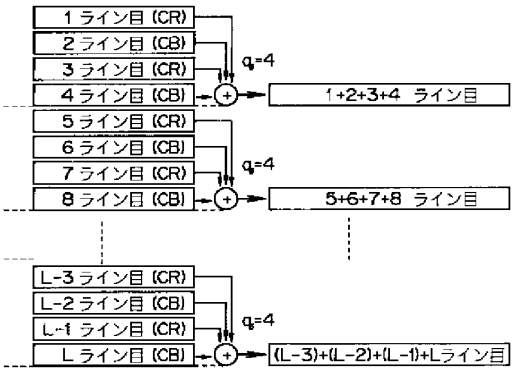
【図２０】


(A)
(B)
L÷n/m ライン
k/q ライン
m=3
n=1
q=3
1 ライン目
2 ライン目
3 ライン目
3 ライン目
j ライン目
j+1 ライン目
j+2 ライン目
j+3 ライン目
j+3 ライン目
j+4 ライン目
j+5 ライン目
j+6 ライン目
j+6 ライン目
j+k-2 ライン目
j+k-1 ライン目
j+k ライン目
j+k ライン目
L-2 ライン目
L-1 ライン目
L ライン目
L ライン目
(j+1)+(j+2)+(j+3) ライン目
(j+4)+(j+5)+(j+6) ライン目
(j+k-2)+(j+k-1)+(j+k) ライン目

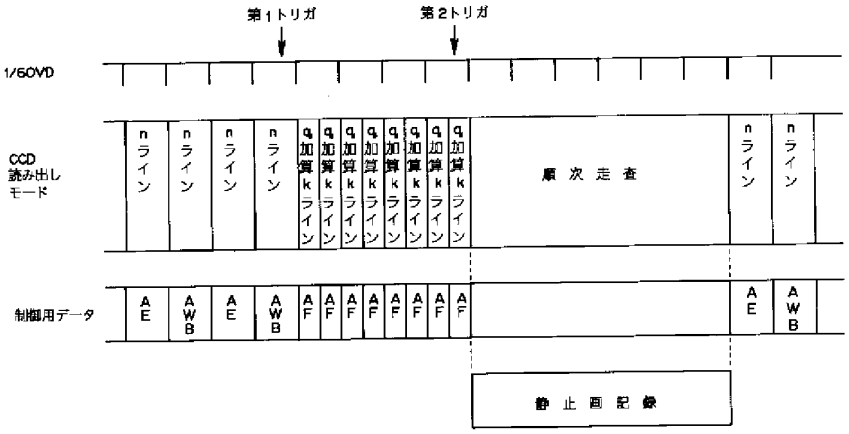
【図２１】


(A)
(B)
L/m ライン
k/q ライン
m=3
n=2
q=3
1 ライン目
2 ライン目
3 ライン目
j+3 ライン目
j ライン目
j+1 ライン目
j+2 ライン目
j+3 ライン目
(j+1)+(j+3) ライン目
j+4 ライン目
j+5 ライン目
j+6 ライン目
(j+4)+(j+6) ライン目
j+k-2 ライン目
j+k-1 ライン目
j+k ライン目
(j+k-2)+(j+k) ライン目
L-2 ライン目
L-1 ライン目
L ライン目
L-2+L ライン目
(j+1)+(j+2)+(j+3) ライン目
(j+4)+(j+5)+(j+6) ライン目
(j+k-2)+(j+k-1)+(j+k) ライン目

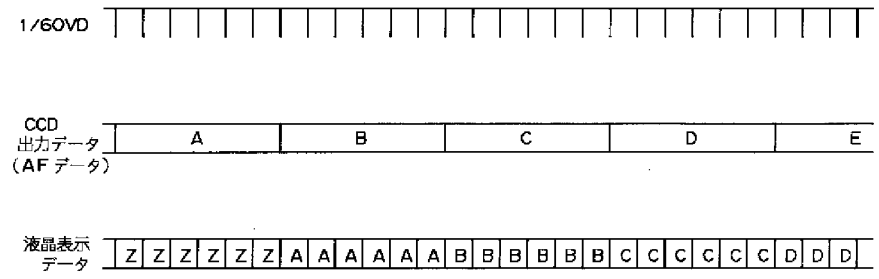
【図２２】


1ライン目 (CR)
2ライン目 (CB)
3ライン目 (CR)
4ライン目 (CB)
q_0=4
1+2+3+4 ライン目
5ライン目 (CR)
6ライン目 (CB)
7ライン目 (CR)
8ライン目 (CB)
q_0=4
5+6+7+8 ライン目
L-3ライン目 (CR)
L-2ライン目 (CB)
L-1ライン目 (CR)
Lライン目 (CB)
q_0=4
(L-3)+(L-2)+(L-1)+Lライン目

【図２３】


第1トリガ
第2トリガ
1/60VD
CCD 読み出しモード
nライン
qを加算kライン
順次走査
制御用データ
AE
AWB
AF
静止画記録

【図２４】


1/60VD
CCD 出力データ (AFデータ)
A
B
C
D
E
液晶表示データ
Z
A
B
C
D

フロントページの続き

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Espacenet

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ELECTRONIC IMAGE-PICKUP DEVICE

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Applicant(s): OLYMPUS OPTICAL CO ± (OLYMPUS OPTICAL CO LTD)

Classification: **- international:** ***H04N5/225; H04N5/232; H04N5/335; H04N5/341; H04N5/343; H04N5/345; H04N5/347; H04N5/351; H04N5/355; H04N5/357; H04N5/363; H04N5/369; H04N5/3728; H04N5/378; H04N5/765; H04N5/77; H04N5/781; H04N9/07;*** (IPC1-7): H04N5/225; H04N5/335; H04N5/765; H04N5/781; H04N9/07

- cooperative: **H04N3/1562 (US)**; **H04N5/347 (EP)**; **H04N5/369 (EP, US)**; **H04N5/3728 (EP)**; **H04N5/772 (EP, US)**; **H04N9/04513 (EP, US)**; **H04N9/04557 (EP, US)**

Application number: JP19970007831 19970120

Priority number(s): JP19970007831 19970120

Also published as: US6882366 (B1)

Abstract of JPH10210367 (A)

PROBLEM TO BE SOLVED: To provide the output of the multiple number of frames per unit time from a solid-state image-pickup element, without using a high drive frequency by providing a mode for taking out the image element signals for the whole lines of the solid-state image-pickup element and a mode for taking out the image signals for k-lines, where a part continues in a vertical direction. SOLUTION: The arrays (lines) of pixels constituting a solid-state image- pickup element in a horizontal direction are arranged for L-lines in a vertical direction. A mode (static image mode) for taking out the pixel signals for all the pixels by sequentially scanning all the lines and the mode (dynamic image mode) for taking out the pixel signals for only k-lines in the vertical direction are provided. At the time of photographing the still image, it is executed at the still image mode. The processing of automatic focusing and the like are

executed at the dynamic image mode and a system provides for next photographing in a standby state, where photographing is not executed. At the time of the dynamic image mode, a frame rate can be improved to L/k-times as much as that at the time of the still image mode. Then, the precision of automatic focusing can be improved.

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DESCRIPTION JPH10210367A

[0001]

INDUSTRIAL APPLICABILITY The present invention relates to an electronic image pickup device, more specifically, an electron that extracts a pixel signal from a solid-state image pickup device having pixels arranged in a two-dimensional manner to record a still image or perform moving image processing. The present invention relates to an image sensor.

[0002]

PROBLEM TO BE SOLVED: With the progress of microfabrication technology in recent years, the number of pixels of a solid-state image sensor such as a CCD that converts an optical image into an electric image signal is increasing.

[0003]

As such a high-pixel CCD, for example, considering an interline type solid-state image sensor equivalent to 1 million pixels, when the solid-state image sensor is sequentially scanned and driven at a frequency of 20 MHz (megahertz) or less, the relationship between the number of pixels Therefore, an image of about 10 to 15 frames per second is usually obtained.

[0004]

This number of frames is not a sufficient number of frames to be used as moving image data, and if the electronic image pickup device having the solid-state image sensor has a control system that requires moving image data, for example, autofocus There is a disadvantage that processing such as (AF), automatic exposure control (AE), and auto white balance (AWB) cannot be performed at high speed.

[0005]

This will be described in detail with reference to FIG.

FIG. 24 is a time chart showing CCD output data and liquid crystal display data obtained by a conventional CCD driving means.

[0006]

In FIG. 24, 1/60 VD is a vertical synchronization signal having a period of 1/60 second, whereas the output data from the CCD is indicated by the reference numerals A, B, C, D, and E. As shown in, it is obtained at a rate of 10 frames per second.

[0007]

On the other hand, for example, when the system is provided with a liquid crystal display device, if the liquid crystal display is not driven at about 60 frames per second, a good display is obtained due to the reaction of the liquid crystal or the like. Since this cannot be performed, the number of frames is increased by storing the output data of the CCD using means such as a memory and outputting the data of the same frame stored in the memory several times. It corresponded so that it could be displayed.

[0008]

That is, as shown in FIG. 24, for example, when the data A is output from the CCD, the data A is temporarily stored in the memory, and when all the data A is stored in the memory, the data A is used as the liquid crystal display data. Data A is repeatedly output from the memory 6 times.

Here, since the data A is output at a rate of 10 frames per second as described above, the liquid crystal display data is output at a rate of 60 frames per second.

[0009]

When such a driving means is used, a means such as a memory is always required, but it is cost-effective to use an expensive memory only for adjusting the number of frames for display. There wasn't.

[0010]

Further, as control data for which the above-mentioned CCD output data is desired to be processed using high-speed moving image data, for example, AF data as shown in parentheses in the CCD output data of FIG. 24, and others It may be necessary to use it as AE data or AWB data.

[0011]

For example, when performing autofocus, it is not always possible to focus using the CCD data for one frame, so autofocus is performed using a plurality of frames. When only about 10 frames per second can be obtained, there is a disadvantage that it takes a long time to perform the autofocus operation.

[0012]

In particular, when the electronic imaging device is an electronic still camera, it is very important not to miss a shutter chance or the like because it captures a still image. It was a big inconvenience in this respect.

[0013]

Moreover, when only a frame rate of about 10 frames per second can be obtained as described above, control cannot be made in time unless AF, AE, and AWB are processed in parallel at the same time, so that a memory is required as described above. , The circuit scale became large, which was disadvantageous in terms of cost.

[0014]

Therefore, in order to increase the number of frames without providing a memory, a means for performing thinning-out reading can be considered.

The conventional thinning-out reading will be described with reference to FIGS. 25 and 26.

[0015]

FIG. 25 is a diagram showing a configuration example of a color filter of a conventional solid-state image sensor.

[0016]

The line-sequential filter configuration as shown in FIG. 25 is known as a Bayer arrangement of primary colors, and the first line is a repetition of red (R) and green (G), and the second line is green (G). Blue (B) is repeated, and the odd-numbered lines thereafter are configured in the same manner as the first line, and the even-numbered lines are configured in the same manner as the second line.

In a CCD generally called all-pixel readout, a filter array in the color difference line sequential format called a Bayer array of primary colors is common.

[0017]

Generally, in a CCD, if an attempt is made to increase the number of frames per unit time by performing a thinning process, it is conceivable to simply thin out one line at a time as shown in FIG.

[0018]

However, when such thinning-out reading is performed, odd-numbered lines such as the first line, the third line, the fifth line, and the like are read out, so that the Bayer arrangement as shown in FIG. 25 above is used. In the CCD having a filter configuration, the RG line (since it is a line containing red information, it is displayed as (CR) in FIG. 26.

) Is read out and only the data that obtains the green (G) and red (R) color signals comes out, and the blue (B) signal existing on the even-numbered line (blue information in FIG. 26) is displayed. The including line is indicated as (CB).

) Will not be obtained.

[0019]

In this way, even if thinning scanning is performed by simply skipping one line in order to increase the number of frames, not all signals of G, R, and B can always be obtained, so that the data is used as color data for liquid crystal display. It was not possible to use it for an electronic still camera equipped with a liquid crystal display device.

[0020]

PROBLEM TO BE SOLVED: To drive a high-pixel interline type solid-state image sensor with a number of frames per unit time suitable for performing moving image signal processing, as described above, a high driving frequency is required. It is necessary, and when scanning is sequentially driven at a frequency of 20 MHz or less, the number of frames per unit time has decreased.

[0021]

In order to cope with this, when thinning scanning is performed, as described above, in the all-pixel readout type CCD image sensor, a color filter having a color difference line sequential type arrangement such as a Bayer arrangement has been generally used. Therefore, the color signal may be missing and the required color signal may not be obtained.

[0022]

The present invention has been made in view of the above circumstances, and an object of the present invention is to provide an electronic image pickup apparatus capable of obtaining a large number of frames per unit time from a solid-state image pickup device without using a high drive frequency. It is said.

[0023]

[Means for Solving the Problems] In order to achieve the above object, the electronic image sensor according to the first invention has pixels that receive light and convert it into an electric signal by arranging them in a two-dimensional manner. A solid-state image sensor in which a plurality of lines are arranged side by side in the vertical direction with a horizontal arrangement of pixels as a line, and all the pixels in order to record a still image by sequentially scanning the solid-state image sensor. Selectively control the mode for extracting the pixel signal and the mode for extracting the pixel signal related to the

partially continuous k (k is a positive integer) line in the vertical direction from the solid-state image sensor for recording a still image or processing a moving image. It is provided with a control means for the operation.

[0024]

Further, the electronic image sensor according to the second invention has pixels that receive light and convert it into an electric signal in a two-dimensional manner, and the lines are arranged in the vertical direction with a horizontal array of the pixels as a line. A mode for extracting pixel signals related to all pixels to record a still image by sequentially scanning a plurality of solid-state image sensors configured side by side and the solid-state image sensor, and for recording a still image or processing a moving image. A pixel signal related to n (n ≧ 1, n is an integer) line is partially continuous for each m (m ≧ 3, m is an integer) line in the vertical direction from the solid-state image sensor, and k (k ≧ 6, k is an integer).) It is provided with a control means for selectively controlling the mode to be taken out in the line.

[0025]

Further, the electronic image sensor according to the third invention has pixels that receive light and convert it into an electric signal by arranging them in a two-dimensional manner, and the lines are arranged in the vertical direction with a horizontal array of the pixels as a line. A mode for extracting pixel signals related to all pixels to record a still image by sequentially scanning a plurality of solid-state image sensors configured side by side and the solid-state image sensor, and for recording a still image or processing a moving image. A pixel signal obtained by adding n (n ≧ 2, n is an integer) line for each m (m ≧ 3, m is an integer) line in the vertical direction from the solid-state image sensor is partially continuous k (k ≧ 6, k is It is provided with a control means for selectively controlling the mode to be taken out in the (integer) line.

[0026]

Therefore, the electronic image pickup device according to the first invention has pixels in which the solid-state image pickup device receives light and converts it into an electric signal in a two-dimensional manner, and the line is a line in the horizontal direction of the pixels. Are configured to be arranged side by side in the vertical direction, and the control means sequentially scans the solid-state image sensor to take out pixel signals related to all pixels in order to record a still image, and records a still image or performs moving image processing. Therefore, the mode of extracting the pixel signal related to the partially continuous k (k is a positive integer) line in the vertical direction from the solid-state image sensor is selectively controlled.

[0027]

Further, the electronic image pickup device according to the second invention has pixels in which a solid-state image sensor receives light and converts it into an electric signal in a two-dimensional manner, and the line is a line in the horizontal direction of the pixels. Are configured to be arranged side by side in the vertical direction, and the control means sequentially scans the solid-state image sensor to take out pixel signals related to all pixels in order to record a still image, and records a still image or performs moving image processing. Therefore, k (k ≧ 6, k is a part of the pixel signal related to the n (n ≧ 1, n is an integer) line for each m (m ≧ 3, m is an integer) line in the vertical direction from the solid-state image sensor. Selectively control the mode to be taken out in the (integer) line.

[0028]

Further, the electronic image pickup device according to the third invention has pixels in which the solid-state image pickup device receives light and converts it into an electric signal in a two-dimensional manner, and the line is a line in the horizontal direction of the pixels. Are configured to be arranged side by side in the vertical direction, and the control means sequentially scans the solid-state image sensor to take out pixel signals related to all pixels in order to record a still image, and records a still image or performs moving image processing. A pixel signal obtained by adding n (n ≧ 2, n is an integer) line for each m (m ≧ 3, m is an integer) line in the vertical direction from the solid-state image sensor is partially continuous k (k ≧ 6, k). Is an integer) Selectively controls the mode to take out in the line.

[0029]

BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, embodiments of the present invention will be described with reference to the drawings.

1 to 6 show the first embodiment of the present invention, and FIG. 1 is a block diagram showing a configuration of an electronic imaging device.

[0030]

The main purpose of this electronic imaging device is basically to capture and record a still image, and as shown in FIG. 1, an electric signal is obtained from a subject image incident through a lens and a diaphragm 17. Adjust the gain of the output gain of the CCD1 which is a solid-state imaging element having a two-dimensional array to convert to, the correlated double sampling circuit (CDS) 2 for removing reset noise and the like from the output of the CCD1, and the correlated double sampling circuit 2. The gain control amplifier (AMP) 3 to be used, the analog-to-digital converter (A / D) 4 that converts the output signal of the gain control amplifier 3 into a digital signal, and the video signal converted into a digital signal are subjected to various processing. A transfer pulse for driving the process processing circuit 5 and the CCD 1 is output, a sample hold pulse for the correlated double sampling circuit 2 is output, and A / D conversion is performed by the analog-digital converter 4. About the timing generator (TG) 6 that outputs a timing pulse for performing, the signal generator (SG) 7 that generates a signal for synchronizing the timing generator 6 with the CPU 8 described later, and the entire electronic imaging device. An operation for autofocus by, for example, a CPU 8 which is a microcomputer that performs various controls including timing, a DRAM 9 which is a memory for accumulating pixel data of the CCD 1 output from the process processing circuit 5, and the lens and the aperture 17. The autofocus circuit (AF) 10 which is a control circuit for performing the above, the automatic exposure control circuit (AE) 11 which is a control circuit for measuring the light of the subject image formed on the CCD1, and the white balance are automatically adjusted. It consists of an auto white balance circuit (AWB) 12 which is a control circuit for controlling, a liquid crystal display device 13 which is a monitor provided in the electronic image pickup device, an external monitor of the electronic image pickup device, and the like. In order to reduce the amount of data and record the pixel data for one screen stored in the DRAM 9 and the external display terminal 14 having an output terminal for outputting to the external display device on the recording medium 16 described later. It is configured to include a compression / decompression circuit 15 for compressing or decompressing compressed data read from the recording medium 16 and a recording medium 16 for recording still image data.

[0031]

In such an electronic imaging device, the following operations are performed when recording an image.

[0032]

The image signal output from the CCD1 via the CDS2, AMP3, A / D4, and process processing circuit 5 is displayed by, for example, the liquid crystal display device 13.

The photographer determines the composition of the subject while looking at the liquid crystal display device 13, and presses a shooting button (not shown).

[0033]

Then, the output of the process processing circuit 5 is compressed by the compression / decompression circuit 15 via the DRAM 9 and recorded on the recording medium 16.

[0034]

Further, when the recorded image is reproduced in the electronic image pickup apparatus, the following operations are performed.

[0035]

The compressed data stored in the recording medium 16 is read out, decompressed by the compression / decompression circuit 15, and the decompressed data is written to the DRAM 9.

[0036]

By outputting this data from the liquid crystal display device 13 or the external display terminal 14 to the external display device again via the process processing circuit 5, the data is reproduced as a still image.

[0037]

Next, in the above-described configuration, a means for driving the CCD1 to obtain image data will be described.

FIG. 2 is a diagram showing a method of reading image data from a line constituting the CCD.

[0038]

In FIG. 2, the horizontal arrangement of the pixels constituting the CCD1 which is the solid-state image sensor of the two-dimensional arrangement is called a line, and this line is vertically arranged from one line to the L line, and these are the CCD1. It is assumed that all the lines are arranged in the vertical direction.

[0039]

FIG. 2A shows a mode in which pixel signals related to all pixels are taken out and a still image is recorded by sequentially scanning the CCD1 from one line to the L line.

[0040]

That is, a high-resolution image as a still image is obtained by sequentially scanning the full screen area as shown by the large outer rectangular frame in FIG. 4 and outputting information related to all pixels by a so-called progressive method. Is a mode in which you can obtain.

[0041]

On the other hand, FIG. 2B shows a partially continuous k (k is a positive integer) line in the vertical direction as shown by diagonal lines in the CCD1 to FIG. 4, that is, from the j + 1 line to the j + k line (j is 0). The mode in which the pixel signal of (the above integers) is taken out and the moving image is processed is shown.

It is also possible to record the output of this mode as a still image.

[0042]

If such a means for reading only the continuous k-line portion is used, the frame rate can be improved L / k times as compared with the case of reading all the L lines, which is very effective when performing moving image processing. Therefore, it is possible to obtain moving image data at a high frame rate.

[0043]

Here, the continuous k-line may be taken at the center of the full screen area of the CCD1, for example.

The image data read out in this mode is used for processing such as autofocus (AF), automatic exposure control (AE), and auto white balance (AWB), as will be described later. In such processing, center-weighted processing is performed. This is because it is often done.

[0044]

Next, how the mode as shown in FIG. 2 (A) and the mode as shown in FIG. 2 (B) are executed will be described with reference to FIG.

FIG. 3 is a time chart showing the reading mode of the CCD in the electronic imaging device.

[0045]

In FIG. 3, the portion described as 1/60 VD is a vertical synchronization signal having a period of 1/60 seconds, and similarly to the one shown in FIG. 24 in the above conventional example, the vertical synchronization signal has a period of, for example, 1/60 seconds. This is an example of the above.

[0046]

Further, in FIG. 3, the mode of the signal read from the CCD1 is shown below the 1/60 VD.

[0047]

When not capturing a high-quality image for a still image, the frame rate is improved and the vertical synchronization signal VD is obtained by reading out a continuous k-line portion in the mode shown in FIG. 2 (B). It is possible to synchronize and perform, for example, moving image processing.

As shown in FIG. 6, the image data output in this way is repeatedly used, for example, frame by frame in the process of calculating control data such as AE, AF, and AWB.

[0048]

When performing different processing for each frame repeatedly, for example, it is conceivable to accumulate control data. In this case, the accumulated data is stored in the same manner according to each processing content. It is also possible to accumulate and process by the system.

[0049]

If a trigger is issued by pressing a shooting button (not shown) during the above processing, the exposure and focus have already been controlled by the video processing up to that point. In addition, a still image can be taken immediately after the frame in which the trigger is input.

[0050]

The still image is photographed by sequentially scanning the CCD1 from the 1st line to the L line in the mode as shown in FIG. 2A.

Assuming that scanning of all lines takes a time of, for example, 1/10 second, when counting by a vertical synchronization signal VD having a cycle of 1/60 second, it is necessary to output all the data of a still image for 6 frames. It takes time.

[0051]

When the output of the still image data is completed, the electronic image pickup apparatus enters the mode of performing moving image processing again, reads out and outputs the continuous k-line portion, performs processing such as AE, AF, AWB, and the like. Prepare for the next shoot.

[0052]

Further, FIG. 5 shows a modification of FIG. 4, and is a diagram showing an example in which a plurality of blocks are taken out with the continuous k-line as one block.

[0053]

That is, in FIG. 4, only one continuous k-line is taken from, for example, the central portion of the full screen area of the CCD1.

[0054]

On the other hand, FIG. 5 shows two continuous k-lines in the upper and lower parts of the full screen area of the CCD1, for example, in the center.

[0055]

By taking out a plurality of blocks in this way, the range in which AE and AF information can be obtained is widened, and so-called multi-division AE and AF can be performed, so that AF accuracy and AE accuracy can be improved. It has the advantage of.

[0056]

When reading a plurality of blocks of continuous k-lines, the frame rate is lower than when reading only one block, but a higher frame rate can still be obtained as compared with the case where all pixels are read. , The effect of speeding up the control can be obtained.

Alternatively, in order not to reduce the frame rate, it is conceivable to make the number of continuous lines k smaller than in the case of reading only one block.

[0057]

Further, in the above description, the case where the number of blocks to be read is 2 is shown, but the case is not limited to this. For example, if the central part is added as a block to about 3 blocks, more accurate control can be performed. It becomes.

[0058]

According to such an embodiment, when a fast frame rate is required to control autofocus, AE, auto white balance, etc., a partially continuous k-line is read out to obtain a high-resolution image for a still image. By sequentially scanning all lines only when output is required, the release time lag is short, and a high-quality image can be obtained, resulting in an electronic imaging device that does not miss a shutter chance.

[0059]

Further, FIG. 6 is a diagram showing the timing for controlling AF, AE, AWB, and in order to improve the frame rate, control of AF, AE, AWB, etc. is performed in parallel as shown in FIG. Since processing is not required, memory is not required, and control circuits can be used in common, the circuit scale can be reduced.

[0060]

Further, by sequentially controlling AF, AE, AWB, etc. frame by frame in this way, there is an advantage that the influence of flicker on each data can be reduced.

[0061]

7 to 12 show a second embodiment of the present invention, and FIG. 7 is a diagram showing a method of reading pixel data from a line constituting the CCD.

In this second embodiment, the same parts as those in the first embodiment described above will be omitted, and only the differences will be mainly described.

[0062]

The main configuration of the electronic imaging device of the second embodiment is the same as that shown in FIG.

[0063]

Next, as shown in FIG. 7, in this embodiment, the pixel signals related to the n ($n \geqq 1$, n is an integer) line are partially continuous with respect to the m ($m \geqq 3$, m is an integer) line in the vertical direction. The process of extracting is performed on the k ($k \geqq 6$, k is an integer) line.

[0064]

More specifically, when reading pixel data from CCD1, a still image recording mode for sequentially scanning and reading all lines from 1 line to L line as shown in FIG. 2A above to perform high-quality shooting. In addition, in the mode in which the n-line pixel signal is taken out for the m-line as shown in FIG. 8 (A) and the k-line in which the n-line pixel signal is partially continuous for the m-line as shown in FIG. 8 (B). It has a take-out mode, and these can be selected.

[0065]

In FIG. 8, as an example, m = 3, n = 1, which means that a signal of one line can be obtained for three lines.

[0066]

Therefore, in the mode shown in FIG. 8A, the frame rate can be tripled.

In general, of all the L lines, the read line is L × n / m, so the frame rate is m / n times.

[0067]

Further, in the mode shown in FIG. 8B, the frame rate is (m × L) / (n × k) because the read line is generally k × n / m among all the L lines. Double.

[0068]

The data on a part of the screen of the CCD1 as shown in FIGS. 2 (B) and 8 (B) can be displayed as a moving image on the external display device via the liquid crystal display device 13 or the external display terminal 14. Not suitable, especially for framing and the like.

For this reason, image data related to the entire screen is required, but as described above, reading out all the lines causes an inconvenience that the number of frames per unit time does not increase. A mode is provided for reading out the full screen as shown by performing thinning processing.

[0069]

As a result, a full-screen moving image having the same framing as the still image actually shot can be displayed on the external display device via the liquid crystal display device 13 or the external display terminal 14 at a high frame rate without the need for memory. Can be displayed.

[0070]

Further, in the mode shown in FIG. 8B, since one line is thinned out for every three lines and the k line is output, the k line is output at the same ratio as that of the first embodiment described above. When improving the frame rate, the k-line read range as shown in the shaded area of FIG. 9 is set, and an area three times as large as the k-line read range shown in the shaded area of FIG. 4 is set. Will have.

[0071]

As a result, a wider area can be used for controlling AF, AE, AWB, etc. without reducing the frame rate. Thus, it has both a mode of reading the full screen by thinning out and a mode of extracting only k lines by thinning out. Therefore, the mode can be properly used depending on whether high-speed processing such as AF is performed or liquid crystal display is performed.

[0072]

Further, in the case of m = 3, n = 1 as described above, that is, in the case of sequentially thinning out the three lines as one unit, as shown in FIG. 11, the third line is the R signal. The 6th line is the line (CB) from which the B signal is obtained (see the line-sequential filter configuration as shown in FIG. 25 above).

[0073]

Since the color signal including the information of R and the color signal including the information of B can be obtained as line-sequential data in this way, the moving image processing data including all the color signals can be obtained by performing the simultaneous processing. ..

If such a signal is obtained, it can be displayed in color by the liquid crystal display device 13 or the like, and the photographer can perform framing with the same image as the image actually captured.

[0074]

When a line-sequential color filter in which different color filters are arranged for each line is used, there is an advantage that all color data can be obtained in a narrow range and the resolution related to the color can be increased. ..

[0075]

Further, although m = 3 and n = 1 have been described above, the present invention is not limited to this, and other numbers may be used.

However, when applied to a Bayer array color filter, it is desirable that m = 2α + 1 (α is a positive integer), that is, m is an odd number.

This is because it becomes possible to obtain compatibility between the case of thinning out and the case of sequential scanning.

[0076]

Next, how the mode as shown in FIG. 8 (A) and the mode as shown in FIG. 8 (B) are executed will be described with reference to FIG.

FIG. 12 is a time chart showing a CCD readout mode and the like in an electronic imaging device.

[0077]

In FIG. 12, a vertical synchronization signal (1/60 VD) having a 1/60 second cycle is shown in the upper row, a CCD read mode is shown in the middle row, and control data is shown in the lower row, and still image recording is further shown below. The part to do is shown.

[0078]

Normally, for example, as shown in FIG. 8 (A) above, by performing thinning scanning that reads out n lines per m line on the full screen, an image related to the full screen suitable for framing is displayed on a liquid crystal display. It is displayed on the device 13, and at this time, the AE and the AWB are repeatedly controlled.

[0079]

Here, the shooting button (not shown) of this electronic imaging device is a two-stage trigger, which corresponds to the preparatory stage of recording that is emitted when the operator wants to take a still image and lightly presses the shooting button. It is assumed to have a first trigger and a second trigger issued to record a still image in a state controlled by the first trigger.

[0080]

Then, when the first trigger is issued during the thinning-out reading of the entire screen as shown in FIG. 8 (A), the k as shown in FIG. 8 (B) is started from the next frame. Changed to line read.

In this k-line readout, AF control is performed to ensure that the focus positions of the lens and the aperture 17 are aligned with the subject.

[0081]

When the second trigger is issued after focusing in this way, all lines on the entire screen are sequentially scanned at a rate of, for example, 10 frames per second, which is 6 frames of 1/60 second of the vertical synchronization signal. The still image output is recorded on the recording medium 16.

[0082]

After recording the still image, in order to prepare for the next shooting, the mode of n-line reading capable of performing a normal liquid crystal display is entered, and AE and AWB are repeated again.

[0083]

According to such an operation method, since AE and AWB have already been completed when the first trigger is issued, only AF needs to be performed during the period from the first trigger to the second trigger. Since the k-line reading is performed, this period can be further shortened, and the release time lag can be shortened.

[0084]

In the above description, only AF is performed between the first trigger and the second trigger, but AF and AE may be performed.

[0085]

Further, FIG. 10 shows a modified example of FIG. 9, and is a diagram showing an example in which a plurality of blocks are taken out with the k line as one block.

[0086]

The example shown in FIG. 10 has two k-line blocks, for example, in the upper and lower parts of the center of the full screen area of the CCD 1, in the same manner as shown in FIG. 5 in the first embodiment described above. It is a thing.

Also in FIG. 10, the width of the k-line block is wider than that shown in FIG. 5, similar to that shown in FIG. 9.

[0087]

In this way, the range for obtaining AE and AF information is further widened, so that the AF accuracy and AE accuracy can be further improved.

[0088]

According to such a second embodiment, it is possible to improve the accuracy of AE and AF because the same effect as that of the first embodiment described above can be obtained and a wider range of information can be obtained. ..

In addition, a full-screen color image suitable for display on a liquid crystal display device can be obtained at a high frame rate.

Then, by appropriately using the plurality of modes, an electronic imaging device having a short release time lag and not missing a shutter chance can be obtained.

[0089]

13 to 17 show a third embodiment of the present invention, and FIG. 13 is a diagram showing a method of reading pixel data from a line constituting the CCD.

In this third embodiment, the same parts as those in the first and second embodiments described above will be omitted, and only the differences will be mainly described.

[0090]

The main configuration of the electronic imaging device of the third embodiment is substantially the same as that shown in FIG.

[0091]

Next, in this embodiment, as shown in FIG. 13, a pixel signal obtained by adding n (n ≧ 2, n is an integer) line for each m (m ≧ 3, m is an integer) line is partially continuous k. (K ≧ 6, k is an integer) It is taken out in the line, for example, it is the same as the second embodiment described above in that it reads out one line for every three lines, but the one line to be read out is The difference is that, for example, two lines are added and read out of the three lines.

The frame rate is the same as that of the second embodiment described above.

[0092]

More specifically, when reading pixel data from CCD1, a still image recording mode for sequentially scanning and reading all lines from 1 line to L line as shown in FIG. 2A above to perform high-quality shooting. In addition to this, a mode in which n lines are added per m line as shown in FIG. 15 (A) and then a pixel signal is taken out, and a mode in which n lines are added per m line as shown in FIG. 15 (B) are partially continuous. It also has a mode to take out in the k-line to be used, and these can be selected.

[0093]

Here, with reference to FIG. 14, the addition of signals in a plurality of lines will be described.

FIG. 14 is a diagram showing addition performed when a signal is transferred in an interline type CCD.

[0094]

In FIG. 14, GA, GB, GC, BA, BB, BC, RA, RB, and RC each indicate a photodiode, and the vertical path located to the right of these photodiodes is a vertical transfer path. The horizontal path located horizontally on the lower end side of the vertical transfer path is the horizontal transfer path.

[0095]

In FIG. 14, a case where m = 3, n = 2, that is, a case where two lines are added for every three lines to obtain one line will be described as an example.

[0096]

Charges are transferred from the photodiode to the vertical transfer path at the end of the exposure.

During this transfer, as shown in the figure, two of the three lines, that is, the photodiode with the subscript A and the photodiode with the subscript C, are shown by ellipses in the figure. Charges are transferred to the vertical transfer path.

[0097]

After that, an operation of transferring charges toward the horizontal transfer path is performed in the vertical transfer path.

Since this vertical transfer has m = 3 as described above, three transfers are performed as one unit.

As a result, the charge from the photodiode with the subscript A and the charge from the photodiode with the subscript C are added.

[0098]

For example, for the lower left part of FIG. 14 where m = 3, the charges of RA and RC among the three photodiodes RA, GB, and RC are sent to the vertical transfer path.

[0099]

Next, when this is transferred once in the vertical direction, the electric charge from the RC is first transferred to the horizontal transfer path, and the electric charge from the RA is transferred to a position in the vertical transfer path next to the GB.

[0100]

Then, when the second transfer in the vertical direction is performed, the electric charge from the RC remains in the horizontal transfer path as it is, and the electric charge from the RA is transferred to a position in the vertical transfer path next to the RC.

[0101]

Furthermore, when the third transfer in the vertical direction is performed, the electric charge from the RC remains in the horizontal transfer path as it is, and the electric charge from the above RA is also transferred into the horizontal transfer path, so that the electric charge from the RA is eventually transferred. And the charges from the RC will be added.

[0102]

By reading out the charges added in this way in order from the horizontal transfer path, a signal of one line can be obtained.

[0103]

After reading the signal of one line in this way, by performing the same operation, the sum of the charges of the two lines in the next three lines is output.

[0104]

When such an addition method is used, when the filter array is composed of a line-sequential Bayer array, as shown in FIG. 16, the first line and the third line, which are CR lines containing R information, are added. Then, the 4th and 6th lines, which are CB lines containing the information of B, are added and output, and then the line output including the information of R and the line output including the information of B are repeated. Therefore, the color signal can be obtained in line sequence.

[0105]

When displaying on the liquid crystal display device 13 or the like, the line containing the information of R and the line containing the information of B are simultaneously performed and interpolated. At this time, for example, as shown in FIG. 25 above. Since the third line containing the information of R and the fourth line containing the information of B are adjacent to each other on the CCD, highly correlated data can be obtained, and even if the number of lines is small, it is good. A signal of image quality can be obtained.

[0106]

Further, in the case of a solid-state image sensor having the color filter of the Bayer arrangement, $m = 2\alpha + 1$ (α is a positive integer), that is, m is an odd number, and the same color signal is added, and the color signal is obtained. It is desirable to take out in line sequence.

[0107]

13 and 15 show an example in which m = 3 and n = 2 as in FIG. 14 above.

[0108]

First, in order to obtain image data related to the entire screen used for liquid crystal display or the like, the mode is as shown in FIG. 15 (A).

[0109]

That is, in all the lines from the 1st line to the L line, the 1st line and the 3rd line among the 3 lines from the 1st line to the 3rd line are added and read out, and from the following 4th line. Of the three lines up to the sixth line, the fourth and sixth lines are added and read out.

[0110]

In the same manner, addition reading is performed one after another, and the L-2th line and the L line among the three lines L-2, L-1, and L are added and read.

At this time, the number of lines to be read is L / m.

[0111]

Next, in order to obtain image data having a high frame rate in order to perform processing such as AF, AE, and AWB, the mode is as shown in FIGS. 13 and 15 (B).

[0112]

That is, in a partially continuous k line from the j + 1th line to the j + kth line, the j + 1th line and the j + 3rd line among the three lines j + 1, j + 2, j + 3 are added and read, and the next j + 4, j + 5 is read. Of the three lines of, j + 6, the j + 4th line and the j + 6th line are added and read.

In the same manner, the j + k-2th line and the j + kth line among the three lines j + k-2, j + k-1, and J + k are added and read.

At this time, the number of lines to be read is k / m.

[0113]

FIG. 17 is a time chart showing a CCD readout mode and the like in an electronic imaging device.

[0114]

The one shown in FIG. 17 is basically the same as the one shown in FIG. 12, except that the CCD read mode is n-line addition in the part used for a normal liquid crystal display or the like. is there.

[0115]

That is, in a normal case, the liquid crystal display or the like is performed while alternately performing AE and AWB for each frame in the mode as shown in FIG. 15 (A).

[0116]

Then, when the first trigger is issued, the autofocus process is performed in the k-line read mode as shown in FIG. 15B.

[0117]

Further, when the second trigger is issued, all lines on the entire screen are sequentially scanned, and a still image is recorded on the recording medium 16.

[0118]

In this embodiment as well, a plurality of blocks composed of k-lines may be taken out in the same manner as shown in FIG.

[0119]

According to such a third embodiment, the same effect as that of the first and second embodiments described above is obtained, and the dynamic range is increased in order to add and output signals of a plurality of lines. It is possible to reduce the influence of moire and the like.

[0120]

18 to 23 show a fourth embodiment of the present invention, and FIG. 18 is a diagram showing a method of reading pixel data from a line constituting the CCD.

In this fourth embodiment, the same parts as those in the first to third embodiments described above will be omitted, and only the differences will be mainly described.

[0121]

The main configuration of the electronic imaging device of the fourth embodiment is substantially the same as that shown in FIG.

[0122]

Next, in this embodiment, as shown in FIG. 18, for a partially continuous k (k ≧ 6, k is an integer) line, all the q lines are added for each q (q ≧ 3, q is an integer) line. The pixel signal is taken out. For example, it is the same as the second and third embodiments described above in that one line is read out for every three lines, but the read one line is used for all three lines. The points of addition and reading are different.

The frame rate is the same as that of the second and third embodiments described above.

[0123]

More specifically, when reading pixel data from CCD1, a still image recording mode for sequentially scanning and reading all lines from 1 line to L line as shown in FIG. 2A above to perform high-quality shooting. In addition, a mode in which n lines of pixel signals are taken out for each m line as shown in FIG. 20 (A) and a pixel signal in which q lines are added in a partially continuous k line as shown in FIG. 20 (B) are taken out. It also has modes so that you can select them.

[0124]

Here, with reference to FIG. 19, the addition of signals in a plurality of lines will be described.

FIG. 19 is a diagram showing addition performed when a signal is transferred in an interline type CCD.

[0125]

In FIG. 19, A, B, and C each indicate a photodiode, and other vertical transfer paths and horizontal transfer paths are the same as those shown in FIG. 14 above.

[0126]

In FIG. 19, a case where q = 3, that is, a case where three lines are added will be described as an example.

[0127]

Charges are transferred from the photodiode to the vertical transfer path at the end of the exposure.

During this transfer, as shown in the figure, charges as shown by ellipses in the figure are transferred from all the photodiodes, that is, all the photodiodes A, B, and C to the vertical transfer path.

[0128]

After that, an operation of vertically transferring the electric charge toward the horizontal transfer path is performed in the vertical transfer path.

Since this vertical transfer has q = 3 as described above, three transfers are performed as one unit.

As a result, the charges of the three photodiodes A, B, and C are added in the horizontal transfer path.

[0129]

By reading out the charges of the three photodiodes A, B, and C added in this way in order from the horizontal transfer path, a signal of one line can be obtained.

[0130]

After reading the signal of one line, the same operation is performed one after another, so that the added charges of the three lines are sequentially output.

[0131]

Here, the signal obtained when q = 4 will be described when the filter array is composed of the Bayer array of line sequence.

[0132]

As shown in FIG. 22, when the first and third lines, which are CR lines consisting of R and G information, and the second and fourth lines, which are CB lines consisting of B and G information, are added. , (R + 2G + B) × 2 signals will be calculated.

[0133]

Such a signal is an output signal very close to a so-called luminance signal, and by adding a plurality of lines, the dynamic range can be increased and the influence of moire and the like can be reduced. ing.

[0134]

Therefore, when performing control that does not necessarily require a color signal, such as autofocus or metering, it is possible to use it as a very effective signal by using this added signal.

[0135]

FIG. 23 is a time chart showing a CCD readout mode and the like in the electronic imaging device.

[0136]

What is shown in FIG. 23 is basically the same as that shown in FIG. 12, and the CCD read mode is q-added in the portion where AF control is performed after the first trigger is issued. The only difference is that it is a line read.

[0137]

That is, in a normal case, the liquid crystal display or the like is performed while alternately performing AE and AWB for each frame in the mode as shown in FIG. 20 (A).

Since the mode shown in FIG. 20A is a mode in which color signals are obtained in line sequence, a signal suitable for controlling AWB or the like can be obtained.

[0138]

Then, when the first trigger is issued, the autofocus process is performed in the k-line read mode in which q is added as shown in FIG. 20B.

Since the mode shown in FIG. 20B is a mode in which a signal close to the luminance signal can be obtained, a signal suitable for controlling AF or the like can be obtained.

[0139]

Further, when the second trigger is issued, all lines on the entire screen are sequentially scanned, and a still image is recorded on the recording medium 16.

[0140]

FIG. 21 shows a modification of FIG. 20, and when reading pixel data from CCD1, all lines from line 1 to line L as shown in FIG. 2A are sequentially scanned. In addition to the still image recording mode for reading and performing high-quality shooting, there is a mode in which n (n ≧ 2, n is an integer) line is added to each m (m ≧ 3, m is an integer) line, and q (q ≧ 3). , Q is an integer) It further has a mode in which all the q lines are added for each line, and each mode can be selected according to the application.

[0141]

Therefore, in the mode of adding n lines for each m line, a line sequential output suitable for liquid crystal display or the like can be obtained, while in the mode of adding q lines, a signal output close to a luminance signal is obtained. By skillfully combining the color filters to be added in the line sequential filter, it is possible to select an appropriate mode according to the application.

[0142]

In this embodiment as well, a plurality of blocks composed of k-lines may be taken out in the same manner as shown in FIG.

[0143]

According to the fourth embodiment, the same effect as that of the first to third embodiments described above is obtained, and a signal close to the luminance signal is obtained when AF or the like is performed after the first trigger. Moreover, since the dynamic range of the signal becomes larger, the accuracy of AF and the minimum subject illuminance required for performing AF can be improved.

[0144]

[Additional Notes] According to the above-described embodiment of the present invention as described in detail above, the following configurations and effects can be obtained.

[0145]

(1) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional manner, and a row of the pixels in the horizontal direction is used as a line, and a plurality of lines are arranged side by side in the vertical direction. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. An electronic image pickup apparatus comprising: a control means for selectively controlling a mode for extracting a pixel signal related to a partially continuous k (k is a positive integer) line.

[0146]

Conventionally, for example, when an interline type solid-state image sensor of 1 million pixel class is sequentially scanned and driven at 20 MHz or less, the number of frames obtained per unit time is 10 to 15 frames / second. For example, in the control that requires moving image data, there is a problem that the processing cannot be performed at high speed.

[0147]

On the other hand, according to the invention described in Appendix (1), the frame rate can be improved (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0148]

(2) The additional note that the control means controls a mode in which a plurality of blocks are taken out from all the lines by using the k line as one block in order to record a still image or process a moving image. The electronic imaging device according to 1).

[0149]

Conventionally, there have been the same problems as those described in Appendix (1).

[0150]

On the other hand, according to the invention described in Appendix (2), the same effect as that of the invention described in Appendix (1) is obtained, and the frame rate is set to (compared to the case where all lines are sequentially scanned and read out. The total number of lines) / {k × (number of blocks composed of k lines)} can be improved.

[0151]

(3) The control means is characterized in that it takes out a pixel signal related to the k line, performs moving image processing, and controls so that the moving image processed signal is used as AF information, AE information, or AWB information. The electronic imaging device according to the appendix (1) or the appendix (2).

[0152]

In the past, the number of frames obtained per unit time was, for example, 10 to 15 frames / sec. Therefore, it takes time to control AF, AE, or AWB, and still image shooting is performed in a short time. I couldn't get in.

[0153]

On the other hand, according to the invention described in Appendix (3), the same effect as that of the invention described in Appendix (1) or Appendix (2) is obtained, and the frame rate is (total number of lines) / k times or (). Total number of lines) / {k × (number of blocks composed of k lines)} can be improved to control AF, AE, or AWB, so still image shooting can be started in a shorter time. be able to.

Further, only the pixel signal related to the area required for controlling AF, AE, or AWB can be obtained at high speed.

[0154]

(4) The control means takes out a pixel signal related to the k-line, performs moving image processing, and controls to use the moving image processed signal as AF information, AE information, or AWB information, and at that time, AF, Addendum (1) or Addendum (2), characterized in that either AE or AWB control data is calculated one by one in one frame, and the calculation of the data is repeated in order. The electronic imaging apparatus according to.

[0155]

In the past, since the frame rate was slow, it was necessary to process AF, AE, or AWB in parallel at the same time, resulting in an increase in circuit scale.

[0156]

On the other hand, according to the invention described in the appendix (4), the same effect as that of the invention described in the appendix (1) or the appendix (2) is obtained, and the control data of AF, AE, or AWB is sequentially input. By calculating, the influence of flicker that may occur on each data can be reduced.

[0157]

(5) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional manner, and a row of the pixels in the horizontal direction is used as a line, and a plurality of the lines are arranged side by side in the vertical direction. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. A mode in which pixel signals related to n (n ≧ 1, n is an integer) line for each m (m ≧ 3, m is an integer) line is taken out in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup apparatus comprising: a control means for selectively controlling.

[0158]

Conventionally, for example, when an interline type solid-state image sensor of 1 million pixel class is sequentially scanned and driven at 20 MHz or less, the number of frames obtained per unit time is 10 to 15 frames / second. For example, in the control that requires moving image data, there is a problem that the processing cannot be performed at high speed.

[0159]

On the other hand, according to the invention described in Appendix (5), the frame rate is improved to (m / n) × (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read. be able to.

Further, by thinning out the lines, it is possible to obtain a pixel signal relating to a wider area without lowering the frame rate.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0160]

(6) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional manner, and a row of the pixels in the horizontal direction is used as a line, and a plurality of the lines are arranged side by side in the vertical direction. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. A mode for extracting a pixel signal related to an n (n ≧ 1, n is an integer) line for each m (m ≧ 3, m is an integer) line, and a vertical mode from the solid-state image sensor for recording a still image or processing a moving image. It is characterized by comprising a control means for selectively controlling a mode in which a pixel signal related to n lines is partially continuous in k (k ≧ 6, k is an integer) line for each m line in a direction. Electronic image sensor.

[0161]

Conventionally, there have been the same problems as those described in Appendix (5).

[0162]

On the other hand, according to the invention described in Appendix (6), the data obtained by thinning out the entire screen in which the frame rate is improved by m / n times and the frame rate are (m / n) × (total number of lines) / k. It is possible to obtain the data obtained by extracting a part of the continuous region in the vertical direction, which has been doubled, as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0163]

(7) The additional note that the control means controls a mode in which a plurality of blocks are taken out from all the lines by using the k line as one block in order to record a still image or process a moving image (7). The electronic imaging device according to 6).

[0164]

Conventionally, there have been the same problems as those described in Appendix (5).

[0165]

On the other hand, according to the invention described in Appendix (7), the same effect as that of the invention described in Appendix (6) is obtained, and the frame rate is (m / n) × (total number of lines) / {k ×, (Number of blocks composed of k-lines)} Can be improved twice.

[0166]

(8) The image data obtained by extracting n-line pixel signals for each m-line in the vertical direction for recording a still image or processing a moving image is characterized in that the color signal is line-sequential data. (5), Appendix (6), or electronic imaging device according to Appendix (7).

[0167]

In a single-panel camera, if the filter of the solid-state image sensor is configured with an emphasis on resolution, it is advantageous to make the color lines sequential.

However, there is a drawback that it is not possible to obtain line-sequential data by a conventional means that simply thins out one line for every two lines.

[0168]

On the other hand, according to the invention described in the appendix (8), the same effect as that of the invention described in the appendix (5), the appendix (6), or the appendix (7) is obtained, and a color signal is obtained in line sequence. As a result, the required color signal can be obtained while maintaining the resolution.

[0169]

(9) The electronic image pickup device according to Appendix (5), Appendix (6), or Appendix (7), wherein the solid-state image pickup device is characterized in that the color filter is composed of a line-sequential filter. . .

[0170]

Conventionally, there have been the same problems as those described in Appendix (8).

[0171]

On the other hand, according to the invention described in the appendix (9), the same effect as that of the invention described in the appendix (5), the appendix (6), or the appendix (7) is obtained, and the output by sequential scanning and the m line are obtained. Color signals can be obtained in line sequence for each output.

[0172]

(10) The electronic imaging device according to Appendix (5), Appendix (6), or Appendix (7), wherein m = 2α + 1 (α is a positive integer) and n = 1.

[0173]

The conventional means of simply thinning out one line for every two lines has a drawback that it is not possible to obtain line-sequential data.

[0174]

On the other hand, according to the invention described in the appendix (10), the same effect as that of the invention described in the appendix (5), the appendix (6), or the appendix (7) is obtained, and the number of lines is odd. By reading out n = 1 line for each line, it is possible to obtain a line-sequential image signal as it is in the case of a line-sequential filter.

[0175]

(11) Addendum (5), Addendum (6), or Addendum (7), wherein the signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information. The electronic imaging apparatus according to.

[0176]

In the past, the number of frames obtained per unit time was, for example, 10 to 15 frames / sec. Therefore, it takes time to control AF, AE, or AWB, and still image shooting is performed in a short time. I couldn't get in.

[0177]

On the other hand, according to the invention described in the appendix (11), the same effect as that of the invention described in the appendix (5), the appendix (6), or the appendix (7) is obtained, and the frame rate is set to (m / n).) × (total number of lines) / k times, or (m / n) × (total number of lines) / {k × (number of blocks composed of k lines)} times improved to AF, AE, or AWB Since the processing can be performed, the still image shooting can be started in a shorter time.

Further, only the pixel signal related to the area required for controlling AF, AE, or AWB can be obtained at high speed.

[0178]

(12) The signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information, and at that time, any one of AF, AE, or AWB control data is used as 1. The electronic imaging apparatus according to Appendix (5), Appendix (6), or Appendix (7), wherein the data is calculated one by one in a frame and the data is calculated repeatedly in order.

[0179]

In the past, since the frame rate was slow, it was necessary to process AF, AE, and AWB in parallel at the same time, resulting in an increase in circuit scale.

[0180]

On the other hand, according to the invention described in the appendix (12), the same effect as that of the invention described in the appendix (5), the appendix (6), or the appendix (7) is obtained, and the AF, AE, or AWB has the same effect. By calculating the control data in order, it is possible to reduce the influence of flicker that may occur on each data.

[0181]

(13) The control means is used to display on a display device attached to the electronic image pickup device, to supply to a display device outside the electronic image pickup device, or as AE information or AWB information. Therefore, when obtaining a moving image processed signal, select a mode for extracting a pixel signal related to n lines for each m line in the vertical direction, and when obtaining a moving image processed signal for use as AF information or AE information. The electronic imaging device according to the appendix (6), wherein a mode for extracting a pixel signal related to n lines in a partially continuous k line is selected for each m line in the vertical direction.

[0182]

The pixel signal output from only the pixels related to a part of the line of the solid-state image sensor was not an output suitable for displaying on the full screen of the display device as it is.

[0183]

On the other hand, according to the invention described in Appendix (13), the same effect as that of the invention described in Appendix (6) is obtained, and the frame rate is (m / n) × (total number of lines) / k times. Alternatively, by having a mode used for the display device in addition to the mode for processing by improving (m / n) × (total number of lines) / {k × (number of blocks composed of k lines)} times, all It is possible to display an image related to the full screen by using the data obtained by thinning out the lines constituting the screen.

[0184]

(14) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of the lines are arranged side by side in the vertical direction, with one array of the pixels in the horizontal direction as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. A mode in which a pixel signal obtained by adding n (n ≧ 2, n is an integer) line for each m (m ≧ 3, m is an integer) line is taken out in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup apparatus comprising: a control means for selectively controlling the above.

[0185]

Conventionally, for example, when an interline type solid-state image sensor of 1 million pixel class is sequentially scanned and driven at 20 MHz or less, the number of frames obtained per unit time is 10 to 15 frames / second. For example, in the control that requires moving image data, there is a problem that the processing cannot be performed at high speed.

[0186]

On the other hand, according to the invention described in Appendix (14), the frame rate can be improved to m × (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read out.

Further, by adding n lines, data having a large dynamic range can be obtained as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0187]

(15) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of the lines are arranged side by side in the vertical direction, with one array of the pixels in the horizontal direction as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. In a mode in which n (n ≧ 2, n is an integer) line is added and extracted for each m (m ≧ 3, m is an integer) line, and in the vertical direction from the solid-state image sensor for recording a still image or processing a moving image. It is characterized by comprising a control means for selectively controlling a mode in which a pixel signal obtained by adding n lines for each m line is taken out in a partially continuous k (k ≧ 6, k is an integer) line. Electronic image sensor.

[0188]

Conventionally, there have been the same problems as those described in Appendix (14).

[0189]

On the other hand, according to the invention described in Appendix (15), the data obtained by thinning out the entire screen with the frame rate improved by m times and the vertical direction with the frame rate improved by m × (total number of lines) / k times. The data obtained by extracting a part of the continuous region of the above can be obtained as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0190]

(16) The additional note that the control means controls a mode in which a plurality of blocks are taken out from all the lines by using the k line as one block in order to record a still image or process a moving image. 14) Or the electronic imaging apparatus according to Appendix (15).

[0191]

Conventionally, there have been the same problems as those described in Appendix (14).

[0192]

On the other hand, according to the invention described in the appendix (16), the same effect as that of the invention described in the appendix (14) or the appendix (15) is obtained, and compared with the case where all the lines are sequentially scanned and read out. , The frame rate can be improved by m × (total number of lines) / {k × (number of blocks composed of k lines)} times.

[0193]

(17) The image data obtained by extracting a pixel signal obtained by adding n lines for each m line in the vertical direction in order to record a still image or process a moving image is characterized in that the color signal is line sequential data. The electronic imaging apparatus according to the appendix (14), the appendix (15), or the appendix (16).

[0194]

When the color filter of the solid-state image sensor is a line-sequential filter, there is a drawback that the color signals are mixed if the addition is simply performed.

[0195]

On the other hand, according to the invention described in the appendix (17), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and a color signal is obtained in line sequence. As a result, the required color signal can be obtained while maintaining the resolution.

[0196]

(18) The electronic image pickup device according to Appendix (14), Appendix (15), or Appendix (16), wherein the solid-state image pickup device is characterized in that the color filter is composed of a line-sequential filter. ..

[0197]

Conventionally, there have been the same problems as those described in Appendix (17).

[0198]

On the other hand, according to the invention described in the appendix (18), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and the output by sequential scanning and the m line are obtained. Color signals can be obtained in line sequence for each output.

[0199]

(19) The electronic imaging apparatus according to Appendix (14), Appendix (15), or Appendix (16), wherein the n lines to be added are configured by the same color filter.

[0200]

Conventionally, there have been the same problems as those described in Appendix (17).

[0201]

On the other hand, according to the invention described in the appendix (19), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and the color signal is not mixed. The influence of moire and the like can be reduced.

[0202]

(20) The n lines to be added are composed of the same color filter, and the color filter of the n lines to be added is different for each m line (14) and (15). , Or the electronic imaging apparatus according to Appendix (16).

[0203]

Conventionally, there have been the same problems as those described in Appendix (17).

[0204]

On the other hand, according to the invention described in the appendix (20), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and the lines are sequentially arranged for each m line. A color signal can be obtained.

[0205]

(21) The electronic imaging device according to Appendix (19), wherein m = 2α + 1 (α is a positive integer).

[0206]

Conventionally, there have been the same problems as those described in Appendix (17).

[0207]

On the other hand, according to the invention described in Appendix (21), the same effect as that of the invention described in Appendix (19) is obtained, and n lines are added for each m line which is an odd number of lines. When obtaining a line-sequential color signal for each m-line, the data of the line closest to the block of the adjacent m-line is used, so that false color is suppressed during simultaneous operation. can do.

[0208]

(22) Addendum (14), Addendum (15), or Addendum (16), wherein the signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information. The electronic imaging apparatus according to.

[0209]

In the past, the number of frames obtained per unit time was, for example, 10 to 15 frames / sec. Therefore, it takes time to control AF, AE, or AWB, and still image shooting is performed in a short time. I couldn't get in.

[0210]

On the other hand, according to the invention described in the appendix (22), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and the frame rate is m × (total). AF can be performed by increasing the number of lines) / k times or m × (total number of lines) / {k × (number of blocks composed of k lines)} times, further increasing the speed. Can be planned.

Further, only the pixel signal related to the area required for AF control can be obtained at high speed.

[0211]

(23) The signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information, and at that time, any one of AF, AE, or AWB control data is used as 1. The electronic imaging apparatus according to Appendix (14), Appendix (15), or Appendix (16), wherein the data is calculated one by one for each frame, and the data is calculated repeatedly in order.

[0212]

In the past, since the frame rate was slow, it was necessary to process AF, AE, and AWB in parallel at the same time, resulting in an increase in circuit scale.

[0213]

On the other hand, according to the invention described in the appendix (23), the same effect as that of the invention described in the appendix (14), the appendix (15), or the appendix (16) is obtained, and the AF, AE, or AWB has the same effect. By calculating the control data in order, it is possible to reduce the influence of flicker that may occur on each data.

[0214]

(24) The control means is used to display on a display device attached to the electronic image pickup device, to supply to a display device outside the electronic image pickup device, or as AE information or AWB information. In order to obtain a moving image processed signal, select a mode in which n lines are added for each m line in the vertical direction to extract a pixel signal, and a moving image processed signal is obtained for use as AF information or AE information. The electronic imaging apparatus according to Appendix (15), wherein a mode for extracting a pixel signal related to n lines in a partially continuous k line is selected for each m line in the vertical direction.

[0215]

The pixel signal output from only the pixels related to a part of the line of the solid-state image sensor was not an output suitable for displaying on the full screen of the display device as it is.

[0216]

On the other hand, according to the invention described in Appendix (24), the same effect as that of the invention described in Appendix (15) is obtained, and the frame rate is m × (total number of lines) / k times, or m × (Total number of lines) / {k × (number of blocks composed of k lines)} By having a mode used for the display device in addition to the mode for processing, the data obtained by thinning out the entire screen is used. , It becomes possible to display the image related to the full screen.

[0217]

(25) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional manner, and a plurality of the lines are arranged side by side in the vertical direction, with a horizontal arrangement of the pixels as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. Selectively control the mode in which the pixel signal obtained by adding all the q lines to each continuous q (q ≧ 3, q is an integer) line is taken out in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup apparatus comprising:

[0218]

Conventionally, for example, when an interline type solid-state image sensor of 1 million pixel class is sequentially scanned and driven at 20 MHz or less, the number of frames obtained per unit time is 10 to 15 frames / second. For example, in the control that requires moving image data, there is a problem that the processing cannot be performed at high speed.

[0219]

On the other hand, according to the invention described in Appendix (25), the frame rate can be improved to q × (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read out.

Further, by adding the q lines, data having a large dynamic range can be obtained as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0220]

(26) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of the lines are arranged side by side in the vertical direction, with one array of the pixels in the horizontal direction as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. A mode for extracting a pixel signal of n (n ≧ 1, n is an integer) line for each m (m ≧ 3, m is an integer) line, and a vertical direction from the solid-state image sensor for recording a still image or processing a moving image. Selectively control the mode in which the pixel signal obtained by adding all the q lines to each continuous q (q ≧ 3, q is an integer) line is taken out in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup apparatus comprising:

[0221]

Conventionally, there have been the same problems as those described in Appendix (25).

[0222]

On the other hand, according to the invention described in Appendix (26), the data obtained by thinning out the entire screen with the frame rate improved by m / n times and the frame rate as compared with the case where all the lines are sequentially scanned and read out. The data obtained by extracting a part of the continuous region in the vertical direction, which is improved by q × (total number of lines) / k times, can be obtained as the output of the solid-state image sensor.

Further, the data obtained by adding the data of different filter colors and the data not added can be obtained as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0223]

(27) Pixels that receive light and convert it into an electric signal are arranged in a two-dimensional manner, and a plurality of the lines are arranged side by side in the vertical direction, with a horizontal arrangement of the pixels as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the solid-state image sensor and the solid-state image sensor, and a vertical direction from the solid-state image sensor to record a still image or process a moving image. A mode in which n (n ≧ 2, n is an integer) line is added to each m (m ≧ 3, m is an integer) line to extract a pixel signal, and the solid-state image sensor for recording a still image or processing a moving image. Select a mode in which a pixel signal obtained by adding all the q lines to each continuous q (q ≧ 3, q is an integer) line in the vertical direction is extracted in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup apparatus comprising: a control means for controlling the image.

[0224]

Conventionally, there have been the same problems as those described in Appendix (25).

[0225]

On the other hand, according to the invention described in Appendix (27), the data obtained by thinning out the entire screen with the frame rate improved by m times and the vertical direction with the frame rate improved by q × (total number of lines) / k times. The data obtained by extracting a part of the continuous region of the above can be obtained as the output of the solid-state image sensor.

Further, the data obtained by adding the data of different filter colors and the data not added can be obtained as the output of the solid-state image sensor.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0226]

(28) The additional note that the control means controls a mode in which a plurality of blocks are taken out from all the lines by using the k line as one block in order to record a still image or process a moving image. 25), Appendix (26), or Electronic Imaging Device according to Appendix (27).

[0227]

Conventionally, there have been the same problems as those described in Appendix (25).

[0228]

On the other hand, according to the invention described in the appendix (28), the same effect as that of the invention described in the appendix (25), the appendix (26), or the appendix (27) is obtained, and all the lines are sequentially scanned. It is possible to improve the frame rate by q × (total number of lines) / {k × (number of blocks composed of k lines)} times as compared with the case of reading.

[0229]

(29) The electronic image pickup device according to the appendix (26), the appendix (27), or the appendix (28), wherein the solid-state image pickup device is characterized in that the color filter is composed of a line-sequential filter. ..

[0230]

Conventionally, when the color filter of the solid-state image sensor is a line-sequential filter, color signals may be mixed even if addition is simply performed.

[0231]

On the other hand, according to the invention described in the appendix (29), the same effect as that of the invention described in the appendix (26), the appendix (27), or the appendix (28) can be obtained, and a combination of color filters to be added can be obtained. , Can be different for each mode.

[0232]

(30) The electronic imaging apparatus according to Appendix (27), wherein the n lines to be added are configured by the same color filter.

[0233]

Conventionally, there have been the same problems as those described in Appendix (29).

[0234]

On the other hand, according to the invention described in Appendix (30), the same effect as that of the invention described in Appendix (27) can be obtained, and the influence of moire and the like can be reduced without mixing the color signals. ..

[0235]

(31) The addition (27), wherein the n lines to be added are composed of the same color filter, and the color filters of the n lines to be added are different for each m line. Electronic imaging device.

[0236]

Conventionally, there have been the same problems as those described in Appendix (29).

[0237]

On the other hand, according to the invention described in Appendix (31), the same effect as that of the invention described in Appendix (27) can be obtained, and a line-sequential color signal can be obtained for each m line.

[0238]

(32) The electronic imaging device according to Appendix (26), wherein m = 2α + 1 (α is a positive integer) and n = 1.

[0239]

Conventionally, there have been the same problems as those described in Appendix (29).

[0240]

On the other hand, according to the invention described in Appendix (32), the same effect as that of the invention described in Appendix (26) is obtained, and n = 1 line is read out for each m line which is an odd number of lines. When the color filter is a line-sequential filter, the line-sequential image signal can be obtained as it is.

[0241]

(33) The electronic imaging device according to Appendix (30), wherein m = 2α + 1 (α is a positive integer).

[0242]

Conventionally, there have been the same problems as those described in Appendix (29).

[0243]

On the other hand, according to the invention described in Appendix (33), the same effect as that of the invention described in Appendix (30) is obtained, and n lines are added for each m line which is an odd number of lines. When obtaining a line-sequential color signal for each m-line, the line data closest to the block of the adjacent m-line is used, so that false color is suppressed during simultaneous operation. be able to.

[0244]

(34) Addendum (25), Addendum (26), Addendum (27), characterized in that the signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information. Alternatively, the electronic imaging device according to Appendix (28).

[0245]

In the past, the number of frames obtained per unit time was, for example, 10 to 15 frames / sec. Therefore, it takes time to control AF, AE, or AWB, and still image shooting is performed in a short time. I couldn't get in.

[0246]

On the other hand, according to the invention described in the appendix (34), the same effect as that of the invention described in the appendix (25), the appendix (26), the appendix (27), or the appendix (28) is obtained, and the frame rate is obtained. AF, AE, or AWB can be performed by improving q × (total number of lines) / k times or q × (total number of lines) / {k × (number of blocks composed of k lines)} times. Therefore, it is possible to further increase the speed.

Further, only the pixel signal related to the area required for controlling AF, AE, and AWB can be obtained at high speed.

[0247]

(35) The signal processed by moving image in any of the above modes is used as AF information, AE information, or AWB information, and at that time, any one of AF, AE, or AWB control data is used as 1. The electronic according to the appendix (25), the appendix (26), the appendix (27), or the appendix (28), wherein the data is calculated one by one in a frame and the data is calculated repeatedly in order. Imaging device.

[0248]

In the past, since the frame rate was slow, it was necessary to process AF, AE, and AWB in parallel at the same time, resulting in an increase in circuit scale.

[0249]

On the other hand, according to the invention described in the appendix (35), the same effect as that of the invention described in the appendix (25), the appendix (26), the appendix (27), or the appendix (28) is obtained, and AF, By sequentially calculating the control data of AE or AWB, it is possible to reduce the influence of flicker that may occur in each data.

[0250]

(36) The control means is used to display on a display device attached to the electronic image pickup device, to supply to a display device outside the electronic image pickup device, or as AE information or AWB information. Therefore, when obtaining a video-processed signal, select a mode for extracting n-line pixel signals for each m-line in the vertical direction, and when obtaining a video-processed signal for use as AF information or AE information, The electronic image pickup apparatus according to Appendix (26), wherein a pixel signal obtained by adding all the q lines to each continuous q line in the vertical direction is extracted in a partially continuous k line.

[0251]

The pixel signal output from only the pixels related to a part of the line of the solid-state image sensor was not an output suitable for displaying on the full screen of the display device as it is.

[0252]

On the other hand, according to the invention described in Appendix (36), the same effect as that of the invention described in Appendix (26) is obtained, and the frame rate is q × (total number of lines) / k times, or q × (Total number of lines) / {k × (number of blocks composed of k lines)} By having a mode used for the display device in addition to the mode for processing, the data obtained by thinning out the entire screen is used. , It becomes possible to display the image related to the full screen.

[0253]

(37) The control means is used to display on a display device attached to the electronic image pickup device, to supply to a display device outside the electronic image pickup device, or as AE information or AWB information. In order to obtain a moving image processed signal, select a mode in which n lines are added for each m line in the vertical direction to extract a pixel signal, and a moving image processed signal is obtained for use as AF information or AE information. The electronic imaging apparatus according to the appendix (27), wherein a pixel signal obtained by adding all the q lines to each continuous q line in the vertical direction is taken out in a partially continuous k line.

[0254]

Conventionally, there have been the same problems as those described in Appendix (36).

[0255]

On the other hand, according to the invention described in Appendix (37), the same effect as that of the invention described in Appendix (27) is obtained, and the frame rate is q × (total number of lines) / k times, or q × (Total number of lines) / {k × (number of blocks composed of k lines)} By having a mode used for the display device in addition to the mode for processing, the data obtained by thinning out the entire screen is used. , It becomes possible to display the image related to the full screen.

[0256]

As described above, according to the electronic imaging apparatus of the present invention according to claim 1, the frame rate is (total number of lines) / k as compared with the case where all lines are sequentially scanned and read out. It can be improved twice.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0257]

According to the electronic imaging apparatus of the present invention according to claim 2, the frame rate is improved to (m / n) × (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read out. Can be done.

Further, by thinning out the lines, it is possible to obtain a pixel signal relating to a wider area without lowering the frame rate.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

[0258]

According to the electronic imaging apparatus of the present invention according to claim 3, the frame rate can be improved to m × (total number of lines) / k times as compared with the case where all lines are sequentially scanned and read out.

Further, by adding n lines, data having a large dynamic range can be obtained as the output of the solid-state image sensor.

Then, a pixel signal relating to a wider area can be obtained without lowering the frame rate.

In this way, the electronic image pickup device can obtain a large number of frames per unit time from the solid-state image pickup device without using a high drive frequency.

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CLAIMS JPH10210367A

1.

A solid-state image sensor in which pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of lines are arranged side by side in the vertical direction with a horizontal arrangement of the pixels as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the element and the solid-state image sensor, and a part in the vertical direction from the solid-state image sensor to record a still image or process a moving image. An electronic image pickup apparatus comprising: a control means for selectively controlling a mode for extracting a pixel signal related to a continuous k (k is a positive integer) line.

2.

A solid-state image sensor in which pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of the lines are arranged side by side in the vertical direction, with a row of the pixels in the horizontal direction as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the element and the solid-state image sensor, and m (m) in the vertical direction from the solid-state image sensor to record a still image or process a moving image. Selectively select a mode in which the pixel signal related to the n (n ≧ 1, n is an integer) line is extracted in a partially continuous k (k ≧ 6, k is an integer) line for each m ≧ 3, m is an integer) line. An electronic image pickup apparatus comprising: a control means for controlling.

3.

A solid-state image sensor in which pixels that receive light and convert it into an electric signal are arranged in a two-dimensional shape, and a plurality of lines are arranged side by side in the vertical direction with a horizontal arrangement of the pixels as a line. A mode in which pixel signals related to all pixels are taken out to record a still image by sequentially scanning the element and the solid-state image sensor, and m (m) in the vertical direction from the solid-state image sensor to record a still image or process a moving image. Selective mode to take out a pixel signal obtained by adding n (n ≧ 2, n is an integer) line for each line (m ≧ 3, m is an integer) in a partially continuous k (k ≧ 6, k is an integer) line. An electronic image pickup device comprising: and a control means for controlling the image.

Espacenet

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IMAGE PICKUP DEVICE

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- cooperative:

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Abstract of JP2000295531 (A)

PROBLEM TO BE SOLVED: To obtain an image pickup device from which a signal is read at a comparatively lower drive frequency in the case of picking up a moving picture even when an image pickup element employing multi-pixels and which can sufficiently be used for a recording purpose without deteriorating the quality of the picture picked up in a moving picture mode. SOLUTION: An image pickup element is provided with a light receiving section 1a, a vertical transfer section 1b, and a horizontal transfer section 1c. The vertical transfer section 1b mixes charge signals obtained by the upper and lower light receiving sections 1a adjacent to each other and provides an output of the result. The horizontal transfer section 1c mixes charge information sets of at least two upper/lower pixels adjacent to each other in the vertical direction that are transferred from the vertical transfer section 1b and provides an output of the result. Thus, a moving picture and a still picture with high quality can be obtained while reducing a drive frequency of the image pickup element.

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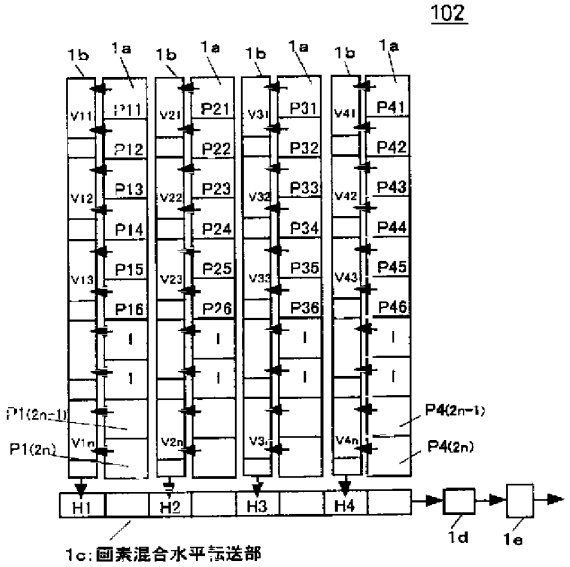
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(54)【発明の名称】　撮像装置

(57)【要約】
【課題】　多画素の撮像素子を使用する場合でも、動画像を撮影する際に比較的に低い駆動周波数で信号を読み出すことができ、しかも、動画モードで撮影された画像の画質も損なわず記録用としても十分に使用可能な撮像装置を提供する。
【解決手段】　撮像素子は、受光部１ａ、垂直転送部１ｂ、および水平転送部１ｃを備えており、垂直転送部１ｂは、垂直方向に互いに隣接した上下の受光部１ａで得られる電荷信号を混合して出力するものであり、かつ、水平転送部１ｃは、垂直転送部１ｂから転送されてくる垂直方向に互いに隣接する少なくとも上下２画素以上の電荷情報を混合して出力するものであって、これにより、撮像素子の駆動周波数を低減しつつ、動画および高画質の静止画像を得る。



【特許請求の範囲】
【請求項１】　光電変換用の各画素を水平方向および垂直方向に配列してなる受光部、この受光部で得られる電荷信号を垂直方向に転送する垂直転送部、およびこの垂直転送部からの電荷信号を水平方向に転送する水平転送部を備えてなる撮像素子を有する撮像装置において、
前記垂直転送部は、垂直方向に互いに隣接した上下の受光部で得られる電荷信号を混合して出力するものであり、かつ、水平転送部は、前記垂直転送部から転送されてくる垂直方向に互いに隣接する少なくとも上下２つ以上の電荷信号を混合して出力するものであることを特徴とする撮像装置。
【請求項２】　光電変換用の各画素を水平方向および垂直方向に配列してなる受光部、この受光部で得られる電荷信号を垂直方向に転送する垂直転送部、およびこの垂直転送部からの電荷信号を水平方向に転送する水平転送部を備えてなる撮像素子を有する撮像装置において、
前記垂直転送部は、各受光部で得られる電荷信号を順次個別に取り込んで垂直方向に転送するものであり、かつ、水平転送部は、垂直転送部で転送される垂直方向に互いに隣接する少なくとも上下３画素以上の電荷情報を混合するものであることを特徴とする撮像装置。
【請求項３】　請求項１または請求項２のいずれかに記載の撮像装置において、
前記垂直転送部における電荷情報の垂直方向の転送速度を高速化する電荷高速転送手段を有することを特徴とする撮像装置。
【請求項４】　請求項１ないし請求項３のいずれかに記載の撮像装置において、
前記水平転送部による混合画素数を可変制御する混合画素数制御手段を備えることを特徴とする撮像装置。
【請求項５】　請求項１ないし請求項４のいずれかに記載の撮像装置において、
手振れ量を検出する手振れ量検出回路、および電子的ズーム倍率を設定するズーム倍率設定回路の少なくとも一方を備えるとともに、
前記撮像素子を駆動する撮像素子駆動回路と、
前記手振れ量または前記ズーム倍率の少なくとも一方の情報に基づいて前記撮像素子駆動回路を制御する撮像素子駆動制御回路と、
を含むことを特徴とする撮像装置。
【請求項６】　請求項１ないし請求項５のいずれかに記載の撮像装置において、
前記受光部には、各画素の垂直方向に沿って同一の色フィルタ素子が配置されていることを特徴とする撮像装置。
【請求項７】　請求項６記載の撮像装置において、
前記色フィルタ素子は、原色フィルタまたは補色フィルタを含む縦ストライプ構成であることを特徴とする撮像装置。
【請求項８】　請求項７記載の撮像装置において、
前記縦ストライプ構成は、Ｒ・Ｇ・ＢまたはＹｅ・Ｇ・Ｍｇの構成であることを特徴とする撮像装置。
【請求項９】　請求項１ないし請求項５のいずれかに記載の撮像装置において、
前記撮像素子の前段には、被写体からの光を分解する色分解光学手段が配置されていることを特徴とする撮像装置。
【請求項１０】　請求項９記載の撮像装置において、
前記色分解光学手段は、被写体像をＲ・Ｇ・Ｂに分解するプリズムにより構成されることを特徴とする撮像装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、動画と静止画の両画像を撮影可能な撮像装置に係り、特には、多画素の撮像素子(以下、ＣＣＤという)で動画モードで画像を撮影する場合でも画質を損なうことなく、その駆動周波数を低く設定できるようにするための技術に関する。
【０００２】
【従来の技術】従来、動画と静止画の両画像を撮影可能な撮像装置として、たとえば、特開平９－３２７０２５号公報に記載されたものが知られている。
【０００３】この従来技術では、順次走査により全画素を独立に読み出すことができるＣＣＤを備えており、動画像を得るための動画モードにおいては、水平転送部で垂直２行間の信号を混合して擬似インターレースを行なう駆動により、２：１インターレースの動画の撮像を行う一方、静止画モードでは、垂直２行間の信号を混合せず、順次走査で各行ごとに独立に信号を読み出して高画質の静止画を撮像するようにしている。
【０００４】
【発明が解決しようとする課題】ところで、近年は、高解像度、手振れ補正等の要求から、ＣＣＤの画素数が増加する傾向にある。
【０００５】ＣＣＤの画素数が、たとえば、通常の７２０Ｈ×２４０Ｖ程度である場合には、動画モードで表示するときのＣＣＤの駆動周波数は、７２０Ｈ×２４０Ｖ×６０≒１３.５ＭＨｚとなり、特に問題はない。
【０００６】ところが、上記のようにＣＣＤの画素数が多くなる場合には、動画モードでの読み出し周波数が極めて高くなる。たとえば、有効画素数が１２８０Ｈ×９６０Ｖ≒１２３万のＣＣＤから６０フィールド/秒以上の動画レートを確保するために必要な駆動周波数は、有効画素だけの駆動を考えても、１２８０×４８０×６０＝３６.８６４ＭＨｚ(通常の約３倍の周波数)となり、ＣＣＤおよびアナログ回路の高周波特性の実現，信号処理回路の高周波数駆動による消費電力増加等が発生する。
【０００７】なお、静止画を表示する場合には、ＮＴＳＣ方式で動画を表示するときのような６０フィールド/

秒といった制約はなく、ＣＣＤの全画素の信号を２フィールド期間以上にわたって時間をかけて読み出しても問題ないので、ＣＣＤの画素数が多くなった場合でも、特にＣＣＤの駆動周波数に対する影響は少ない。

【０００８】動画モードでの画像表示に際して、多画素のＣＣＤの駆動周波数を下げる技術として、たとえば、特開平１０－１３６２４４号公報に記載されているように、垂直方向に３ライン毎に２ライン分の画素信号を間引いて１ライン分の画素信号だけを出力することで、６０枚/秒のフレームレートで画像を表示できるようにしたものがある。

【０００９】この場合の技術は、電子スチルカメラでの電子ビューファインダーへの表示を主目的としたものであって、画像の記録を目的とするものではないので、間引き処理により画質がある程度劣化していてもさほど問題にならない。

【００１０】しかし、動画モードの画像を記録することを目的とする場合には、画質が劣化しているために不十分である。

【００１１】本発明は、上記課題を解決するものであって、多画素のＣＣＤを用いて被写体を動画モードで撮影する場合においても、比較的に低い駆動周波数(例えば２５ＭＨz以下)で信号を読み出すことができ、しかも、動画モードで撮影された画像の画質も損なわず記録用としても十分に使用可能な撮像装置を提供することを課題とする。

【００１２】

【課題を解決するための手段】本発明の撮像装置は、この課題を解決するために、光電変換用の各画素を水平方向および垂直方向に配列してなる受光部、この受光部で得られる電荷信号を垂直方向に転送する垂直転送部、およびこの垂直転送部からの電荷信号を水平方向に転送する水平転送部を備えてなる撮像素子を有する撮像装置において、次のように構成している。

【００１３】第１の発明は、前記垂直転送部は、垂直方向に互いに隣接した上下の受光部で得られる電荷信号を混合して出力するものであり、かつ、水平転送部は、前記垂直転送部から転送されてくる垂直方向に互いに隣接する少なくとも上下２つ以上の電荷情報を混合して出力するものである。

【００１４】第２の発明は、垂直転送部は、各受光部で得られる電荷信号を順次個別に取り込んで垂直方向に転送するものであり、かつ、水平転送部は、垂直転送部で転送される垂直方向に互いに隣接する少なくとも上下３画素以上の電荷情報を混合するものである。

【００１５】第１および第２の発明によれば、多画素の撮像素子を使用する場合でも、動画像を撮影する際の撮像素子の駆動周波数を下げて低消費電力で駆動できるとともに、高画質の静止画像を得ることが可能である。

【００１６】第３の発明は、前記垂直転送部における電荷情報の垂直方向の転送速度を高速化する電荷高速転送手段を有する。

【００１７】第３の発明によれば、動画と同一画角の高画質な静止画像を得ることができる。

【００１８】第４の発明は、水平転送部による混合画素数を可変制御する混合画素数制御手段を備えている。

【００１９】第４の発明によれば、撮像素子の駆動周波数の低減および複数のテレビジョン方式への対応、また高感度撮影への対応を容易に行うことが可能である。

【００２０】第５の発明は、手振れ量を検出する手振れ量検出回路、および電子的ズーム倍率を設定するズーム倍率設定回路の少なくとも一方を備えるとともに、撮像素子を駆動する撮像素子駆動回路と、前記手振れ量または前記ズーム倍率の少なくとも一方の情報に基づいて前記撮像素子駆動回路を制御する撮像素子駆動制御回路とを含む。

【００２１】第５の発明によれば、撮像素子の駆動周波数の低減および手ぶれ補正または電子ズーム機能の実現が可能である。

【００２２】第６の発明は、第１の発明ないし第５の発明の内のいずれかの構成において、撮像素子の前段には、被写体からの光を分解する色分解光学手段が配置されている。

【００２３】この第６の発明によれば、撮像素子の駆動周波数の低減のみならず、水平および垂直方向に高解像度な信号を得ることが可能である。

【００２４】

【発明の実施の形態】以下、本発明の実施の形態について、図面を用いて説明する。

【００２５】(実施形態１)図１は、本発明の実施形態１に係る撮像装置のブロック図である。

【００２６】この実施形態１の撮像装置は、レンズ１０１、撮像素子(ＣＣＤ)１０２、撮像素子駆動回路１０３、アナログ信号処理回路１０４、アナログ・デジタル変換回路(以下、Ａ／Ｄと表記する)１０５、デジタル信号処理回路１０６、撮像素子駆動制御回路１０７、システム制御回路１０８を備える。

【００２７】この構成の撮像装置において、レンズ１０１を通過した被写体の画像がＣＣＤ１０２で撮像されて光電変換され、これにより得られる電荷信号が撮像素子駆動回路１０３の駆動によってアナログ信号処理回路１０４に出力される。

【００２８】この場合の撮像素子駆動回路１０３は、後述するように、チャージパルス、Ｖ転送パルスおよび高速転送パルス、Ｈ転送パルスをそれぞれ発生する。したがって、この回路１０３が特許請求の範囲における高速転送手段に対応している。

【００２９】アナログ信号処理回路１０４では、ノイズ除去、増幅等の処理を行い、Ａ／Ｄ１０５にてデジタル信号に変換される。デジタル信号処理回路１０６では輝

度信号等の映像信号を作成している。また、撮像素子駆動回路１０３は、撮像素子駆動制御回路１０７およびシステム制御回路１０８によって制御されている。

【００３０】図２は図１に示したＣＣＤ１０２の構成を示す説明図である。

【００３１】図２において、１aは受光部、１bは垂直転送部、１cは画素混合水平転送部、１dは電荷検出増幅器、１eは出力回路である。

【００３２】ここで、図２におけるＣＣＤ１０２では、テレビジョン信号における１フィールド期間(ＮＴＳＣ方式の場合、約６０分の１秒)内に、ＣＣＤ全ての画素に蓄積した電荷信号を読み出すために、垂直方向において互いに隣接した上下２画素の電荷信号を混合し、この混合のペアをフィールドごとに切り替えている(以下、インタレース読み出し駆動という)。

【００３３】すなわち、このインタレース読み出し駆動では、垂直方向に隣接する上下２画素(受光部１a)の電荷信号は、チャージパルスによって垂直転送部1bに移送される時に２画素混合される。例えば、ある１フィールド期間では、Ｖ１１にはＰ１１とＰ１２の電荷信号が混合し、Ｖ１２にはＰ１３とＰ１４の電荷信号が混合し、Ｖ１３にはＰ１５とＰ１６の電荷信号が混合する。次の１フィールド期間では、Ｖ１１にはＰ１２とＰ１３の電荷信号が混合し、Ｖ１２にはＰ１４とＰ１５の電荷信号が混合する。

【００３４】この電荷信号は垂直転送部１bから画素混合水平転送部1cまで転送される。従来、水平転送部は垂直転送部１bから転送されてきた１ライン分ごとの電荷信号を単に転送するだけであったが、この実施形態１の画素混合水平転送部１cでは、垂直転送部１bから転送されてくる垂直方向の隣接する上下２画素の電荷信号を加算混合するようにしている。

【００３５】例えば、２画素混合の場合には、Ｈ１にてＶ11とＶ１２の電荷信号が加算混合される。したがってＶ１１＝Ｐ１１＋Ｐ１２，Ｖ１２＝Ｐ１３＋Ｐ１４のときには、Ｈ１＝Ｖ１１＋Ｖ１２＝Ｐ１１＋Ｐ１２＋Ｐ１３＋Ｐ１４となり、また、Ｖ１１＝Ｐ１２＋Ｐ１３，Ｖ１２＝Ｐ１４＋Ｐ１５のときには、Ｈ１＝Ｖ１１＋Ｖ１２＝Ｐ１２＋Ｐ１３＋Ｐ１４＋Ｐ１５となる。この加算混合された電荷信号は、水平方向に転送され、電荷検出増幅器１d、出力回路１eを経て出力される。

【００３６】上記のように、垂直方向の画素の電荷信号が混合加算されることから、この実施形態１では、受光部１aには、各画素の垂直方向に沿って同一の色フィルタ素子(図示せず)が配置されている。この色フィルタ素子の構成としては、(Ｒ，Ｇ，Ｂ)の原色縦ストライプや、(Ｙｅ，Ｇ，Ｃｙ)の補色を含む縦ストライプ等が適用されるが、これに限るものでなく、Ｒ，Ｇ，Ｂへの色分離が可能であれば良い。

【００３７】図３は図２に示したＣＣＤ１０２の駆動タイミングの一例を示す説明図であって、同図(a)は前段フィールドの開始付近、同図(b)は後段フィールドの開始付近の駆動タイミングを示している。

【００３８】図３(a)，(b)において、垂直ＢＬＫはテレビジョン信号での垂直ブランキング信号、ＨＤ・ＶＤはテレビジョン信号での水平方向・垂直方向の基準信号、チャージパルス(ＣＨ)はＣＣＤ１０２の受光部１aに蓄積された電荷を垂直転送部１ｂに移送するための信号である。また、Ｖ転送パルスは、垂直転送部１ｂで垂直方向に電荷を転送するための信号である。特に、手振れ補正用として予めＣＣＤ１０２に確保されている実際の表示に寄与しない領域の画素に蓄積された電荷を破棄するために、Ｖ転送パルス内には、チャージパルス(ＣＨ)の前後に位置する箇所に高速転送パルスが挿入されている。Ｈ転送パルスは、垂直転送部１bから位相された電荷を画素混合水平転送部１cから水平方向に転送するための信号、撮像素子出力信号は転送パルス等によって読み出された出力信号を示している。

【００３９】次に、この駆動による撮像素子１０２の読み出し動作について説明する。

【００４０】図４は、ＣＣＤ１０２の画素領域と図３に示したＣＣＤ１０２に対する駆動タイミングとの関係を示す説明図である。

【００４１】図４において、ＣＣＤ１０２の全領域Ａ０の内、Ａ２の部分が実際の表示に寄与する領域、Ａ１，Ａ３の部分は垂直方向の手振れ補正を行うために確保された領域で、手振れの程度に応じて各領域Ａ１，Ａ３の大きさが互いに変更されるようになっている。ただし、Ａ１とＡ３の領域の総和は変わらない。

【００４２】ＣＣＤ１０２は、まず、高速転送(前半)期間の高速転送パルスの数によってＡ１領域からの電荷信号が高速に転送された後に、Ｖ転送パスルによってＡ２領域の正規の電荷信号が出力され、その後、高速転送(後半)期間の高速転送パルスの数によってＡ３領域からの電荷信号が高速に転送される。この場合、Ａ１，Ａ３の領域から高速転送される電荷信号は、表示には寄与せず破棄されることになる。

【００４３】いま、ＣＣＤ１０２の垂直方向の全画素数をＶ、Ａ１領域の垂直方向の画素数をＶ１、Ａ２領域の垂直方向の画素数をＶ２、Ａ３領域の垂直方向の画素数をＶ３とすると、インタレース読み出し駆動時においては、垂直転送部１bにおいて垂直方向の互いに隣接する２画素が互いに混合加算されるために、受光部１aから垂直転送部１bへ移送される時には、全体で(Ｖ/２)ライン分の信号となる。

【００４４】ここで、図３において、チャージパルスの出力後、高速転送パルスが(Ｖ１)／２個分だけ出力された後、次のＶ転送パルスが出力される時点からＡ２領域の電荷信号が正規信号として読み出される。このとき、図２で示したように、画素混合水平転送部１cにおい

て、垂直転送部１bの垂直方向で上下に隣接する２つの電荷信号が加算混合されて正規信号として出力される。その後、高速転送パルスが(Ｖ３)／２個分だけ出力されたときに、Ａ３領域の電荷信号が高速転送される。

【００４５】次に、このように構成された実施形態１の撮像装置において、ＣＣＤ１０２の有効画素数が１２８０Ｈ×１０２４Ｖの場合、必要とされる駆動周波数について具体的に検討する。

【００４６】いま、動画モードにおいて６０枚/秒のフレームレートで画像を表示することを想定し、ＣＣＤ１０２をインタレース読み出し駆動する場合、Ｖ1=３２、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝２、Ｖ３＝３２とすると、１フィールド期間にＣＣＤ１０２のＡ２領域(Ｖ２＝９６０画素)を２４０ラインの信号として出力することができ、この時の駆動周波数は、ＮＴＳＣ方式で有効画素だけの駆動を考えると、１２８０×２４０×６０＝１８.４ＭHzとなる。

【００４７】また、静止画モードで画像を表示することを想定し、ＣＣＤ１０２をインタレース読み出し駆動する場合、Ｖ1=0、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝１、Ｖ３＝0とすると、ＣＣＤ１０２の全領域の信号を５１２ラインの信号として読み出すことができ、この読み出しをＮＴＳＣ方式での２フィールド期間とすることにより、有効画素だけの駆動を考えると１２８０×５１２×３０＝１９.７ＭHzとなる。

【００４８】更に、静止画モードで画像を表示することを想定し、インタレース読み出し駆動の特別な読み出しとして、奇数ラインと偶数ラインの信号を受光部１aから別々に２回に分けて読み出す場合、Ｖ1=0，Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝１，Ｖ３＝0とすることにより、ＣＣＤ１０２の全領域の信号を１０２４ラインの信号として垂直方向の加算処理することなく読み出すことができ、この読み出しをＮＴＳＣ方式での４フィールド期間とすることにより、有効画素だけの駆動を考えると１２８０×１０２４×１５＝１９.７ＭHzとなる。

【００４９】言い換えれば、動画モードにおいては、約２０ＭＨｚの駆動周波数で６０枚/秒の画像を得ることができ、また、静止画モードにおいては、５１２ラインなら３０枚/秒、１０２４ラインなら１５枚/秒の画像を得ることが可能である。

【００５０】上記の各画像生成において、動画モードでは図４のＡ２領域で得られる電荷信号を用い、静止画モードでは、ＣＣＤの全領域Ａ１＋Ａ２＋Ａ３(有効画素数が１２８０Ｈ×１０２４Ｖ)からの電荷信号を用いる場合を示したが、この場合、動画像と静止画像とでは表示領域の大きさが異なるために、結果として、画角が変化することになる。

【００５１】そこで、動画モードで得られる動画像と静止画モードで得られる静止画像とが同じ画角になるように調整する必要性がある場合には、静止画モードでも動画モードの場合と同じくＡ２領域で得られた信号のみをＣＣＤ１０２から出力するようにする。

【００５２】すなわち、上記のＣＣＤ１０２をインタレース読み出し駆動し、Ｖ1=３２、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝１、Ｖ３＝３２とすることにより、ＣＣＤ１０２から４８０ラインの信号として読み出すことができる。この読み出しをＮＴＳＣ方式で２フィールド期間に割り当てることにより、有効画素だけの駆動を考えると、１２８０×４８０×３０＝１８.４ＭHzとなる。

【００５３】また、インタレース読み出し駆動の特別な読み出しとして奇数ラインと偶数ラインの信号を受光部１aから別々に２回に分けて読み出し、Ｖ1=３２、Ａ２領域での加算混合する電荷信号数＝１、Ｖ３＝３２とすることにより、ＣＣＤ１０２の中央のＡ２領域の信号を９６０ラインの信号として垂直方向の加算処理なく読み出すことができ、この読み出しをＮＴＳＣ方式での４フィールド期間に割り当てることにより、有効画素だけの駆動を考えると、１２８０×９６０×１５＝１８.４ＭHzとなる。

【００５４】この場合は、言い換えれば、約２０ＭＨｚの駆動周波数で、６０枚/秒の動画像と４８０ライン－３０枚/秒、および９６０ライン－１５枚/秒の静止画像を得ることが可能である。

【００５５】以上のように、この実施形態１では、インタレース読み出し駆動において、垂直転送部１bの電荷信号を画素混合水平転送部１cで垂直方向に加算する駆動を行うことにより、ＣＣＤ１０２が多画素の場合でも比較的低い駆動周波数でもって駆動して動画像を得ることができる。

【００５６】また、ＣＣＤ１０２の全領域の信号を用いて高画質な静止画像を得ることができ、更に、動画像と同一画角の高画質な静止画像をも得ることができ、従来と同じ周波数に対応したアナログ信号処理回路およびＡ／Ｄを用いて低消費電力でもって動画像および静止画像を作成することが可能となる。

【００５７】(実施形態２)図５は本発明の実施形態２に係るＣＣＤの構成を示す説明図である。

【００５８】図５において、１aは受光部、１bは垂直転送部、１cは画素混合水平転送部、１dは電荷検出増幅器、１eは出力回路である。

【００５９】ここで、図５におけるＣＣＤ１０２では、垂直転送部１bの段数を図２に示したＣＣＤの場合の段数の２倍にすることにより、順次走査によって１フレーム(１画面)分の画素の各電荷信号を混合することなく独立に読み出している(以下、全画素読み出し駆動という)。

【００６０】すなわち、この全画素読み出し駆動では、垂直方向に隣接する画素(受光部１a)の電荷信号はチャージパルスによって混合されることなく垂直転送部１bにそのまま移送され、垂直転送部１bから画素混合水平転送部１fまで転送される。

【００６１】また、従来、水平転送部は垂直転送部１bから転送されてきた１ライン分の電荷信号を単に転送するだけであったが、この実施形態２の画素混合水平転送部１cでは、垂直転送部１bから転送されてくる垂直方向の隣接する上下間の電荷信号を加算混合するようにしている。

【００６２】例えば、画素混合水平転送部１cが４画素混合を行う場合、Ｈ１ではＶ１p，Ｖ2p，Ｖ3p，Ｖ4pの各電荷信号、つまりＰ１１，Ｐ１２，Ｐ１３，Ｐ１４の４つの受光部の電荷信号が加算混合される。この加算混合された電荷信号は、水平方向に転送され、電荷検出増幅器１d、出力回路１eを経て撮像信号として出力する。

【００６３】その他の構成は、実施形態１の場合と同様であるから、ここでは詳しい説明は省略する。

【００６４】次に、この全画素読み出し駆動によるＣＣＤ１０２の読み出し動作を、実施形態１の場合と同じく、図４を用いて説明する。

【００６５】ＣＣＤ１０２は、まず、高速転送(前半)期間の高速転送パルスの数によってＡ１領域からの電荷信号が高速に転送された後に、Ｖ転送パスルによってＡ２領域の正規の電荷信号が出力され、その後、高速転送(後半)期間の高速転送パルスの数によってＡ３領域からの電荷信号が高速に転送される。この場合、Ａ１，Ａ３の領域から高速転送される電荷信号は、表示には寄与せず破棄されることになる。

【００６６】実施形態１の場合と同様に、いま、ＣＣＤ１０２の垂直方向の全画素数をＶ、Ａ１領域の垂直方向の画素数をＶ１、Ａ２領域の垂直方向の画素数をＶ２、Ａ３領域の垂直方向の画素数をＶ３とすると、全画素読み出し駆動時においては、垂直転送部１bでの垂直方向の２画素混合加算はないので、受光部１aから垂直転送部１bへ移送される時に全体でＶライン分の信号となる。

【００６７】ここで、チャージパルスの出力後、高速転送パルスがＶ１個分だけ出力された後、次のＶ転送パルスが出力される時点からＡ２領域の電荷信号が正規信号として読み出される。このとき、図５に示したように、画素混合水平転送部１cにおいて、垂直転送部１bの垂直方向で上下に隣接する４つの電荷信号が同時に加算混合されて正規信号として出力される。その後、高速転送パルスがＶ３個分だけ出力されたときに、Ａ３領域の電荷信号が高速転送される。

【００６８】次に、このように構成された実施形態２の撮像装置において、有効画素数が１２８０Ｈ×１０２４Ｖを有するＣＣＤについて、その駆動周波数について具体的に検討する。

【００６９】いま、動画モードで６０枚/秒のフレームレートで画像を表示することを想定し、ＣＣＤ１０２を全画素読み出し駆動する場合、Ｖ１=３２、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝４、Ｖ３＝３２とすると、１フィールド期間にＣＣＤのＡ２領域(Ｖ２＝９６０画素)を２４０ライン(＝９６０／４ライン)の信号として出力することができ、この時の駆動周波数は、ＮＴＳＣ方式で有効画素だけの駆動を考えると、１２８０×２４０×６０＝１８.４MHzとなる。

【００７０】また、静止画モードで画像を表示することを想定し、Ｖ１=０、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝１、Ｖ３＝０とすることにより、ＣＣＤ１０２の全領域の信号を１０２４ラインの信号として読み出すことができる。そして、この読み出しをＮＴＳＣ方式での４フィールド期間に割り当てることにより、有効画素だけの駆動を考えると、１２８０×１０２４×１５＝１９.７MHzとなる。

【００７１】言い換えれば、約２０ＭＨｚの駆動周波数では、６０枚/秒の動画像、１０２４ライン－１５枚/秒の静止画像を得ることが可能である。

【００７２】このように、ＣＣＤ１０２の画素混合水平転送部１cにおいて、Ａ２領域での電荷信号を混合加算することにより、動画モードにおいてもテレビジョン方式に合致した画像を得ることが可能であり、また、全画素読み出し駆動を複数のフィール期間にわたって行うことで、静止画像を得ることが可能である。

【００７３】なお、実施形態１の場合と同様、動画モードで得られる動画像と静止画モードで得られる静止画像とが同じ画角になるように調整する必要性がある場合には、静止画モードでも動画モードと同じくＡ２領域で得られた信号のみをＣＣＤ１０２から出力するようにする。

【００７４】すなわち、上記のＣＣＤ１０２を全画素読み出し駆動し、Ｖ１=３２、Ａ２領域で得られる電荷信号について画素混合水平転送部１cで加算混合する電荷信号数＝１，Ｖ３＝３２とすることにより、撮像素子の中央領域の信号を９６０ラインの信号として読み出すことができ、この読み出しをＮＴＳＣ方式での４フィールド期間とすることにより、有効画素だけの駆動を考えると１２８０×９６０×１５＝１８.４MHzとなる。

【００７５】この場合は、言い換えれば約２０ＭＨｚの駆動周波数で、６０枚/秒の動画像と９６０ライン－１５枚/秒の静止画像を得ることが可能である。

【００７６】以上のように、この実施の形態２の場合も、全画素読み出し駆動において、垂直転送部１bの電荷信号を画素混合水平転送部１cで垂直方向に加算する

駆動を行うことにより、実施形態１と同様、ＣＣＤ１０２が多画素の場合でも、比較的低い駆動周波数でもって動画像を得ることができる。

【００７７】また、ＣＣＤ１０２の全領域の信号を用いて高画質な静止画像を得ることができ、更に、動画像と同一画角の高画質な静止画像をも得ることができ、従来と同じ周波数に対応たアナログ信号処理回路およびＡ／Ｄを用いて低消費電力でもって動画像および静止画像を作成することが可能となる。

【００７８】(実施形態３)図６は、本発明の実施形態３に係る撮像装置のブロック図であり、図１に示した実施形態１の構成と対応する部分には同一の符号を付す。

【００７９】この実施形態２の撮像装置の特徴は、画素混合水平転送部１cにおいて垂直転送部１bの垂直方向で上下に隣接する電荷信号を加算混合する数を任意に設定することができる混合画素数設定回路１０９を設けたことである。

【００８０】また、この実施形態３のＣＣＤ１０２としては、図２に示したインタレース読み出し駆動方式のものだけでなく、図５に示した実施形態２における全画素読み出し駆動方式のものを使用することができる。

【００８１】その他の構成は、実施形態１の場合と同じであるから、ここでは詳しい説明は省略する。

【００８２】図７(a)～(d)は、ＣＣＤ１０２の一例として、図５に示した全画素読み出し駆動方式のＣＣＤ１０２を用いた場合の画素混合の説明図であり、混合画素数設定回路１０９で設定した混合画素数に対応する各動作を示している。

【００８３】図７において、受光部１aに蓄積された電荷は、独立に垂直転送部１bに移送され混合画素数設定回路１０９で設定した混合画素数に応じて画素混合水平転送部１cにて電荷が加算される。

【００８４】このように構成された実施形態３における撮像装置においては、混合画素数設定回路１０９によって設定された画素数に対応して、システム制御回路１０８は撮像素子駆動制御回路１０７を通じて撮像素子駆動回路１０３を制御し必要な撮像素子１０２への駆動を行う。

【００８５】この時、ＣＣＤ１０２においては、図７(a)～(d)にそれぞれ示すように、画素混合水平転送部１cにおいて、混合画素数設定回路１０９で設定された画素数だけ混合加算される。

【００８６】ここで、ＣＣＤ１０２が全画素読み出し駆動方式のもので、有効画素数が１２８０Ｈ×９６０Ｖとすると、まず、(a)２画素混合＋高速転送無し(Ｖ１＋Ｖ３＝０)の設定により、４８０ラインの出力信号となり、６０枚／秒のフレーム画像(ＮＴＳＣ方式)を得ることができる。また、(b)３画素混合＋高速転送(Ｖ１＋Ｖ３＝９０)の設定により、２９０ラインの出力信号となり、５０枚／秒のフィールド画像(ＰＡＬ方式)を得ることができる。(c)４画素混合＋高速転送無し(Ｖ１＋Ｖ３＝０)の設定により、２４０ラインの出力信号となり、６０枚／秒のフィールド画像(ＮＴＳＣ方式)を得ることができる。

【００８７】このように、混合画素数の設定とこれに対応した高速転送設定により、同一の撮像素子から６０フレーム画像(ＮＴＳＣ方式)、５０フィールド画像(ＰＡＬ方式)、高感度タイプ(４画素Mix方式)の６０フィールド画像(ＮＴＳＣ方式)の各撮像信号を得ることが可能である。

【００８８】また、ＣＣＤ１０２を全画素読み出し駆動方式のもので、有効画素数が１６００Ｈ×１２００Ｖにすると、まず、(a)２画素混合＋高速転送(Ｖ１＋Ｖ３＝４０)の設定により、５８０ラインの出力信号となり、５０枚／秒のフレーム画像(ＰＡＬ方式)を得ることができる。(c)４画素混合＋高速転送(Ｖ１＋Ｖ３＝４０)の設定により、２９０ラインの出力信号となり、５０枚／秒のフィールド画像(ＰＡＬ方式)を得ることができる。(d)５画素混合＋高速転送無し(Ｖ１＋Ｖ３＝０)の設定により、２４０ラインの出力信号となり、６０枚／秒のフィールド画像(ＮＴＳＣ方式)を得ることができる。

【００８９】このように、混合画素数設定とこれに対応した高速転送設定により、同一の撮像素子から５０フレーム画像(ＰＡＬ方式)、高感度タイプ(４画素Mix方式)の５０フィールド画像(ＰＡＬ方式)、高感度タイプ(５画素Mix方式)の６０フィールド画像(ＮＴＳＣ方式)の撮像信号をそれぞれ得ることが可能である。

【００９０】以上のように、この実施の形態３では、混合画素数設定回路１０９で混合画素数を可変するとともに、これに対応した高速転送設定を行うにより、同一のＣＣＤ１０２を用いた撮像装置において、ＮＴＳＣ，ＰＡＬ等の各種のテレビジョン方式への対応することができ、高感度撮影への対応を容易に行うことが可能になる。

【００９１】(実施形態４)図８は、本発明の実施形態４に係る撮像装置のブロック図であり、図１に示した実施形態１の構成と対応する部分には同一の符号を付す。

【００９２】この実施形態４では、図１に示した実施形態１の構成に対して、手振れ量検出回路１１１、クロック変換回路１１２、動き補正回路１１３、および動き補正制御回路１１４がさらに設けられている。

【００９３】上記の手ぶれ量検出回路１１１としては、映像検出方式つまり映像信号の一定期間内の移動量の検出、または、センサ検出方式つまり角速度センサ等による機器そのものの動きの検出等がある。また、クロック変換回路１１２は、ＣＣＤ１０２の出力信号に対するデジタル信号処理の周波数とテレビジョン信号の出力フォーマットに合致した信号の出力周波数とが異なるために、それぞれの整合をとるために設けられている。

【００９４】その他の構成は実施形態１の場合と同様で

ある。

【００９５】なお、この実施形態４においても、ＣＣＤ１０２としては、図２に示した実施形態１のインタレース読み出し駆動方式のものだけでなく、図５に示した実施形態２の全画素読み出し駆動方式のものを使用することができる。

【００９６】この実施形態４における撮像装置においては、撮像素子駆動制御回路１０７に制御される撮像素子駆動回路１０３の駆動により、ＣＣＤ１０２が光電変換を行い撮像信号を生成する。以下、アナログ信号処理回路１０４ではノイズ除去、増幅等の処理を行い、Ａ／Ｄ１０５にてデジタル信号に変換され、デジタル信号処理回路１０６では輝度信号等の映像信号を作成している。

【００９７】ここで、撮像素子駆動回路１０３、撮像素子駆動制御回路１０７、Ａ／Ｄ１０５、デジタル信号処理回路１０６の基準クロックはfck１である。

【００９８】デジタル信号処理回路１０６の出力信号は、クロック変換回路１１２においてクロック変換され、基準クロックがfck２のデジタル信号となる。また、クロック変換回路１１２の出力信号は動き補正回路１１３に入力される。

【００９９】ここで、動き補正回路１１３、動き補正制御回路１１４の基準クロックはfck２である。

【０１００】システム制御回路１０８は上記撮像素子駆動制御回路１０７、動き補正制御回路１１４をコントロールしている。ここで、手ぶれ量検出回路１１１が検出した動きデータは、システム制御回路１０８に入力され、システム制御回路１０８が撮像素子駆動制御回路１０７および動き補正制御回路１１４を制御することによって手振れ補正を行う。

【０１０１】次に、ＣＣＤ１０２、撮像素子駆動回路１０３の動作について、図９および図１０を用いて説明する。

【０１０２】図９はＣＣＤ１０２の画素領域を示す説明図である。ここでは、ＣＣＤ１０２の全画素領域Ａ０がm_0画素×n_0ラインで構成され、また、この全画素領域Ａ０内には、それよりも小さい一つの信号切り出し領域Ａ４が確保され、その信号切り出し領域Ａ４は、m_1画素×n_1ライン($m_1 < m_0$，$n_1 < n_0$)で構成されているものとする。なお、信号切り出し領域Ａ４の位置は、固定されたものではなく、手振れの方向と量に応じて変位される。

【０１０３】図１０に示すように、まず、撮像素子駆動回路１０３による高速掃き出し処理により、全画素領域Ａ０(m_0画素×n_0ライン)の内から(m_0画素×n_1ライン)の領域の信号のみが読み出され、次に、この(m_0画素×n_1ライン)の領域の電荷信号は、デジタル信号処理部１０６において、(m_1画素×n_1ライン)の領域の信号が切り出され、その後、クロック変換を行って最終的な表示形態に適合した(m_2画素×n_1ライン)のデータとなる。

【０１０４】ここで、手ぶれ量検出回路１１１で検出した動き検出データに基づいて、垂直方向の動きをキャンセルするように全画素領域Ａ０内から必要なＣＣＤ読み出し領域(m_0画素×n_1ライン)の位置が決定され、水平方向の動きをキャンセルするように信号切り出し領域Ａ４(m_1画素×n_1ライン)の位置が設定される。

【０１０５】これは、例えばＣＣＤ１０２のアスペクト比(縦横比)がテレビジョン信号と同じ４：３の場合、ＣＣＤ１０２からの読み出し時に垂直方向にn_1/n_0の比でもって切り出されるので、デジタル信号処理部１０６において、水平方向にも同様にn_1/n_0の比で切り出す必要があるためである。したがって、信号切り出し領域Ａ４(m_1画素×n_1ライン)の水平方向の画素数m_1と切り出し前の水平方向の画素数m_0との比m_1/m_0は、$m_1/m_0 = n_1/n_0$の関係を満たしている。

【０１０６】続いて、この信号切り出し領域Ａ４の信号をテレビジョン信号の出力フォーマットに合致した表示領域Ａ５(m_2画素×n_1ライン)となるように、データ読み出しのクロック周波数をクロック変換回路１１２において変換している。

【０１０７】図１１は動き補正回路１１３の具体的な構成を示すブロック図である。

【０１０８】この動き補正回路１１３は、フィールドメモリ４０１、メモリ制御回路４０２、補間回路４０３、補間制御回路４０４から構成されている。

【０１０９】この動き補正回路１１３は、入力信号がメモリ制御回路４０２によってフィールドメモリ４０１に書き込まれ(図１２の場合のＳ１１～Ｓ６８)、必要な領域の信号(図１２の場合のＳ２２～Ｓ５７)が読み出される。この読み出された信号は、補間回路４０３によって水平補間処理および垂直補間処理を施される。この補間回路４０３では、補間制御回路４０４によって画素間の内挿処理を行う。この画素間の内挿処理の動作を図１２に併記している。

【０１１０】図１２に示すように、画素間内挿は映像信号の空間的位置の１画素以下の移動であり、フィールドメモリ４０１の読み出しによる画素単位位置制御と画素間内挿による画素内位置制御により手振れ補正を行う。

【０１１１】以上のように、この実施の形態４では、手ぶれ量検出回路１１１による手ぶれ量に応じてＣＣＤ１０２の垂直転送部１bの高速転送設定により手ぶれ成分をキャンセルし、さらに、画素混合水平転送部１cにおいて垂直転送部１bの電荷信号を垂直方向に混合加算する駆動を行うことにより、ＣＣＤ１０２が多画素の場合でも比較的低い駆動周波数で動画像を得ることができ、また、ＣＣＤ１０２の全領域の信号を用いて高画質な静止画像を得ることがができる。

【０１１２】(実施形態５)図１３は、本発明の実施形態５に係る撮像装置のブロック図であり、図８に示した実施形態４の構成と対応する部分には同一の符号を付す。

【０１１３】この実施形態５では、図８に示した実施形態４の構成に対して、電子ズーム倍率設定回路１１５をさらに設けている。この電子ズーム倍率設定回路１１５を設けた関係上、動き補正回路１１６は動き補正のみならず、補間演算も行えるようになっており、その場合の動き補正回路１１６の構成例としては、実施形態４の図１１と同様のブロック図が考えられる。また、動き補正制御回路１１７も動き補正回路１１６の動き補正の制御のみならず、補間動作も制御できるようになっている。

【０１１４】その他の構成は図８に示した実施形態４の場合と同様である。

【０１１５】なお、この実施形態５においても、ＣＣＤ１０２としては、図２に示した実施形態１のインタレース読み出し駆動方式のものだけでなく、図５に示した実施形態２の全画素読み出し駆動方式のものを使用することができる。

【０１１６】この実施形態５における撮像装置において、撮像素子駆動回路１０３、撮像素子駆動制御回路１０７、Ａ／Ｄ１０５、デジタル信号処理回路１０６の基準クロックはfck１である。

【０１１７】次に、デジタル信号処理回路１０６の出力信号は、クロック変換回路１１２においてクロック変換され、基準クロックがfck２のデジタル信号となる。また、クロック変換回路１１２からの出力信号は、動き補正回路１１６に入力される。ここで、動き補正回路１１６、動き補正制御回路１１７の基準クロックはfck２である。

【０１１８】また、システム制御回路１０８は、上記撮像素子駆動制御回路１０７、動き補正制御回路１１７をコントロールしている。手ぶれ量検出回路１１１が検出した動きデータと電子ズーム倍率設定回路１１５で設定された電子ズーム倍率とは、共にシステム制御回路１０８に入力され、これに応じてシステム制御回路１０８が撮像素子駆動制御回路１０７および動き補正制御回路１１７を制御することによって手振れ補正のみならず、電子ズーム処理（補間拡大処理）を行う。

【０１１９】次に、撮像素子１０２、撮像素子駆動回路１０３の動作について、図１４を用いて説明する。

【０１２０】ＣＣＤ１０２の全領域は（m_0画素×n_0ライン）で構成され、手振れ補正のための余裕領域を有している。ここで、撮像素子駆動回路１０３による高速掃き出し処理により、（m_0画素×n_2ライン）（$n_2 < n_0$）の領域の信号が読み出され、次に、この（m_0画素×n_2ライン）の領域の撮像信号はデジタル信号処理部１０６において（m_3画素×n_2ライン）（$m_3 < m_0$）の領域の信号が切り出され、その後、クロック変換回路１１２よるクロック変換および動き補正回路１１６により補間演算による拡大処理を行って（m_2画素×n_1ライン）（$m_2 > m_3$，$n_1 > n_2$）のデータの信号となる。

【０１２１】ここで、手ぶれ量検出回路１１１で検出した動き検出データおよび電子ズーム倍率設定回路１１５で設定した電子ズーム倍率に基づいて、垂直方向の動きを抑制してズーム倍率に一致するように、ＣＣＤ読み出し領域Ａ２（m_0画素×n_2ライン）の位置が設定され、水平方向の動きを抑制してズーム倍率に一致するように信号切り出し領域Ａ４（m_3画素×n_2ライン）の位置が設定される。

【０１２２】この場合も、実施形態４の場合と同様、アペクト比（縦横比）がテレビジョン信号と同じになるように、$n_2 / n_0 = m_3 / m_0$の関係を有する。

【０１２３】続いて、この切り出し領域Ａ４の信号をテレビジョン信号の出力フォーマットに合致した表示領域Ａ５（m_2画素×n_1ライン）となるように、データ読み出しのクロック周波数をクロック変換回路１１２において変換し、さらに、動き補正回路１１６において所定の垂直および水平の大きさに画像を拡大している。

【０１２４】上記の動き補正回路１１６における電子ズーム処理（補間拡大処理）としては、図１１に示すように、メモリ制御回路４０２によってフィールドメモリ４０１に書き込まれ、必要な領域の信号が読み出される。この読み出された信号は、補間回路４０３によって水平補間拡大処理および垂直補間拡大処理を施される。この補間回路４０３では補間制御回路４０４によって画素間の内挿処理を含む拡大処理を行う。

【０１２５】以上のように、この実施の形態５では、手ぶれ量検出回路１１１による手ぶれ量および電子ズーム倍率設定回路１１５で設定された電子ズーム倍率に応じて、手ぶれ成分を抑制するとともに、ズーム倍率に合致した切り出し領域を決定することができる。しかも、上記の各実施形態１～４と同様、垂直転送部１bの電荷信号を画素混合水平転送部１cにおいて垂直方向に加算する駆動を行うことにより、比較的低い駆動周波数で多画素のＣＣＤ１０２から動画像を得ることができ、またＣＣＤ１０２の全領域の信号を用いて高画質な静止画像を得ることがができる。

【０１２６】なお、この実施形態５においては、手ぶれ補正と電子ズームの両機能を有する場合を示したが、電子ズーム単独機能の場合においても、同様の効果を得ることが可能である。

【０１２７】（実施形態６）図１５は、本発明の実施形態６に係る撮像装置のブロック図である。

【０１２８】この実施形態６の撮像装置は、光電変換機能を有する撮像素子部２０１、撮像素子部２０１に備わる水平画素ずらし部２０２、撮像素子部２０１に対する撮像素子駆動回路２０３、撮像素子駆動回路２０３を制御する駆動制御回路２０４、撮像素子部２０１の出力信号にサンプリング，増幅等の処理を行うアナログ信号処理回路２０５、アナログ信号処理回路２０５の出力信号に対するＡ/Ｄ２０６、Ａ/Ｄ変換されたディジタル信号から輝度信号や色信号，色差信号などの生成またはＲＧ

Ｂ信号処理を行うディジタル信号処理回路２０７、ディジタル信号処理回路２０７に備わる水平画素ずらし処理回路２０８、駆動制御回路２０４およびディジタル信号処理回路２０７を総合的に制御するシステム制御回路２０９を含んで構成されている。

【０１２９】以上のように構成されたこの実施形態６の撮像装置について説明する。

【０１３０】撮像素子部２０１は、プリズム等の光学素子と複数のＣＣＤを含んで構成されており、撮像素子部２０１において水平画素ずらし部２０２を経て出力されるＲ，Ｇ，Ｂの複数の出力信号はアナログ信号処理回路２０５およびＡ/Ｄ変換回路２０６を経てディジタル信号となる。このディジタル信号は、ディジタル信号処理回路２０７において、水平画素ずらし処理回路２０８を経て輝度信号処理および色信号処理され輝度信号(Ｙ１)と色信号(Ｃ１)が出力される。

【０１３１】以下、３ＣＣＤ信号処理特有の水平画素ずらし処理について説明する。

【０１３２】まず、水平画素ずらし部を備えた撮像素子部２０１について図１６を用いて説明する。

【０１３３】撮像素子部２０１が３ＣＣＤ構成の場合には、水平画素ずらし部無しの撮像素子部が図１６(a)に示すように、Ｇ・Ｒ・Ｂ－ＣＣＤを空間的に水平方向に対して同一位置に配置しているのに対し、水平画素ずらし部２０２を備えた撮像素子部２０１は、図１６(b)に示すように、Ｇ－ＣＣＤに対しＲ・Ｂ－ＣＣＤを空間的に水平方向に対して１／２画素分ずらして配置している。これにより、輝度信号を得るときにＧ信号と他の信号を等量加算することで折り返し成分を除去して高解像度を得るものである。また、水平画素ずらし部２０２を備えた撮像素子部２０１の他の構成例として、撮像素子部２０１が４ＣＣＤ構成（Ｇ１，Ｇ２，Ｒ，Ｂ－ＣＣＤ）等があり、この場合はＧ１－ＣＣＤとＧ２－ＣＣＤを空間的に１／２画素分ずらして配置している。

【０１３４】次に、水平画素ずらし処理回路２０８の動作について図１７を用いて説明する。

【０１３５】撮像素子部２０１が３ＣＣＤ構成の水平画素ずらし有りの方式では、ＣＣＤの駆動周波数がfckの場合、ＣＣＤに備わる光学フィルターは周波数がfck以上のところを落とすようにしている。それによって高解像度が得られるが、Ｒ，Ｇ，Ｂの各々で考えると折り返し(モアレ)が生じることになる。

【０１３６】しかし、この水平画素ずらしによって、Ｒ，Ｂのモアレ成分はＧのモアレ成分に対して位相が反転しているので、信号処理の演算でＲ，Ｇ，Ｂを足し合わせることでこのモアレが略除去されるのである(ただし、モアレは完全になくならずある程度残る)。ただし、Ｒ，Ｇ，ＢそれぞれのＣＣＤを駆動する回路が同一である場合が多く、実際にＣＣＤから取り出される信号の時間的な位置は図１７のＲＢ信号とＧ信号のようなタイミングになる。したがって、Ｇ信号の空間的な位置を復元するために、Ｇ信号を１Ｔ(Ｔ：２fckレート)遅らせた後、次の(１)式に示すＹマトリクス演算を行っている。

【０１３７】

$$Y=0.299R+0.587G+0.114B \qquad (1)$$

このように、３ＣＣＤ構成の撮像装置においては、水平画素ずらし部２０２および水平画素ずらし処理回路２０８を備えることで輝度信号の高解像度化を実現、言い換えれば同一の水平解像度を得るために必要な撮像素子の画素数および駆動周波数の低減化を実現している。本発明の実施形態６の撮像装置においては、この水平画素ずらし部２０２が実施形態１に示した撮像素子で構成されている。以下水平画素ずらし部２０２の動作を説明する。

【０１３８】ここで撮像素子は実施形態１で示したように垂直転送部の高速転送駆動と垂直転送部の電荷信号を垂直方向に加算する駆動を行うことができる。これにより、例えば、１２８０Ｈ×１０２４Ｖの撮像素子をインタレース読み出し駆動を行う場合、Ｖ１=３２、Ｖ２領域について画素混合水平転送部１ｃで加算混合する電荷信号数＝２、Ｖ３＝３２とすると、１フィールド期間に撮像素子の中央部の９６０画素の領域を２４０ラインの信号として出力することができ、この時の駆動周波数はＮＴＳＣ方式で有効画素だけの駆動を考えると、１２８０×２４０×６０＝１８.４MHzとなる。さらに、この場合の水平解像度は水平画素ずらし処理回路２０８の処理により１２８０画素の約１.５倍の１９２０画素相当の解像度を有する。

【０１３９】以上のように、この実施の形態６では、垂直転送部の高速転送駆動と垂直転送部の電荷信号を垂直方向に加算する駆動を行うことにより比較的低い駆動周波数で高画素の撮像素子から動画像を得、また水平画素ずらし処理を行うことにより輝度信号の水平方向の高解像度化を実現できる。言い換えれば、同一の水平解像度を得るために必要な撮像素子の画素数および駆動周波数の低減化を実現している。さらに、高速転送駆動段数の制御により手ぶれ補正を行うことが可能である。また、撮像素子の全領域の信号を用いて高画質な静止画像を得ることがができ、更に動画像と同一画角の高画質な静止画像をも得ることが可能である。

【０１４０】なお、この実施形態６においては水平画素ずらし処理を有する３ＣＣＤ構成の撮像装置について説明したが、水平画素ずらし処理を有しない３ＣＣＤ構成の撮像装置においても同様に比較的低い駆動周波数で高画素の撮像素子から動画像を得、さらに、高速転送駆動段数の制御により手ぶれ補正を行うことが可能である。また、ＣＣＤの全領域の信号を用いて高画質な静止画像

を得ることがができ、更に、動画像と同一画角の高画質な静止画像をも得ることが可能である。

【０１４１】以上のように、この実施の形態６では、垂直転送部の高速転送駆動と垂直転送部の電荷信号を垂直方向に加算する駆動を行うことにより比較的低い駆動周波数で高画素の撮像素子から動画像を得、また水平画素ずらし処理を行うことにより輝度信号の水平方向の高解像度化を実現できる。言い換えれば、同一の水平解像度を得るために必要な撮像素子の画素数および駆動周波数の低減化を実現している。さらに、高速転送駆動段数の制御により手ぶれ補正を行うことが可能である。また、撮像素子の全領域の信号を用いて高画質な静止画像を得ることがができ、更に動画像と同一画角の高画質な静止画像をも得ることが可能である。

【０１４２】なお、この実施形態６においては水平画素ずらし処理を有する３ＣＣＤ構成の撮像装置について説明したが、水平画素ずらし処理を有しない３ＣＣＤ構成の撮像装置においても同様に比較的低い駆動周波数で高画素の撮像素子から動画像を得、さらに、高速転送駆動段数の制御により手ぶれ補正を行うことが可能である。また、ＣＣＤの全領域の信号を用いて高画質な静止画像を得ることがができ、更に、動画像と同一画角の高画質な静止画像をも得ることが可能である。

【０１４３】

【発明の効果】本発明では、次の効果が得られる。

【０１４４】(１)　第１および第２の発明によれば、多画素の撮像素子を使用する場合であっても、その駆動周波数を下げて低消費電力で駆動できるとともに、撮像素子の全領域の信号を用いれば高画質の静止画像を得ることが可能である。

【０１４５】(２)　第３の発明によれば、上記(１)の効果に加えて、さらに、動画像と同一画角の高画質な静止画像をも得ることができる。

【０１４６】(３)　第４の発明によれば、上記(１)，(２)の効果に加えて、撮像素子の駆動周波数の低減および複数のテレビジョン方式への対応、また高感度撮影への対応を容易に行うことが可能である。

【０１４７】(４)　第５の発明によれば、上記(１)～(３)の効果に加えて、撮像素子の駆動周波数の低減および手ぶれ補正または電子ズーム機能の実現が可能である。

【０１４８】(５)　この第６の発明によれば、上記(１)～(４)の効果に加えて、撮像素子の駆動周波数の低減のみならず、水平および垂直方向に高解像度な信号を得ることが可能である。

【図面の簡単な説明】

【図１】本発明の実施形態１における撮像装置のブロック図

【図２】図１の撮像装置における撮像素子の構成を示すブロック図

【図３】図２に示す撮像素子の駆動信号の関係を示すタイミングチャート

【図４】図２に示す撮像素子の読み出し信号領域の説明図

【図５】本発明の実施形態２に係る撮像装置の撮像素子の構成を示す説明図

【図６】本発明の実施の形態３における撮像装置のブロック図

【図７】図６に示した撮像素子の画素混合の説明図

【図８】本発明の実施形態４における撮像装置のブロック図

【図９】図８に示した撮像素子において手振れ補正のために全画素領域内に信号切り出し領域を確保した場合の説明図

【図１０】図８の撮像装置における撮像素子からの信号の読み出し動作を示す説明図

【図１１】図８の撮像装置における動き補正回路の具体的な構成例を示すブロック図

【図１２】図１１に示した動き補正回路の動作例を示す説明図

【図１３】本発明の実施形態５における撮像装置のブロック図

【図１４】図１３の撮像装置における撮像素子から信号の読み出し動作を示す説明図

【図１５】本発明の実施形態６における撮像装置の構成を示すブロック図

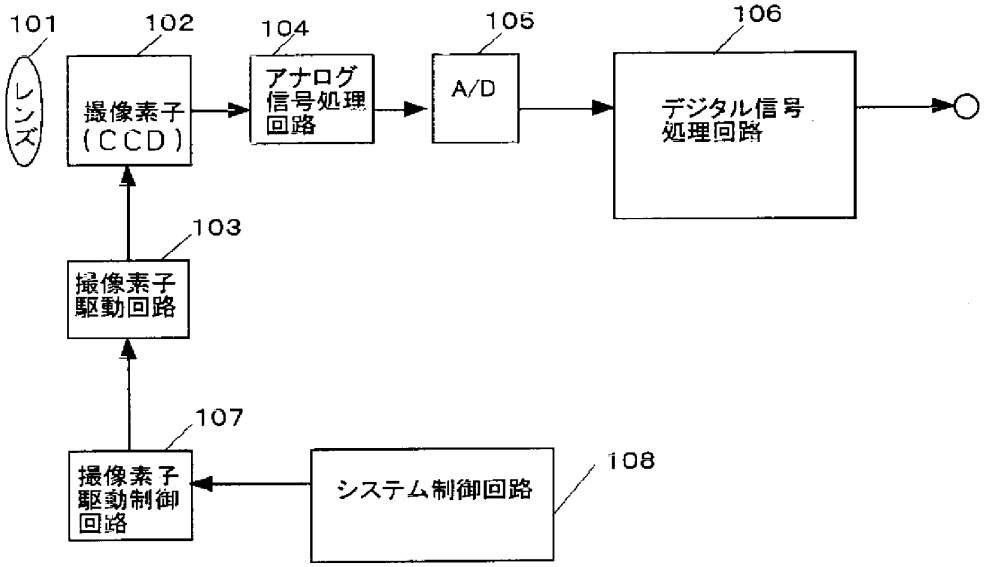
【図１６】図１５に示した撮像素子部の説明図

【図１７】図１５に示した水平画素ずらし処理回路動作の説明図

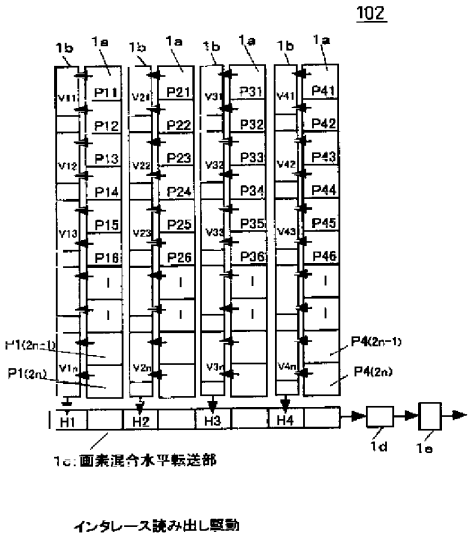
【符号の説明】

１ａ…受光部、１ｂ…垂直転送部、１ｃ…画素混合水平転送部、１０２…ＣＣＤ、１０３，２０３…撮像素子駆動回路、１０４，２０５…アナログ信号処理回路、１０５，２０６…Ａ／Ｄ変換回路、１０６，２０７…デジタル信号処理回路、１０７，２０４…撮像素子駆動制御回路、１０８，２０９…システム制御回路、１０９…混合画素数設定回路、１１１…手ぶれ量検出回路、１１２…クロック変換回路、１１３，１１６…動き補正回路、１１４，１１７…動き補正制御回路、１１５…電子ズーム倍率設定回路、２０１…撮像素子部、２０２…水平画素ずらし部、２０８…水平画素ずらし処理回路。

【図１】

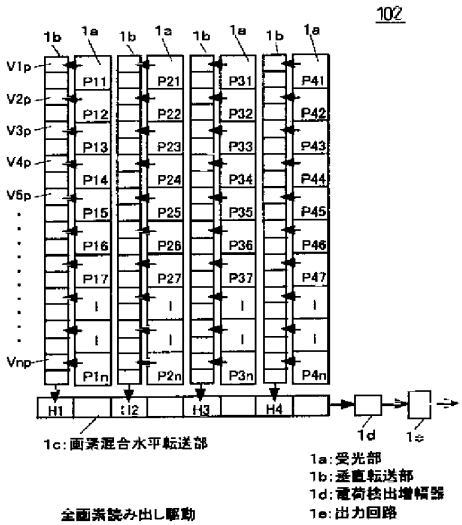


【図２】



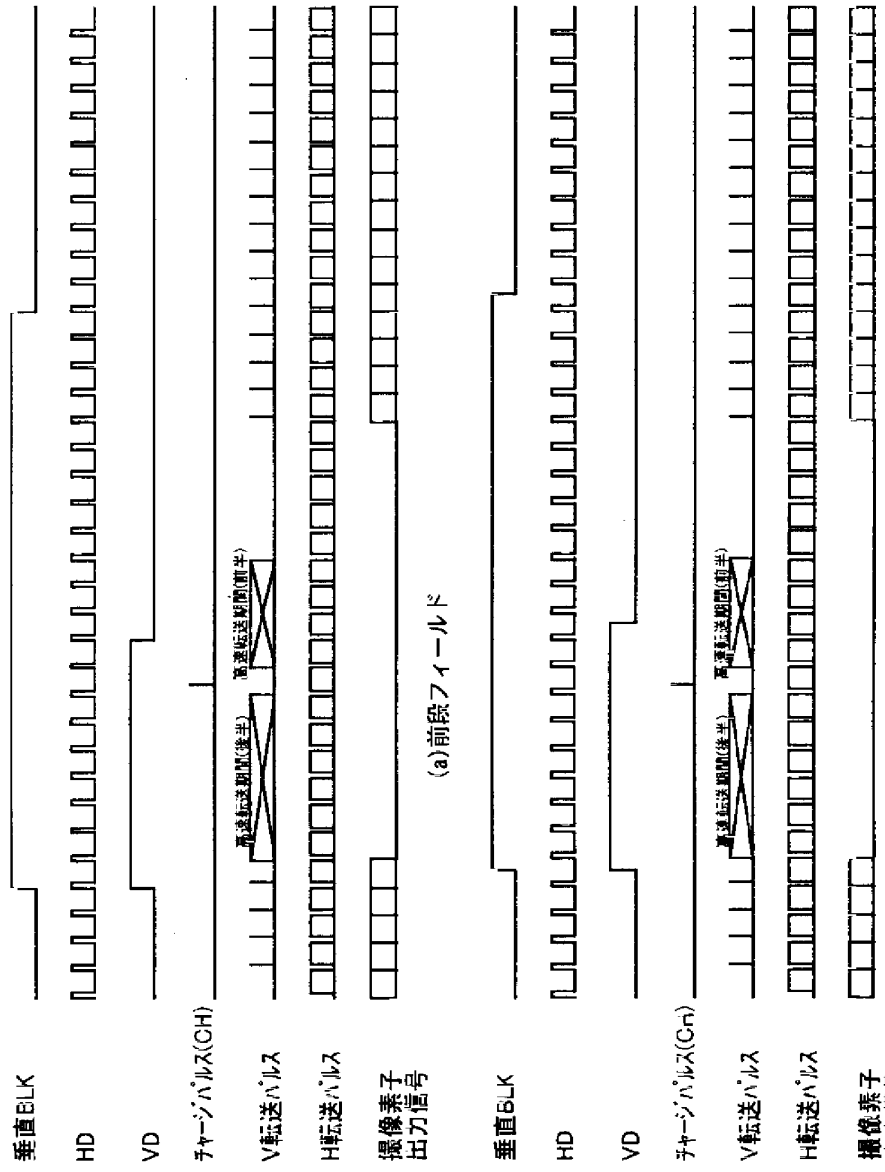
インタレース読み出し駆動

【図５】

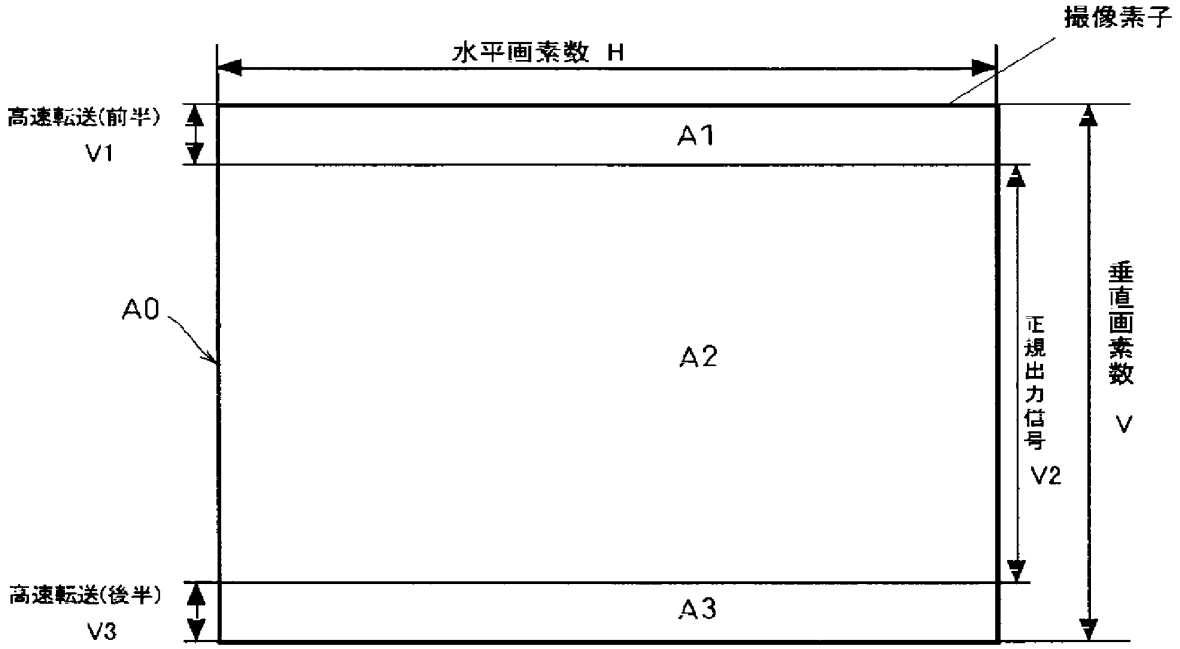


全画素読み出し駆動

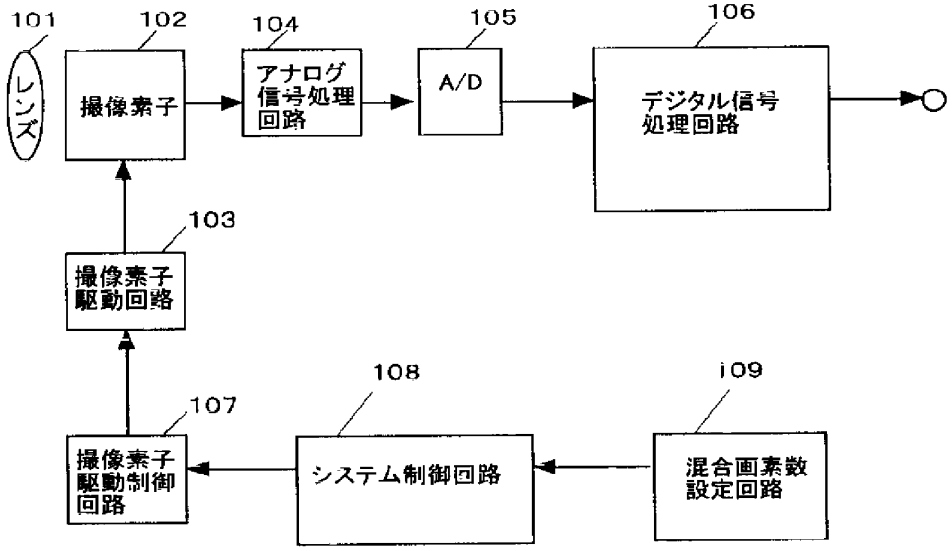
【図3】


垂直BLK
HD
VD
チャージパルス(CH)
V転送パルス
H転送パルス
撮像素子
出力信号
高速転送期間(後半)
高速転送期間(前半)
(a)前段フィールド
垂直BLK
HD
VD
チャージパルス(Cn)
V転送パルス
H転送パルス
撮像素子
出力信号
高速転送期間(後半)
高速転送期間(前半)
(b)後段フィールド

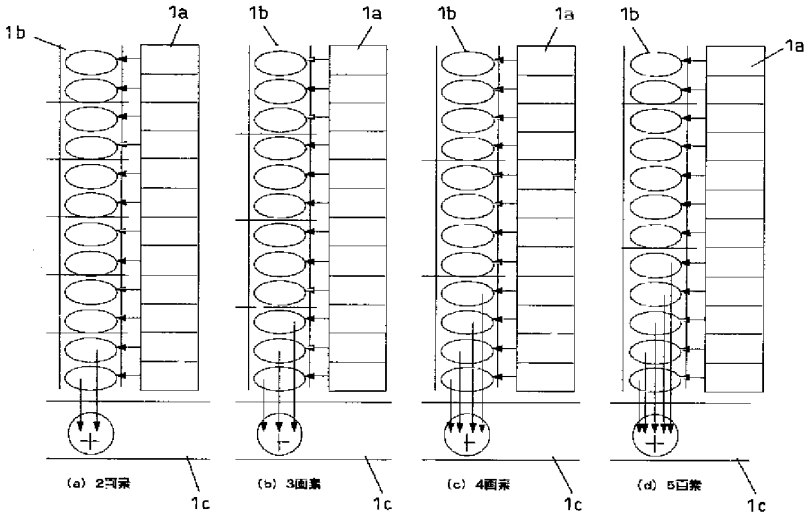
【図4】


撮像素子
水平画素数 H
高速転送(前半)
V1
A1
A0
A2
正規出力信号
V2
垂直画素数
V
高速転送(後半)
V3
A3

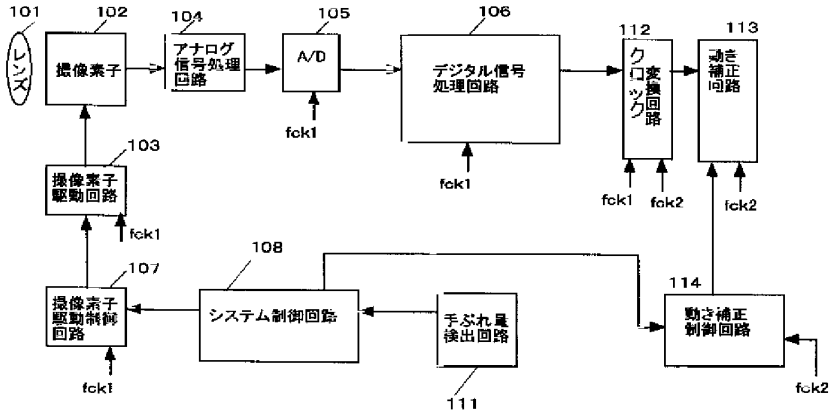
【図6】


101
102
104
105
106
レンズ
撮像素子
アナログ信号処理回路
A/D
デジタル信号処理回路
103
撮像素子駆動回路
107
108
109
撮像素子駆動制御回路
システム制御回路
混合画素数設定回路

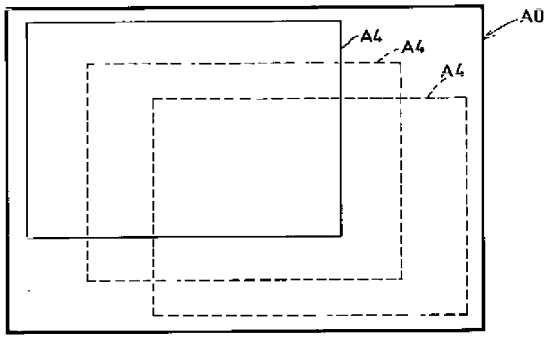
【図7】


1a
1b
1c
(a) 2画素
(b) 3画素
(c) 4画素
(d) 5画素

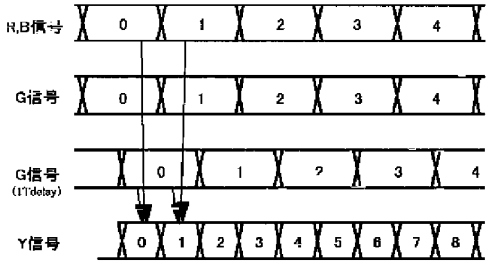
【図8】


101
レンズ
102
撮像素子
103
撮像素子駆動回路
104
アナログ信号処理回路
105
A/D
106
デジタル信号処理回路
107
撮像素子駆動制御回路
108
システム制御回路
111
手ぶれ量検出回路
112
クロック変換回路
113
動き補正回路
114
動き補正制御回路
fck1
fck2

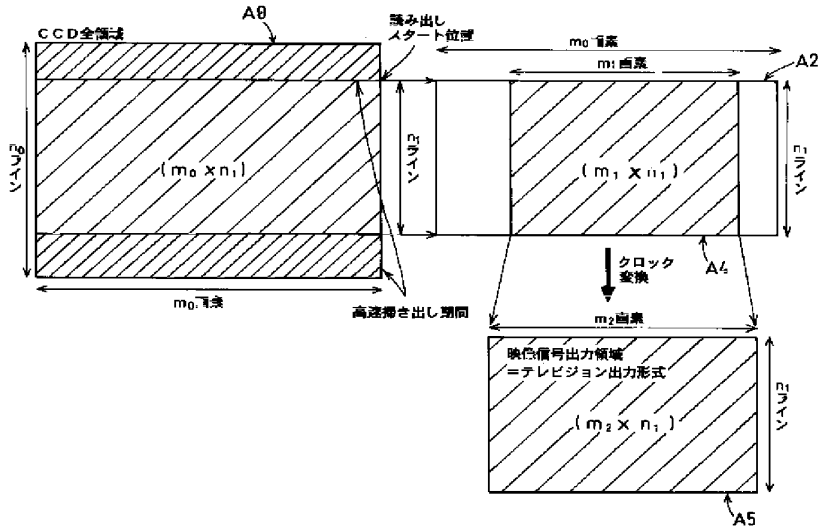
【図9】


A0
A4
A4
A4

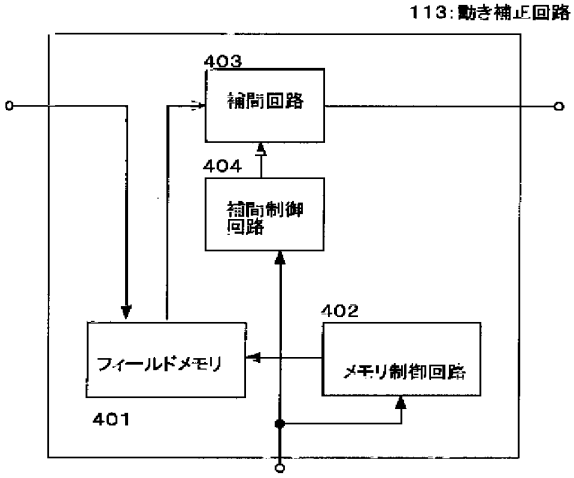
【図17】


R,B信号
G信号
G信号
(1Tdelay)
Y信号
0
1
2
3
4
5
6
7
8

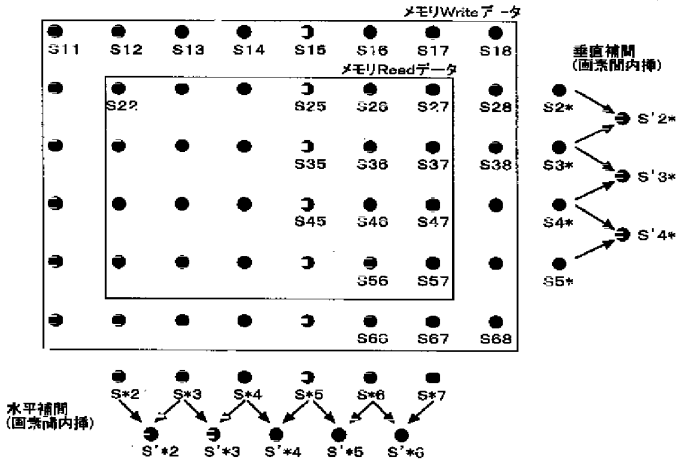
【図１０】


A0
CCD全領域
読み出しスタート位置
m0画素
m1画素
A2
n0ライン
n1ライン
(m0 x n1)
(m1 x n1)
クロック変換
A4
m0画素
高速掃き出し期間
m2画素
映像信号出力領域
＝テレビジョン出力形式
n2ライン
(m2 x n1)
A5

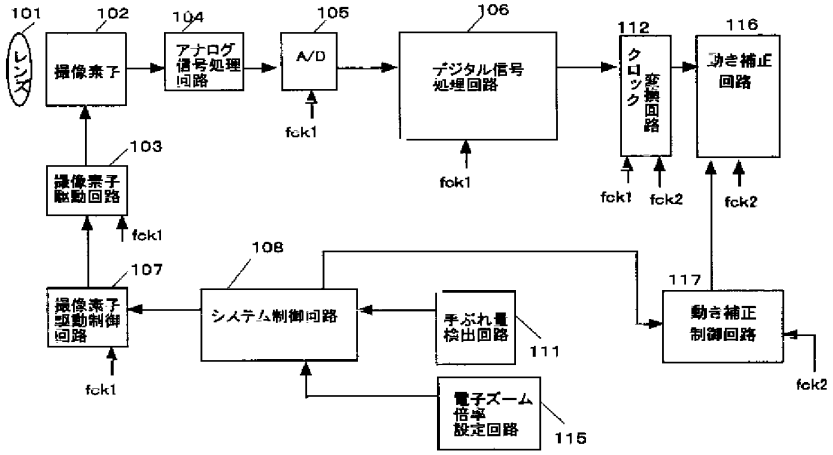
【図１１】


113：動き補正回路
403
補間回路
404
補間制御回路
402
フィールドメモリ
メモリ制御回路
401

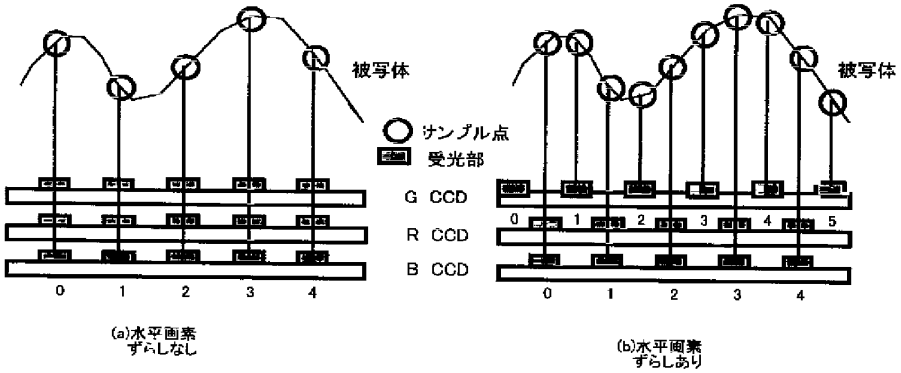
【図１２】


メモリWriteデータ
メモリReadデータ
S11 S12 S13 S14 S15 S16 S17 S18
S22 S25 S26 S27 S28
S35 S36 S37 S38
S45 S46 S47
S56 S57
S66 S67 S68
垂直補間
(画素間内挿)
S2* S'2*
S3* S'3*
S4* S'4*
S5*
水平補間
(画素間内挿)
S*2 S*3 S*4 S*5 S*6 S*7
S'*2 S'*3 S'*4 S'*5 S'*6

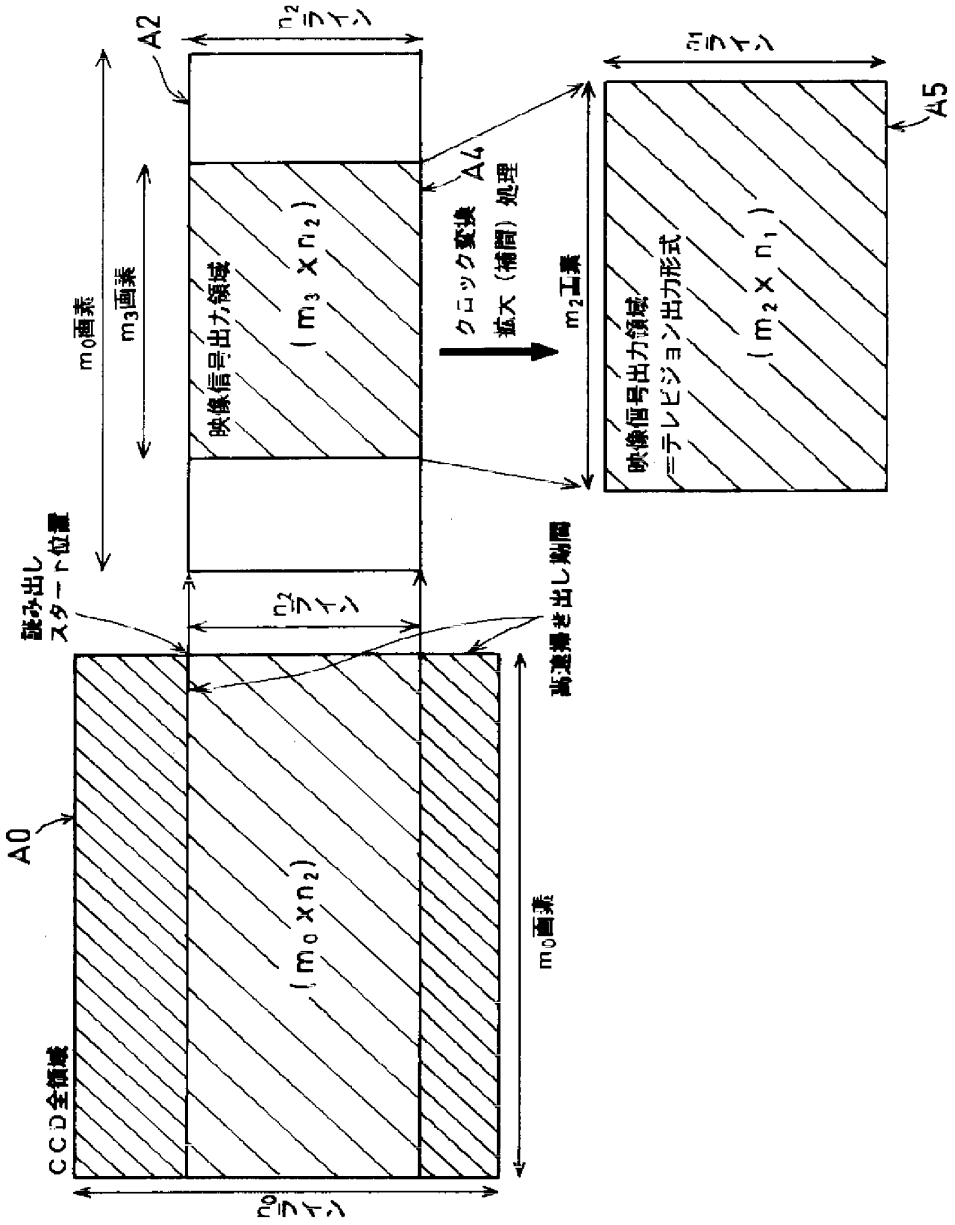
【図１３】


101
レンズ
102
撮像素子
104
アナログ信号処理回路
105
A/D
fck1
106
デジタル信号処理回路
112
クロック変換回路
116
ぶれ補正回路
fck2
103
撮像素子駆動回路
107
撮像素子駆動制御回路
108
システム制御回路
手ぶれ量検出回路
111
117
動き補正制御回路
電子ズーム倍率設定回路
115

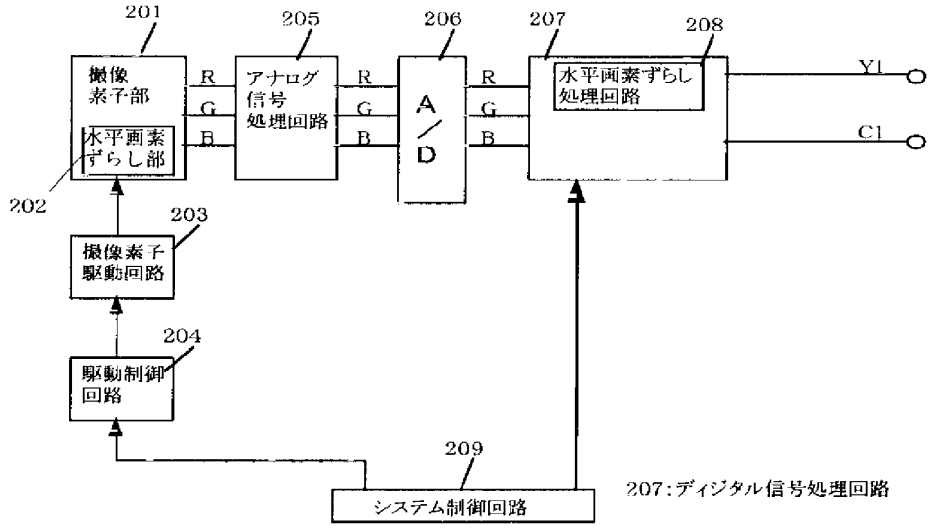
【図１６】


被写体
サンプル点
受光部
G CCD
R CCD
B CCD
0 1 2 3 4
(a)水平画素ずらしなし
被写体
0 1 2 3 4 5
0 1 2 3 4
(b)水平画素ずらしあり

【図14】


A2
n2ライン
m0画素
m3画素
映像信号出力領域
(m3×n2)
クロック変換
拡大(補間)処理
m2画素
A4
n1ライン
A5
映像信号出力領域
=テレビジョン出力形式
(m2×n1)
読み出し
スタート位置
n2ライン
高速掃き出し期間
A0
CCD全領域
(m0×n2)
m0画素
n0ライン

【図15】


201
205
206
207
208
撮像
素子部
水平画素
ずらし部
202
R
G
B
アナログ
信号
処理回路
A
/
D
水平画素ずらし
処理回路
Y1
C1
203
撮像素子
駆動回路
204
駆動制御
回路
209
システム制御回路
207:ディジタル信号処理回路

Espacenet

Bibliographic data: JP2000295531 (A) — 2000-10-20

IMAGE PICKUP DEVICE

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Classification: **- international:** ***H04N5/232; H04N5/335; H04N5/341; H04N5/345; H04N5/347; H04N5/349; H04N5/351; H04N5/3728; H04N9/07;*** (IPC1-7): H04N5/232; H04N5/335; H04N9/07

- cooperative:

Application number: JP19990098615 19990406

Priority number (s): JP19990098615 19990406

Abstract of JP2000295531 (A)

PROBLEM TO BE SOLVED: To obtain an image pickup device from which a signal is read at a comparatively lower drive frequency in the case of picking up a moving picture even when an image pickup element employing multi-pixels and which can sufficiently be used for a recording purpose without deteriorating the quality of the picture picked up in a moving picture mode. SOLUTION: An image pickup element is provided with a light receiving section 1a, a vertical transfer section 1b, and a horizontal transfer section 1c. The vertical transfer section 1b mixes charge signals obtained by the upper and lower light receiving sections 1a adjacent to each other and provides an output of the result. The horizontal transfer section 1c mixes charge information sets of at least two upper/lower pixels adjacent to each other in the vertical direction that are transferred from the vertical transfer section 1b and provides an output of the result. Thus, a moving picture and a still picture with high quality can be obtained while reducing a drive frequency of the image pickup element.

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DESCRIPTION JP2000295531A

[0001]

INDUSTRIAL APPLICABILITY The present invention relates to an image pickup device capable of capturing both moving images and still images, and in particular, when an image is captured in a moving image mode by a multi-pixel image sensor (hereinafter referred to as CCD). However, it relates to a technique for making it possible to set the drive frequency low without impairing the image quality.

[0002]

PROBLEM TO BE SOLVED: To conventionally, as an imaging device capable of capturing both moving images and still images, those described in Japanese Patent Application Laid-Open No. 9-327025 are known.

[0003]

In this conventional technique, a CCD capable of independently reading out all pixels by sequential scanning is provided, and in a moving image mode for obtaining a moving image, a pseudo-interchange is performed by mixing signals between two vertical lines in a horizontal transfer unit. While the drive to perform the race captures the moving image of the 2: 1 interface, in the still image mode, the signals between the two vertical lines are not mixed, and the signals are independently signaled for each line by sequential scanning. Is read out to capture a high-quality still image.

[0004]

PROBLEM TO BE SOLVED: To solve a problem In recent years, the number of pixels of a CCD tends to increase due to demands for high resolution, image stabilization and the like.

[0005]

When the number of pixels of the CCD is, for example, about 720H × 240V, the driving frequency of the CCD when displaying in the moving image mode is 720H × 240V × 60≒13.5MHz, and there is no particular problem.

[0006]

However, when the number of pixels of the CCD is large as described above, the read frequency in the moving image mode becomes extremely high.

For example, the drive frequency required to secure a moving image rate of 60 fields / second or more from a CCD having an effective pixel count of 1280H × 960V≒1.23 million is 1280 × 480 × 60 = 1280 × 480 × 60 even when considering driving of only effective pixels. It becomes 36.864 MHz (about three times the normal frequency), and the high frequency characteristics of the

CCD and analog circuits are realized, and the power consumption increases due to the high frequency drive of the signal processing circuit.

[0007]

When displaying a still image, there is no restriction such as 60 fields / second as in the case of displaying a moving image by the NTSC method, and even if the signals of all the pixels of the CCD are read out over a period of 2 fields or more over a long period of time. Since there is no problem, even if the number of pixels of the CCD is increased, the influence on the driving frequency of the CCD is particularly small.

[0008]

As a technique for lowering the drive frequency of a multi-pixel CCD when displaying an image in the moving image mode, for example, as described in Japanese Patent Application Laid-Open No. 10-136244, a pixel signal for 2 lines for every 3 lines in the vertical direction. By thinning out and outputting only the pixel signal for one line, it is possible to display an image at a frame rate of 60 frames / sec.

[0009]

The technology in this case is mainly intended for display on the electronic viewfinder with an electronic still camera, not for image recording, so even if the image quality is deteriorated to some extent by the thinning process. It doesn't really matter.

[0010]

However, when the purpose is to record an image in the moving image mode, the image quality is deteriorated, which is insufficient.

[0011]

The present invention solves the above problems, and even when a subject is photographed in a moving image mode using a multi-pixel CCD, a signal can be read out at a relatively low drive frequency (for example, 25 MHz or less). Moreover, it is an object of the present invention to provide an imaging device that can be sufficiently used for recording without impairing the image quality of images taken in the moving image mode.

[0012]

[Means for Solving the Problem] In order to solve this problem, the image pickup device of the present invention is obtained by a light receiving unit formed by arranging each pixel for photoelectric conversion in a horizontal direction and a vertical direction. An image pickup device including an image pickup device including a vertical transfer unit that transfers a charge signal in a vertical direction and a horizontal transfer unit that transfers a charge signal from the vertical transfer unit in a horizontal direction is configured as follows. ..

[0013]

In the first invention, the vertical transfer unit mixes and outputs charge signals obtained by upper and lower light receiving units adjacent to each other in the vertical direction, and the horizontal transfer unit transfers from the vertical transfer unit. At least two or more charge information adjacent to each other in the vertical direction is mixed and output.

[0014]

In the second invention, the vertical transfer unit sequentially and individually captures the charge signals obtained by each light receiving unit and transfers them in the vertical direction, and the horizontal transfer unit transfers the charge signals in the vertical direction by the vertical transfer unit. It mixes charge information of at least three pixels above and below adjacent to each other.

[0015]

According to the first and second inventions, even when a multi-pixel image sensor is used, the drive frequency of the image sensor when capturing a moving image can be lowered to drive the image sensor with low power consumption, and a high-quality still image can be obtained. It is possible to obtain.

[0016]

The third invention includes a charge high-speed transfer means for increasing the vertical transfer rate of charge information in the vertical transfer unit.

[0017]

According to the third invention, it is possible to obtain a high-quality still image having the same angle of view as a moving image.

[0018]

The fourth invention includes a mixed pixel number control means for variably controlling the number of mixed pixels by a horizontal transfer unit.

[0019]

According to the fourth invention, it is possible to easily reduce the drive frequency of the image sensor, support a plurality of television systems, and support high-sensitivity shooting.

[0020]

A fifth invention includes at least one of a camera shake amount detecting circuit for detecting a camera shake amount and a zoom magnification setting circuit for setting an electronic zoom magnification, and an image sensor drive circuit for driving an image sensor, and the camera shake amount or the camera shake amount or it includes an image sensor drive control circuit that controls the image sensor drive circuit based on information on at least one of the zoom magnifications.

[0021]

According to the fifth invention, it is possible to reduce the drive frequency of the image sensor and realize the camera shake correction or the electronic zoom function.

[0022]

In the sixth aspect of the invention, in any of the first to fifth aspects of the invention, a color-separating optical means for decomposing light from a subject is arranged in front of the image pickup device.

[0023]

According to the sixth invention, it is possible not only to reduce the drive frequency of the image sensor but also to obtain a high-resolution signal in the horizontal and vertical directions.

[0024]

BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, embodiments of the present invention will be described with reference to the drawings.

[0025]

(Embodiment 1) FIG. 1 is a block diagram of an image pickup apparatus according to a first embodiment of the present invention.

[0026]

The image pickup device of the first embodiment includes a lens 101, an image pickup element (CCD) 102, an image pickup element drive circuit 103, an analog signal processing circuit 104, an analog-to-digital conversion circuit (hereinafter referred to as A / D) 105, and a digital signal. It includes a processing circuit 106, an image sensor drive control circuit 107, and a system control circuit 108.

[0027]

In the image pickup device having this configuration, the image of the subject passing through the lens 101 is captured by the CCD 102 and photoelectrically converted, and the charge signal obtained thereby is output to the analog signal processing circuit 104 by driving the image pickup device drive circuit 103.

[0028]

In this case, the image sensor drive circuit 103 generates a charge pulse, a V transfer pulse, a high-speed transfer pulse, and an H transfer pulse, respectively, as described later.

Therefore, this circuit 103 corresponds to the high-speed transfer means in the claims.

[0029]

The analog signal processing circuit 104 performs processing such as noise removal and amplification, and is converted into a digital signal by the A / D 105.

The digital signal processing circuit 106 creates a video signal such as a luminance signal.

Further, the image sensor drive circuit 103 is controlled by the image sensor drive control circuit 107 and the system control circuit 108.

[0030]

FIG. 2 is an explanatory diagram showing the configuration of the CCD 102 shown in FIG.

[0031]

In FIG. 2, 1a is a light receiving unit, 1b is a vertical transfer unit, 1c is a pixel mixing horizontal transfer unit, 1d is a charge detection amplifier, and 1e is an output circuit.

[0032]

Here, in the CCD 102 in FIG. 2, in order to read out the charge signals accumulated in all the pixels of the CCD within one field period (about 1/60 second in the case of the NTSC system) in the television signal, each other in the vertical direction. The charge signals of two adjacent pixels above and below are mixed, and this mixed pair is switched for each field (hereinafter referred to as interlaced read drive).

[0033]

That is, in this interlaced read-out drive, the charge signals of the upper and lower two pixels (light receiving unit 1a) adjacent to each other in the vertical direction are mixed by two pixels when they are transferred to the vertical transfer unit 1b by the charge pulse.

For example, in a certain one-field period, the charge signals of P11 and P12 are mixed in V11, the charge signals of P13 and P14 are mixed in V12, and the charge signals of P15 and P16 are mixed in V13.

In the next one-field period, the charge signals of P12 and P13 are mixed in V11, and the charge signals of P14 and P15 are mixed in V12.

[0034]

This charge signal is transferred from the vertical transfer unit 1b to the pixel mixing horizontal transfer unit 1c.

Conventionally, the horizontal transfer unit simply transfers the charge signal for each line transferred from the vertical transfer unit 1b, but in the pixel mixing horizontal transfer unit 1c of the first embodiment, the vertical transfer unit 1b The charged signals of the two adjacent upper and lower pixels in the vertical direction that are transferred are added and mixed.

[0035]

For example, in the case of two-pixel mixing, the charge signals of V11 and V12 are added and mixed at H1.

したがってＶ１１＝Ｐ１１＋Ｐ１２，Ｖ１２＝Ｐ１３＋Ｐ１４のときには、Ｈ１＝Ｖ１１＋Ｖ１２＝Ｐ１１＋Ｐ１２＋Ｐ１３＋Ｐ１４となり、また、Ｖ１１＝Ｐ１２＋Ｐ１３，Ｖ１２＝Ｐ１４＋Ｐ１５のときには、Ｈ１＝Ｖ１１＋Ｖ１２＝Ｐ１２＋Ｐ１３＋Ｐ１４＋Ｐ１５となる。

The added and mixed charge signal is transferred in the horizontal direction and output via the charge detection amplifier 1d and the output circuit 1e.

[0036]

As described above, since the charge signals of the pixels in the vertical direction are mixed and added, in the first embodiment, the light receiving unit 1a has the same color filter element (not shown) along the vertical direction of each pixel. Is placed.

As the configuration of this color filter element, vertical stripes of primary colors (R, G, B), vertical stripes including complementary colors of (Ye, G, Cy), etc. are applied, but the present invention is not limited to this, and R , G, B as long as color separation is possible.

[0037]

FIG. 3 is an explanatory diagram showing an example of the drive timing of the CCD 102 shown in FIG. 2, where FIG. 3A shows the drive timing near the start of the front field and FIG. 3B shows the drive timing near the start of the rear field. ing.

[0038]

In FIGS. 3A and 3B, the vertical BLK is the vertical blanking signal in the television signal, the HD / VD is the horizontal / vertical reference signal in the television signal, and the charge pulse (CH) is the CCD102. This is a signal for transferring the charge accumulated in the light receiving unit 1a of the above to the vertical transfer unit 1b.

Further, the V transfer pulse is a signal for transferring charges in the vertical direction by the vertical transfer unit 1b.

In particular, it is located before and after the charge pulse (CH) in the V transfer pulse in order to discard the charge accumulated in the pixels in the region that does not contribute to the actual display, which is reserved in advance in the CCD 102 for image stabilization. A high-speed transfer pulse is inserted at the location.

The H transfer pulse indicates a signal for horizontally transferring the charge phased from the vertical transfer unit 1b from the pixel mixing horizontal transfer unit 1c, and the image pickup element output signal indicates an output signal read by the transfer pulse or the like. ..

[0039]

Next, the reading operation of the image pickup device 102 by this drive will be described.

[0040]

FIG. 4 is an explanatory diagram showing the relationship between the pixel region of the CCD 102 and the drive timing for the CCD 102 shown in FIG.

[0041]

In FIG. 4, of the total area A0 of the CCD 102, the area A2 contributes to the actual display, and the areas A1 and A3 are areas reserved for vertical image stabilization, depending on the degree of image stabilization. Therefore, the sizes of the regions A1 and A3 are changed from each other.

However, the sum of the areas A1 and A3 does not change.

[0042]

In the CCD102, first, the charge signal from the A1 region is transferred at high speed by the number of high-speed transfer pulses in the high-speed transfer (first half) period, then the normal charge signal in the A2 region is output by the V transfer pulse, and then the high speed is obtained. The charge signal from the A3 region is transferred at high speed depending on the number of high-speed transfer pulses during the transfer (second half) period.

In this case, the charge signals transferred at high speed from the regions A1 and A3 do not contribute to the display and are discarded.

[0043]

Now, assuming that the total number of pixels in the vertical direction of the CCD 102 is V, the number of pixels in the vertical direction of the A1 region is V1, the number of pixels in the vertical direction of the A2 region is V2, and the number of pixels in the vertical direction of the A3 region is V3, interlace. In the read-out drive, two pixels adjacent to each other in the vertical direction are mixed and added to each other in the vertical transfer unit 1b. Therefore, when the two pixels are transferred from the light receiving unit 1a to the vertical transfer unit 1b, the entire (V / 2) line is used. It becomes a minute signal.

[0044]

Here, in FIG. 3, after the charge pulse is output, only (V1) / 2 high-speed transfer pulses are output, and then the charge signal in the A2 region is regarded as a normal signal from the time when the next V transfer pulse is output. Read out.

At this time, as shown in FIG. 2, in the pixel mixing horizontal transfer unit 1c, two charge signals vertically adjacent to each other in the vertical direction of the vertical transfer unit 1b are added and mixed and output as a normal signal.

After that, when only (V3) / 2 high-speed transfer pulses are output, the charge signal in the A3 region is transferred at high speed.

[0045]

Next, in the image pickup apparatus of the first embodiment configured as described above, when the number of effective pixels of the CCD 102 is 1280H × 1024V, the required drive frequency will be specifically examined.

[0046]

Now, assuming that an image is displayed at a frame rate of 60 images / second in the moving image mode, when the CCD102 is interlaced and read and driven, the pixel mixing horizontal transfer unit 1c is used for the charge signal obtained in the V1 = 32 and A2 regions. Assuming that the number of charge signals to be added and mixed is 2 and V3 = 32, the A2 region (V2 = 960 pixels) of the CCD102 can be output as a 240-line signal in one field period, and the drive frequency at this time is NTSC. Considering the drive of only the effective pixels, 1280 × 240 × 60 = 18.4 MHz.

[0047]

Further, assuming that an image is displayed in the still image mode, when the CCD 102 is interlaced and read and driven, the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c with respect to the charge signals obtained in the V1 = 0 and A2 regions = When 1, V3 = 0, the signal of the entire region of the CCD 102 can be read out as a signal of 512 lines, and by setting this reading as a two-field period in the NTSC method, considering the driving of only the effective pixels, 1280 × 512 × 30 = 19.7 MHz.

[0048]

Further, assuming that an image is displayed in the still image mode, as a special readout of the interlace readout drive, when the odd-numbered line and even-numbered line signals are separately read from the light receiving unit 1a in two times, V1 = 0. By setting the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c = 1, V3 = 0 for the charge signals obtained in the A2 region, the signals in the entire region of the CCD 102 are added in the vertical direction as signals of 1024 lines. By setting this reading as a 4-field period in the NTSC method, it becomes 1280 × 1024 × 15 = 19.7 MHz when considering the driving of only the effective pixels.

[0049]

In other words, in the moving image mode, 60 images / sec can be obtained at a drive frequency of about 20 MHz, and in the still image mode, 30 images / sec for 512 lines and 15 images / sec for 1024 lines. It is possible to obtain an image.

[0050]

In each of the above image generations, the charge signal obtained in the A2 region of FIG. 4 is used in the moving image mode, and the charge signal from the entire area A1 + A2 + A3 (effective pixel number is 1280H × 1024V) of the CCD is used in the still image mode. As shown, in this case, since the size of the display area is different between the moving image and the still image, the angle of view changes as a result.

[0051]

Therefore, when it is necessary to adjust the moving image obtained in the moving image mode and the still image obtained in the still image mode to have the same angle of view, in the still image mode as in the moving image mode, in the A2 area. Only the obtained signal is output from the CCD 102.

[0052]

That is, the above CCD102 is interlaced and read-driven, and the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c with respect to the charge signals obtained in the V1 = 32 and A2 regions is set to 1 and V3 = 32. It can be read as a signal of 480 lines.

By allocating this reading to the two-field period by the NTSC method, considering the driving of only the effective pixels, it becomes 1260 × 480 × 30 = 16.4 MHz.

[0053]

Further, as a special read of the interlaced read drive, the signals of the odd line and the even line are read separately from the light receiving unit 1a in two times, and the number of charge signals to be added and mixed in the V1 = 32, A2 region = 1, V3. By setting = 32, the signal in the A2 region in the center of the CCD 102 can be read as a signal of 960 lines without vertical addition processing, and by allocating this reading to the 4-field period in the NTSC method, only the effective pixels can be read. Considering the drive of, 1260 × 960 × 15 = 18.4 MHz.

[0054]

In this case, in other words, at a drive frequency of about 20 MHz, it is possible to obtain a moving image of 60 images / second, a still image of 480 lines-30 images / second, and a still image of 960 lines-15 images / second.

[0055]

As described above, in the first embodiment, in the interlace read-out drive, the charge signal of the vertical transfer unit 1b is added in the vertical direction by the pixel mixing horizontal transfer unit 1c, so that the CCD 102 has a large number of pixels. A moving image can be obtained by driving with a relatively low drive frequency.

[0056]

Further, a high-quality still image can be obtained by using the signal of the entire region of the CCD 102, and a high-quality still image having the same angle of view as the moving image can be obtained, which corresponds to the same frequency as the conventional one. It is possible to create moving images and still images with low power consumption by using an analog signal processing circuit and A / D.

[0057]

(Embodiment 2) FIG. 5 is an explanatory diagram showing a configuration of a CCD according to the second embodiment of the present invention.

[0058]

In FIG. 5, 1a is a light receiving unit, 1b is a vertical transfer unit, 1c is a pixel mixing horizontal transfer unit, 1d is a charge detection amplifier, and 1e is an output circuit.

[0059]

Here, in the CCD 102 in FIG. 5, by doubling the number of stages of the vertical transfer unit 1b to the number of stages in the case of the CCD shown in FIG. 2, each charge signal of one frame (one screen) of pixels is sequentially scanned. Are read independently without mixing (hereinafter referred to as all pixel read drive).

[0060]

That is, in this all-pixel read-out drive, the charge signals of the vertically adjacent pixels (light receiving unit 1a) are transferred as they are to the vertical transfer unit 1b without being mixed by the charge pulse, and the pixels are mixed and horizontally transferred from the vertical transfer unit 1b. Transferred to part 1f.

[0061]

Further, conventionally, the horizontal transfer unit simply transfers the charge signal for one line transferred from the vertical transfer unit 1b, but in the pixel mixed horizontal transfer unit 1c of the second embodiment, the vertical transfer unit 1b The charge signals between the vertically adjacent upper and lower parts transferred from the above are added and mixed.

[0062]

For example, when the pixel mixing horizontal transfer unit 1c mixes four pixels, the charge signals of V1p, V2p, V3p, and V4p, that is, the charge signals of the four light receiving units P11, P12, P13, and P14 are added and mixed in H1. To.

The added and mixed charge signal is transferred in the horizontal direction and output as an image pickup signal through the charge detection amplifier 1d and the output circuit 1e.

[0063]

Since other configurations are the same as in the case of the first embodiment, detailed description thereof will be omitted here.

[0064]

Next, the read operation of the CCD 102 by the all-pixel read drive will be described with reference to FIG. 4 as in the case of the first embodiment.

[0065]

In the CCD102, first, the charge signal from the A1 region is transferred at high speed by the number of high-speed transfer pulses in the high-speed transfer (first half) period, then the normal charge signal in the A2 region is output by the V transfer pulse, and then the high speed is obtained. The charge signal from the A3 region is transferred at high speed depending on the number of high-speed transfer pulses during the transfer (second half) period.

In this case, the charge signals transferred at high speed from the regions A1 and A3 do not contribute to the display and are discarded.

[0066]

As in the case of the first embodiment, the total number of pixels in the vertical direction of the CCD 102 is now V, the number of pixels in the vertical direction of the A1 region is V1, the number of pixels in the vertical direction of the A2 region is V2, and the number of pixels in the vertical direction of the A3 region is the vertical direction. Assuming that the number of pixels is V3, the vertical transfer unit 1b does not mix and add two pixels in the vertical direction when all-pixel read-out drive is performed. It becomes a signal of.

[0067]

Here, after the charge pulse is output, only one V1 high-speed transfer pulse is output, and then the charge signal in the A2 region is read out as a normal signal from the time when the next V transfer pulse is output.

At this time, as shown in FIG. 5, in the pixel mixing horizontal transfer unit 1c, four charge signals vertically adjacent to each other in the vertical direction of the vertical transfer unit 1b are simultaneously added and mixed and output as a normal signal.

After that, when only V3 high-speed transfer pulses are output, the charge signal in the A3 region is transferred at high speed.

[0068]

Next, in the image pickup apparatus of the second embodiment configured as described above, the drive frequency of the CCD having an effective pixel count of 1280H × 1024V will be specifically examined.

[0069]

Now, assuming that an image is displayed at a frame rate of 60 images / second in the moving image mode, when the CCD102 is read out and driven for all pixels, the pixel mixing horizontal transfer unit 1c is used for the charge signal obtained in the V1 = 32 and A2 regions. Assuming that the number of charge signals to be added and mixed is 4 and V3 = 32, the CCD A2 region (V2 = 960 pixels) can be output as a 240 line (= 960/4 line) signal in one field period. The drive frequency of is 1280 × 240 × 60 = 18.4 MHz when considering the drive of only effective pixels in the NTSC method.

[0070]

Further, assuming that the image is displayed in the still image mode, the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c for the charge signals obtained in the V1 = 0 and A2 regions is set to 1 and V3 = 0. , The signal of the entire region of the CCD 102 can be read out as a signal of 1024 lines.

Then, by allocating this reading to the four-field period in the NTSC system, considering the driving of only the effective pixels, it becomes 1280 × 1024 × 15 = 19.7 MHz.

[0071]

In other words, at a drive frequency of about 20 MHz, it is possible to obtain 60 moving images / sec and 1024 lines-15 still images / sec.

[0072]

In this way, by mixing and adding the charge signals in the A2 region in the pixel mixing horizontal transfer unit 1c of the CCD 102, it is possible to obtain an image that matches the television system even in the moving image mode, and all the pixels. It is possible to obtain a still image by performing the readout drive over a plurality of feel periods.

[0073]

As in the case of the first embodiment, when it is necessary to adjust the moving image obtained in the moving image mode and the still image obtained in the still image mode to have the same angle of view, the moving image is also moved in the still image mode. As in the mode, only the signal obtained in the A2 region is output from the CCD 102.

[0074]

That is, by driving the CCD 102 to read out all pixels and setting the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c with respect to the charge signals obtained in the V1 = 32 and A2 regions = 1, V3 = 32, the image sensor The signal in the central region of the above can be read out as a signal of 960 lines, and by setting this reading as a 4-field period in the NTSC method, 1280 × 960 × 15 = 18.4 MHz when considering the driving of only effective pixels. ..

[0075]

In this case, in other words, at a drive frequency of about 20 MHz, it is possible to obtain a moving image of 60 images / second and a still image of 960 lines-15 images / second.

[0076]

As described above, also in the case of the second embodiment, in the all-pixel read-out drive, the charge signal of the vertical transfer unit 1b is added in the vertical direction by the pixel mixing horizontal transfer unit 1c, thereby performing the drive as in the first embodiment. Similarly, even when the CCD 102 has a large number of pixels, a moving image can be obtained with a relatively low drive frequency.

[0077]

Further, a high-quality still image can be obtained by using the signal of the entire region of the CCD 102, and a high-quality still image having the same angle of view as the moving image can be obtained, which corresponds to the same frequency as the conventional one. It is possible to create moving images and still images with low power consumption by using an analog signal processing circuit and A / D.

[0078]

(Embodiment 3) FIG. 6 is a block diagram of an image pickup apparatus according to a third embodiment of the present invention, and the same reference numerals are given to parts corresponding to the configuration of the first embodiment shown in FIG.

[0079]

The feature of the image pickup apparatus of the second embodiment is a mixed pixel number setting circuit capable of arbitrarily setting the number of charge signals vertically adjacent to each other in the vertical transfer unit 1b in the pixel mixing horizontal transfer unit 1c. It is that 109 was provided.

[0080]

Further, as the CCD 102 of the third embodiment, not only the interlaced read-out drive method shown in FIG. 2 but also the all-pixel read-out drive method according to the second embodiment shown in FIG. 5 can be used.

[0081]

Since other configurations are the same as those in the first embodiment, detailed description thereof will be omitted here.

[0082]

7 (a) to 7 (d) are explanatory views of pixel mixing when the CCD 102 of the all-pixel read-out drive method shown in FIG. 5 is used as an example of the CCD 102, and are set by the mixed pixel number setting circuit 109. Each operation corresponding to the number of mixed pixels is shown.

[0083]

In FIG. 7, the electric charge accumulated in the light receiving unit 1a is independently transferred to the vertical transfer unit 1b, and the electric charge is added by the pixel mixing horizontal transfer unit 1c according to the number of mixed pixels set by the mixed pixel number setting circuit 109. To.

[0084]

In the image pickup apparatus according to the third embodiment configured as described above, the system control circuit 108 sets the image pickup element drive circuit 103 through the image pickup element drive control circuit 107 in response to the number of pixels set by the mixed pixel number setting circuit 109. It controls and drives the necessary image sensor 102.

[0085]

At this time, in the CCD 102, as shown in FIGS. 7A to 7D, the pixel mixing horizontal transfer unit 1c mixes and adds the number of pixels set by the mixed pixel number setting circuit 109.

[0086]

Here, assuming that the CCD 102 is an all-pixel read-out drive system and the number of effective pixels is 1280H × 960V, first, (a) 2 pixel mixing + no high-speed transfer (V1 + V3 = 0) is set, and the output signal of 480 lines is output. Therefore, a frame image (NTSC method) of 60 frames / second can be obtained.

Further, by setting (b) 3-pixel mixing + high-speed transfer (V1 + V3 = 90), an output signal of 290 lines can be obtained, and a field image (PAL method) of 50 images / second can be obtained.

(c) By setting 4 pixel mixing + no high-speed transfer (V1 + V3 = 0), an output signal of 240 lines can be obtained, and a field image (NTSC method) of 60 images / second can be obtained.

[0087]

In this way, by setting the number of mixed pixels and the high-speed transfer setting corresponding to this, 60 frame images (NTSC method), 50 field images (PAL method), and high-sensitivity type (4 pixel Mix method) can be obtained from the same image sensor. It is possible to obtain each image pickup signal of a 60-field image (NTSC method).

[0088]

Further, when the CCD 102 is of the all-pixel read-out drive system and the number of effective pixels is 1600H × 1200V, first, (a) 2 pixel mixing + high-speed transfer (V1 + V3 = 40) is set to obtain an output signal of 580 lines. A frame image (PAL method) of 50 images / second can be obtained.

(c) By setting 4 pixel mixing + high-speed transfer (V1 + V3 = 40), an output signal of 290 lines can be obtained, and a field image (PAL method) of 50 images / second can be obtained.

(d) By setting 5 pixel mixing + no high-speed transfer (V1 + V3 = 0), an output signal of 240 lines can be obtained, and a field image (NTSC method) of 60 images / second can be obtained.

[0089]

In this way, by setting the number of mixed pixels and the high-speed transfer setting corresponding to this, 50 frame images (PAL method) from the same image sensor, 50 field images (PAL method) of high sensitivity type (4 pixel Mix method), and high It is possible to obtain image pickup signals of 60-field images (NTSC method) of sensitivity type (5-pixel Mix method).

[0090]

As described above, in the third embodiment, the number of mixed pixels is changed by the mixed pixel number setting circuit 109, and the high-speed transfer setting corresponding to this is performed. It is possible to support various television systems such as PAL, and it is possible to easily support high-sensitivity shooting.

[0091]

(Embodiment 4) FIG. 8 is a block diagram of an image pickup apparatus according to a fourth embodiment of the present invention, and the same reference numerals are given to parts corresponding to the configuration of the first embodiment shown in FIG.

[0092]

In the fourth embodiment, the camera shake amount detection circuit 111, the clock conversion circuit 112, the motion correction circuit 113, and the motion correction control circuit 114 are further provided with respect to the configuration of the first embodiment shown in FIG.

[0093]

The camera shake amount detection circuit 111 includes a video detection method, that is, detection of the amount of movement of a video signal within a certain period, or a sensor detection method, that is, detection of the movement of the device itself by an angular velocity sensor or the like.

Further, since the frequency of digital signal processing for the output signal of the CCD 102 and the output frequency of the signal matching the output format of the television signal are different from each other, the clock conversion circuit 112 is provided to match each other.

[0094]

Other configurations are the same as in the case of the first embodiment.

[0095]

In the fourth embodiment as well, the CCD 102 includes not only the interlaced read-out drive method of the first embodiment shown in FIG. 2 but also the all-pixel read-out drive method of the second embodiment shown in FIG. Can be used.

[0096]

In the image pickup apparatus according to the fourth embodiment, the CCD 102 performs photoelectric conversion and generates an image pickup signal by driving the image pickup element drive circuit 103 controlled by the image pickup element drive control circuit 107.

Hereinafter, the analog signal processing circuit 104 performs processing such as noise removal and amplification, and the A / D 105 converts it into a digital signal, and the digital signal processing circuit 106 creates a video signal such as a luminance signal.

[0097]

Here, the reference clock of the image sensor drive circuit 103, the image sensor drive control circuit 107, the A / D 105, and the digital signal processing circuit 106 is fck1.

[0098]

The output signal of the digital signal processing circuit 106 is clock-converted by the clock conversion circuit 112, and the reference clock becomes a digital signal of fck2.

Further, the output signal of the clock conversion circuit 112 is input to the motion correction circuit 113.

[0099]

Here, the reference clock of the motion correction circuit 113 and the motion correction control circuit 114 is fck2.

[0100]

The system control circuit 108 controls the image sensor drive control circuit 107 and the motion correction control circuit 114.

Here, the motion data detected by the camera shake amount detection circuit 111 is input to the system control circuit 108, and the system control circuit 108 controls the image pickup element drive control circuit 107 and the motion correction control circuit 114 to perform camera shake correction.

[0101]

Next, the operation of the CCD 102 and the image sensor drive circuit 103 will be described with reference to FIGS. 9 and 10.

[0102]

FIG. 9 is an explanatory diagram showing a pixel region of the CCD 102.

Here, the entire pixel area A0 of the CCD 102 is composed of m0 pixels × n0 lines, and one smaller signal cutout area A4 is secured in the all pixel area A0, and the signal cutout area A4 is defined as the signal cutout area A4. , M1 pixel x n1 line (m1 <m0, n1 <n0).

The position of the signal cutting region A4 is not fixed, but is displaced according to the direction and amount of camera shake.

[0103]

As shown in FIG. 10, first, only the signal in the region (m0 pixel × n1 line) is read out from the total pixel region A0 (m0 pixel × n0 line) by the high-speed sweeping process by the image sensor drive circuit 103. Next, the charge signal in the region of (m0 pixel × n1 line) is cut out by the digital signal processing unit 106 in the region of (m1 pixel × n1 line), and then clock conversion is performed to finally perform the clock conversion. The data is suitable for various display formats (m2 pixels x n1 lines).

[0104]

Here, based on the motion detection data detected by the camera shake amount detection circuit 111, the position of the required CCD read area (m0 pixel × n1 line) is determined from within the entire pixel area A0 so as to cancel the vertical motion. , The position of the signal cutout region A4 (m1 pixel × n1 line) is set so as to cancel the movement in the horizontal direction.

[0105]

For example, when the aspect ratio (aspect ratio) of the CCD 102 is 4: 3, which is the same as the television signal, it is cut out at a ratio of n1 / n0 in the vertical direction when reading from the CCD 102. This is because it is necessary to cut out at a ratio of n1 / n0 in the horizontal direction as well.

Therefore, the ratio m1 / m0 of the number of pixels m1 in the horizontal direction of the signal cutout region A4 (m1 pixel × n1 line) to the number of pixels m0 in the horizontal direction before cutting out satisfies the relationship of m1 / m0 = n1 / n0. There is.

[0106]

Subsequently, the clock conversion circuit 112 converts the clock frequency of data reading so that the signal in the signal cutout area A4 becomes the display area A5 (m2 pixel × n1 line) that matches the output format of the television signal. ..

[0107]

FIG. 11 is a block diagram showing a specific configuration of the motion correction circuit 113.

[0108]

The motion correction circuit 113 includes a field memory 401, a memory control circuit 402, an interpolation circuit 403, and an interpolation control circuit 404.

[0109]

In the motion correction circuit 113, the input signal is written to the field memory 401 by the memory control circuit 402 (S11 to S68 in the case of FIG. 12), and the signals in the required area (S22 to S57 in the case of FIG. 12) are read out. ..

The read signal is subjected to horizontal interpolation processing and vertical interpolation processing by the interpolation circuit 403.

In the interpolation circuit 403, the interpolation control circuit 404 performs interpolation processing between pixels.

The operation of the interpolation processing between the pixels is also shown in FIG.

[0110]

As shown in FIG. 12, interpolation is a movement of one pixel or less of the spatial position of the video signal, and camera shake correction is performed by pixel-based position control by reading out the field memory 401 and intra-pixel position control by interpolation. I do.

[0111]

As described above, in the fourth embodiment, the camera shake component is canceled by the high-speed transfer setting of the vertical transfer unit 1b of the CCD 102 according to the camera shake amount by the camera shake amount detection circuit 111, and further, the pixel mixing horizontal transfer unit 1c is vertical. By driving the transfer unit 1b to mix and add the charge signals in the vertical direction, a moving image can be obtained at a relatively low drive frequency even when the CCD 102 has a large number of pixels, and signals in the entire region of the CCD 102 are used. High-quality still images can be obtained.

[0112]

(Embodiment 5) FIG. 13 is a block diagram of an image pickup apparatus according to a fifth embodiment of the present invention, and the same reference numerals are given to parts corresponding to the configuration of the fourth embodiment shown in FIG.

[0113]

In the fifth embodiment, the electronic zoom magnification setting circuit 115 is further provided with respect to the configuration of the fourth embodiment shown in FIG.

Since the electronic zoom magnification setting circuit 115 is provided, the motion correction circuit 116 can perform not only motion correction but also interpolation calculation. In that case, the configuration example of the motion correction circuit 116 is the fourth embodiment. A block diagram similar to that shown in FIG. 11 can be considered.

Further, the motion correction control circuit 117 can also control not only the motion correction of the motion correction circuit 116 but also the interpolation operation.

[0114]

Other configurations are the same as in the case of the fourth embodiment shown in FIG.

[0115]

In the fifth embodiment as well, the CCD 102 includes not only the interlaced read-out drive method of the first embodiment shown in FIG. 2 but also the all-pixel read-out drive method of the second embodiment shown in FIG. Can be used.

[0116]

In the image pickup apparatus according to the fifth embodiment, the reference clock of the image pickup element drive circuit 103, the image pickup element drive control circuit 107, the A / D 105, and the digital signal processing circuit 106 is fck1.

[0117]

Next, the output signal of the digital signal processing circuit 106 is clock-converted by the clock conversion circuit 112, and the reference clock becomes a digital signal of fck2.

Further, the output signal from the clock conversion circuit 112 is input to the motion correction circuit 116.

Here, the reference clock of the motion correction circuit 116 and the motion correction control circuit 117 is fck2.

[0118]

Further, the system control circuit 108 controls the image sensor drive control circuit 107 and the motion correction control circuit 117.

The motion data detected by the camera shake detection circuit 111 and the electronic zoom magnification set by the electronic zoom magnification setting circuit 115 are both input to the system control circuit 108, and the system control circuit 108 responds to the image sensor drive control circuit. By controlling 107 and the motion correction control circuit 117, not only camera shake correction but also electronic zoom processing (intertrusion enlargement processing) is performed.

[0119]

Next, the operation of the image sensor 102 and the image sensor drive circuit 103 will be described with reference to FIG.

[0120]

The entire region of the CCD 102 is composed of (m0 pixels × n0 lines) and has a margin region for camera shake correction.

Here, the signal in the region of (m0 pixel × n2 line) (n2 <n0) is read out by the high-speed sweeping process by the image sensor drive circuit 103, and then the imaging of this region (m0 pixel × n2 line) is performed. The signal is cut out from the digital signal processing unit 106 in the region of (m3 pixel × n2 line) (m3 <m0), and then the clock conversion by the clock conversion circuit 112 and the enlargement processing by the interpolation calculation are performed by the motion correction circuit 116. (M2 pixel x n1 line) (m2> m3, n1> n2) data signal.

[0121]

Here, based on the motion detection data detected by the camera shake amount detection circuit 111 and the electronic zoom magnification set by the electronic zoom magnification setting circuit 115, the CCD read area so as to suppress the vertical movement and match the zoom magnification. The position of A2 (m0 pixel × n2 line) is set, and the position of the signal cutout area A4 (m3 pixel × n2 line) is set so as to suppress the movement in the horizontal direction and match the zoom magnification.

[0122]

Also in this case, as in the case of the fourth embodiment, there is a relationship of n2 / n0 = m3 / m0 so that the aspect ratio (aspect ratio) is the same as that of the television signal.

[0123]

Subsequently, the clock frequency of data reading is converted by the clock conversion circuit 112 so that the signal of the cutout area A4 becomes the display area A5 (m2 pixel × n1 line) matching the output format of the television signal, and further. The motion correction circuit 116 enlarges the image to a predetermined vertical and horizontal size.

[0124]

As the electronic zoom processing (interpolation enlargement processing) in the motion correction circuit 116, as shown in FIG. 11, the memory control circuit 402 writes the electronic zoom process to the field memory 401, and the signal in the required area is read out.

The read signal is subjected to horizontal interpolation enlargement processing and vertical interpolation enlargement processing by the interpolation circuit 403.

In this interpolation circuit 403, the interpolation control circuit 404 performs enlargement processing including interpolation processing between pixels.

[0125]

As described above, in the fifth embodiment, the camera shake component is suppressed and the zoom magnification is matched according to the camera shake amount by the camera shake amount detection circuit 111 and the electronic zoom magnification set by the electronic zoom magnification setting circuit 115. The cutout area can be determined.

Moreover, as in the above-described first to fourth embodiments, the charge signal of the vertical transfer unit 1b is driven by the pixel mixing horizontal transfer unit 1c to add the charge signal in the vertical direction, so that the multi-pixel CCD 102 has a relatively low drive frequency. A moving image can be obtained, and a high-quality still image can be obtained by using signals in the entire region of the CCD 102.

[0126]

In the fifth embodiment, the case where both the camera shake correction and the electronic zoom functions are provided is shown, but the same effect can be obtained even in the case of the electronic zoom single function.

[0127]

(Embodiment 6) FIG. 15 is a block diagram of an image pickup apparatus according to a sixth embodiment of the present invention.

[0128]

The image pickup apparatus of the sixth embodiment controls the image pickup element section 201 having a photoelectric conversion function, the horizontal pixel shift section 202 provided in the image pickup element section 201, the image pickup element drive circuit 203 for the image pickup element section 201, and the image pickup element drive circuit 203. Brightness from A / D 206 and A / D converted digital signals for the output signals of the drive control circuit 204, the analog signal processing circuit 205 that performs processing such as sampling and amplification on the output signal of the image pickup element 201, and the analog signal processing circuit 205. Comprehensive digital signal processing circuit 207 that generates signals, color signals, color difference signals, etc. or RGB signal processing, horizontal pixel shift processing circuit 208, drive control circuit 204, and digital signal processing circuit 207 provided in the digital signal processing circuit 207. It is configured to include a system control circuit 209 to be controlled.

[0129]

The image pickup apparatus of the sixth embodiment configured as described above will be described.

[0130]

The image sensor unit 201 includes an optical element such as a prism and a plurality of CCDs, and the plurality of R, G, and B output signals output from the image sensor unit 201 via the horizontal pixel shift unit 202 are analog. It becomes a digital signal through the signal processing circuit 205 and the A / D conversion circuit 206.

The digital signal is processed by the digital signal processing circuit 207 through the horizontal pixel shift processing circuit 208 for the brightness signal processing and the color signal processing, and the brightness signal (Y1) and the color signal (C1) are output.

[0131]

Hereinafter, the horizontal pixel shift processing peculiar to the 3CCD signal processing will be described.

[0132]

First, the image sensor unit 201 provided with the horizontal pixel shift unit will be described with reference to FIG.

[0133]

When the image sensor unit 201 has a 3CCD configuration, the image sensor unit without the horizontal pixel shift unit is spatially at the same position with respect to the horizontal direction as shown in FIG. 16 (a). As shown in FIG. 16B, the image sensor unit 201 provided with the horizontal pixel shift unit 202 arranges the R / B-CCD in the spatially horizontal direction with respect to the G-CCD. On the other hand, the arrangement is shifted by 1/2 pixel.

As a result, when a luminance signal is obtained, the G signal and another signal are added in equal amounts to remove the folding component and obtain a high resolution.

Further, as another configuration example of the image sensor unit 201 provided with the horizontal pixel shift unit 202, the image sensor unit 201 has a 4CCD configuration (G1, G2, R, B-CCD) or the like, and in this case, it is referred to as G1-CCD. The G2-CCDs are spatially staggered by 1/2 pixel.

[0134]

Next, the operation of the horizontal pixel shift processing circuit 208 will be described with reference to FIG.

[0135]

In the method in which the image sensor unit 201 has a three-CCD configuration with horizontal pixel shift, when the drive frequency of the CCD is fck, the optical filter provided in the CCD drops the frequency of fck or higher.

As a result, high resolution can be obtained, but wrapping (moire) will occur when considering each of R, G, and B.

[0136]

However, due to this horizontal pixel shift, the phase of the moiré component of R and B is inverted with respect to the moiré component of G, so this moiré is substantially removed by adding R, G, and B in the signal processing calculation. (However, moire does not disappear completely and remains to some extent).

However, in many cases, the circuits for driving the R, G, and B CCDs are the same, and the temporal position of the signal actually extracted from the CCD is the timing as shown in the RB signal and the G signal in FIG.

Therefore, in order to restore the spatial position of the G signal, after delaying the G signal by 1T (T: 2fck rate), the Y matrix operation shown in the following equation (1) is performed.

[0137]

Y = 0.299R + 0.587G + 0.114B (1) As described above, in the image sensor having a 3CCD configuration, the horizontal pixel shift unit 202 and the horizontal pixel shift processing circuit 208 are provided to realize high resolution of the brightness signal, in other words. For example, the number of pixels and the drive frequency of the image sensor required to obtain the same horizontal resolution have been reduced.

In the image pickup apparatus of the sixth embodiment of the present invention, the horizontal pixel shift portion 202 is composed of the image pickup device shown in the first embodiment.

The operation of the horizontal pixel shifting unit 202 will be described below.

[0138]

Here, as shown in the first embodiment, the image sensor can perform high-speed transfer drive of the vertical transfer unit and drive to add the charge signal of the vertical transfer unit in the vertical direction.

As a result, for example, when an image sensor of 1280H × 1024V is interlaced and read out, assuming that the number of charge signals to be added and mixed by the pixel mixing horizontal transfer unit 1c for the V1 = 32 and V2 regions = 2 and V3 = 32, 1 During the field period, the region of 960 pixels in the center of the image sensor can be output as a signal of 240 lines, and the drive frequency at this time is 1280 x 240 x 60 = 16 considering the drive of only effective pixels by the NTSC method. It becomes .4 MHz.

Further, the horizontal resolution in this case has a resolution equivalent to 1920 pixels, which is about 1.5 times that of 1280 pixels by the processing of the horizontal pixel shift processing circuit 208.

[0139]

As described above, in the sixth embodiment, the high-speed transfer drive of the vertical transfer unit and the drive of adding the charge signal of the vertical transfer unit in the vertical direction are performed to move the moving image from the high-pixel image sensor at a relatively low drive frequency. By obtaining an image and performing horizontal pixel shift processing, it is possible to realize high resolution of the brightness signal in the horizontal direction.

In other words, the number of pixels and the drive frequency of the image sensor required to obtain the same horizontal resolution are reduced.

Further, it is possible to perform image stabilization by controlling the number of high-speed transfer drive stages.

In addition, a high-quality still image can be obtained by using signals in the entire region of the image sensor, and a high-quality still image having the same angle of view as the moving image can also be obtained.

[0140]

Although the image sensor having a 3CCD configuration having a horizontal pixel shift process has been described in the sixth embodiment, a high pixel image pickup with a relatively low drive frequency is also performed in the image sensor having a 3CCD configuration not having the horizontal pixel shift process. It is possible to obtain a moving image from the element and further perform camera shake correction by controlling the number of high-speed transfer drive stages.

Further, it is possible to obtain a high-quality still image by using the signals in the entire area of the CCD, and further, it is possible to obtain a high-quality still image having the same angle of view as the moving image.

[0141]

As described above, in the sixth embodiment, the high-speed transfer drive of the vertical transfer unit and the drive of adding the charge signal of the vertical transfer unit in the vertical direction are performed to move the moving image from the high-pixel image sensor at a relatively low drive frequency. By obtaining an image and performing horizontal pixel shift processing, it is possible to realize high resolution of the brightness signal in the horizontal direction.

In other words, the number of pixels and the drive frequency of the image sensor required to obtain the same horizontal resolution are reduced.

Further, it is possible to perform image stabilization by controlling the number of high-speed transfer drive stages.

In addition, a high-quality still image can be obtained by using signals in the entire region of the image sensor, and a high-quality still image having the same angle of view as the moving image can also be obtained.

[0142]

Although the image sensor having a 3CCD configuration having a horizontal pixel shift process has been described in the sixth embodiment, a high pixel image pickup with a relatively low drive frequency is also performed in the image sensor having a 3CCD configuration not having the horizontal pixel shift process. It is possible to obtain a moving image from the element and further perform camera shake correction by controlling the number of high-speed transfer drive stages.

Further, it is possible to obtain a high-quality still image by using the signals in the entire area of the CCD, and further, it is possible to obtain a high-quality still image having the same angle of view as the moving image.

[0143]

[Effects of the Invention] In the present invention, the following effects can be obtained.

[0144]

(1) According to the first and second inventions, even when a multi-pixel image sensor is used, the drive frequency can be lowered to drive the image sensor with low power consumption, and signals in the entire region of the image sensor can be transmitted. If used, it is possible to obtain a high-quality still image.

[0145]

(2) According to the third invention, in addition to the effect of (1) above, it is possible to further obtain a high-quality still image having the same angle of view as the moving image.

[0146]

(3) According to the fourth invention, in addition to the effects of (1) and (2) above, it is possible to reduce the drive frequency of the image sensor, support a plurality of television systems, and support high-sensitivity shooting. It can be done easily.

[0147]

(4) According to the fifth invention, in addition to the effects of (1) to (3) above, it is possible to reduce the drive frequency of the image sensor and realize the camera shake correction or the electronic zoom function.

[0148]

(5) According to the sixth invention, in addition to the effects of (1) to (4) above, not only the drive frequency of the image sensor can be reduced, but also high-resolution signals can be obtained in the horizontal and vertical directions. It is possible.

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CLAIMS JP2000295531A

1.

A light receiving unit in which each pixel for photoelectric conversion is arranged in the horizontal and vertical directions, a vertical transfer unit that vertically transfers the charge signal obtained by the light receiving unit, and a horizontal transfer unit that transfers the charge signal from the vertical transfer unit. In an imaging apparatus having an imaging element including a horizontal transfer unit for transferring to, the vertical transfer unit mixes and outputs charge signals obtained from upper and lower light receiving units adjacent to each other in the vertical direction. The horizontal transfer unit is an imaging device that mixes and outputs at least two or more charge signals that are adjacent to each other in the vertical direction and are transferred from the vertical transfer unit.

2.

A light receiving unit formed by arranging each pixel for photoelectric conversion in the horizontal and vertical directions, a vertical transfer unit that vertically transfers the charge signal obtained by the light receiving unit, and a horizontal transfer unit that transfers the charge signal from the vertical transfer unit. In an imaging apparatus having an imaging element including a horizontal transfer unit for transferring to, the vertical transfer unit sequentially individually captures charge signals obtained by each light receiving unit and transfers them in the vertical direction, and is horizontal. The transfer unit is an imaging device that mixes charge information of at least three upper and lower pixels adjacent to each other in the vertical direction transferred by the vertical transfer unit.

3.

The imaging device according to claim 1 or 2, further comprising a charge high-speed transfer means for increasing the vertical transfer rate of charge information in the vertical transfer unit.

4.

The imaging device according to any one of claims 1 to 3, further comprising a mixed pixel number control means for variably controlling the number of mixed pixels by the horizontal transfer unit.

5.

The image pickup device according to any one of claims 1 to 4, includes at least one of a camera shake amount detection circuit for detecting the camera shake amount and a zoom magnification setting circuit for setting an electronic zoom magnification, and the image sensor. An image pickup apparatus comprising: an image sensor drive circuit for driving and an image sensor drive control circuit for controlling the image sensor drive circuit based on at least one information of the camera shake amount or the zoom magnification.

6.

The imaging device according to any one of claims 1 to 5, wherein the same color filter element is arranged in the light receiving unit along the vertical direction of each pixel.

7.

The imaging device according to claim 6, wherein the color filter element has a vertical stripe configuration including a primary color filter or a complementary color filter.

8.

The imaging device according to claim 7, wherein the vertical stripe configuration has a configuration of R / G / B or Ye / G / Mg.

9.

The image pickup apparatus according to any one of claims 1 to 5, wherein a color separation optical means for decomposing light from a subject is arranged in front of the image pickup device.

10.

The image pickup device according to claim 9, wherein the color separation optical means is composed of a prism that separates a subject image into R, G, and B.

Espacenet

Bibliographic data: JPH09275351 (A) — 1997-10-21

PLURAL-MODE MOBILE RADIO EQUIPMENT

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Applicant(s): MATSUSHITA ELECTRIC IND CO LTD ± (MATSUSHITA ELECTRIC IND CO LTD)

Classification: **- international:** ***H04B1/04; H04B1/3822; H04B1/40; H04W52/02; H04W88/02;*** (IPC1-7): H04B1/04; H04B1/40; H04Q7/38

- cooperative: Y02D30/70 (EP)

Application number: JP19960110568 19960408

Priority number (s): JP19960110568 19960408

Also published as: CN1169089 (A)

Abstract of JPH09275351 (A)

PROBLEM TO BE SOLVED: To provide a mobile radio equipment operated for plural mobile communication systems in which increase in current consumption of power amplifiers is suppressed by bypassing an isolator with respect to a mobile communication system not needing any isolator. SOLUTION: Signals received from I, Q modulation input terminals 14, 15 respectively pass trough low-pass filters 12, 13, modulated by an orthogonal modulator 11, given to a variable gain amplifier 10, in which the gain is adjusted, the resulting signal passes through a low-pass filter 9 and converted into a radio frequency by a transmission mixer 7. Then the signal is given to a variable gain amplifier 6, in which the gain is adjusted and the result is given to a power amplifier 5. The output of the power amplifier 5 is selected so as to be led to an isolator 3 or bypass the isolator 3 by a high frequency switch 4 selected depending on a mobile communication system. Then the transmission wave is given to a shared equipment 2 and sent from an antenna 1 as a radio wave to a radio base station.

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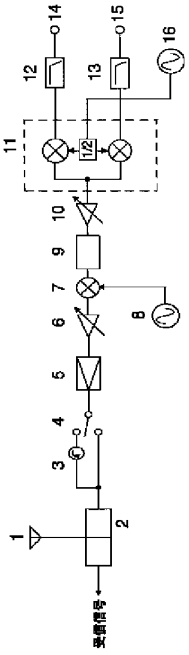
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(54)【発明の名称】　複数モード移動無線機

(57)【要約】

【課題】　アイソレータが不要な移動通信システムに対してはアイソレータをバイパスすることにより、電力増幅器の消費電流の増大を抑えた複数の移動通信システムで動作する移動無線機を提供する。

【解決手段】　Ｉ、Ｑ変調入力端子14、15から入力された信号はそれぞれの低域通過フィルタ12、13を通過し、直交変調器11で変調され、可変利得増幅器10で利得調整され、低域通過フィルタ９を通過後、送信ミキサ７で無線周波数に変換される。その後、可変利得増幅器６で利得調整された後、電力増幅器５に入力される。電力増幅器５の出力は、移動通信システムによって切り替わる高周波スイッチ４によりアイソレータ３を介在させるか、バイパスさせるかの切り替えが行なわれる。その後、送信波は共用器２に入力され、アンテナ１から電波として無線基地局へ送信される。



【特許請求の範囲】
【請求項１】　異なった通信方式を使用する複数の移動通信システムに対し、変復調方式を前記複数の移動通信システムにより切り替えてアクセスできるようにした複数の通信方式で動作する移動無線機において、電力増幅器の出力側に前記複数の移動通信システムによって切り替わる高周波スイッチを設け、アイソレータが必要とされる移動通信システムに対してはアイソレータを介在させ、アイソレータが不要な移動通信システムに対してはアイソレータをバイパスさせることを特徴とする複数モード移動無線機。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、変復調方式を切り替えて複数の移動通信システムで動作するようにした複数モード移動無線機に関し、特にアイソレータが不要な移動通信システムに対してはアイソレータをバイパスして、電力増幅器の消費電流の増大を抑えた複数の移動通信システムで動作する移動無線機に関する。
【０００２】
【従来の技術】図２は従来の技術による、異なった通信方式を使用する複数の移動通信システムで動作する移動無線機の送信回路部の構成を示すものである。以下、この従来例の動作について図２とともに説明する。
【０００３】図２において、送信回路部は、アンテナ１と、共用器２と、アイソレータ３と、電力増幅器５と、可変利得増幅器６と、送信ミキサ７と、第１局部発振器８と、低域通過フィルタ９と、可変利得増幅器10と、直交変調器11と、Ｉ変調入力信号に対する低域通過フィルタ12と、Ｑ変調入力信号に対する低域通過フィルタ13と、Ｉ変調入力端子14と、Ｑ変調入力端子15と、送信変調用局部発振器16とから構成されている。
【０００４】Ｉ、Ｑ変調入力端子14、15から入力された信号は、それぞれの低域通過フィルタ12、13を通過し、直交変調器11で変調され、可変利得増幅器10で利得調整され、低域通過フィルタ９を通過後、送信ミキサ７で無線周波数に変換される。その後、可変利得増幅器６で利得調整された後、電力増幅器５に入力される。電力増幅器５の出力はアイソレータ３を通過した後、共用器２に入力され、アンテナ１から電波として無線基地局へ送信される。
【０００５】
【発明が解決しようとする課題】前記従来の構成においては、アイソレータを用いなければならず、アイソレータの通過損失を無視するわけにはいかない。つまり、アイソレータ前段までにこの損失を考慮した電力増幅レベルが必要であり、アイソレータが不要な移動通信システムに対しても電力増幅器の消費電流を増大させてしまい、通話時間が短くなるという問題があった。
【０００６】本発明は、このような従来の問題を解決するものであり、アイソレータが不要な移動通信システムに対してはアイソレータをバイパスすることにより、電力増幅器の消費電流の増大を抑えた複数の移動通信システムで動作する移動無線機を提供することを目的とするものである。
【０００７】
【課題を解決するための手段】前記の目的を達成するために本発明は、電力増幅器の出力側に高周波スイッチを設け、アイソレータが不要な移動通信システムに対しては、アイソレータをバイパスすることにより、電力増幅器の消費電流の増大を抑えるようにしたものである。
【０００８】
【発明の実施の形態】図１は、異なった通信方式を使用する複数の移動通信システムで動作する本発明の移動無線機の送信回路部のブロック図を示す。以下、この実施の形態の動作について図１とともに説明する。
【０００９】図１において、送信回路部は、アンテナ１と、共用器２と、アイソレータ３と、高周波スイッチ４と、電力増幅器５と、可変利得増幅器６と、送信ミキサ７と、第１局部発振器８と、低域通過フィルタ９と、可変利得増幅器10と、直交変調器11と、Ｉ変調入力信号に対する低域通過フィルタ12と、Ｑ変調入力信号に対する低域通過フィルタ13と、Ｉ変調入力端子14と、Ｑ変調入力端子15と、送信変調用局部発振器16とから構成されている。
【００１０】Ｉ、Ｑ変調入力端子14、15から入力された信号はそれぞれの低域通過フィルタ12、13を通過し、直交変調器11で変調され、可変利得増幅器10で利得調整され、低域通過フィルタ９を通過後、送信ミキサ７で無線周波数に変換される。その後、可変利得増幅器６で利得調整された後、電力増幅器５に入力される。電力増幅器５の出力は、移動通信システムによって切り替わる高周波スイッチ４によりアイソレータ３を介在させるか、バイパスさせるかの切り替えが行なわれる。その後、送信波は共用器２に入力され、アンテナ１から電波として無線基地局へ送信される。
【００１１】この構成において、アイソレータ３を必要としない移動通信システム（例えば、アナログセルラーシステム）に対しては、アイソレータ３をバイパスさせることができるので、アイソレータ３の通過損失（約０．７ｄＢ～１．０ｄＢ）の分だけ電力増幅器５の消費電流を低減させることができ、電池使用時間（通話時間）の長い、複数の通信方式で動作する移動無線機を実現できるものである。
【００１２】
【発明の効果】前記実施の形態の説明から明らかなように本発明は、アイソレータの不要な移動通信システム（例えば、アナログセルラーシステム）においては、アイソレータをバイパスし、電力増幅器の不要な消費電流の増加を抑えるとともに、アイソレータを必要とする移

動通信システム（例えば、デジタル変調セルラーシステム）においてはアイソレータを介在させるようにし、アイソレータの不要な移動通信システムにおいて、通話時間を長くすることができるという効果を有する。

【図面の簡単な説明】

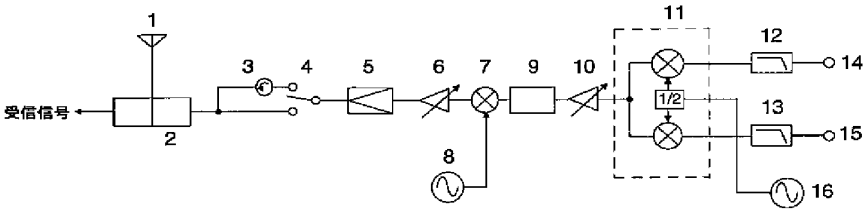
【図１】本発明の移動無線機の送信回路部の実施の形態を示す概略ブロック図、

【図２】従来の移動無線機の送信回路部を示す概略ブロック図である。

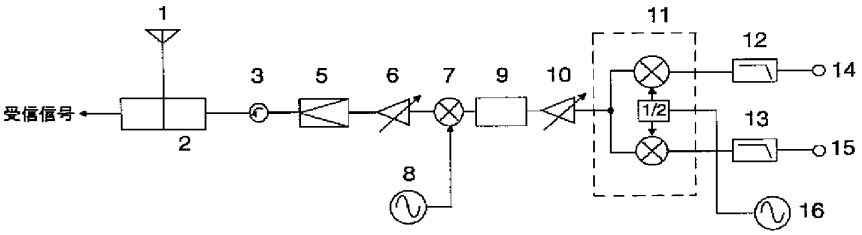
【符号の説明】

１　アンテナ
２　共用器
３　アイソレータ
４　高周波スイッチ
５　電力増幅器
６　可変利得増幅器
７　送信ミキサ
８　第１局部発振器
９、12、13　低域通過フィルタ
10　可変利得増幅器
11　直交変調器
14　Ｉ信号変調入力端子
15　Ｑ信号変調入力端子
16　送信変調用局部発振器

【図１】



【図２】



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Bibliographic data: JPH09275351 (A) — 1997-10-21

PLURAL-MODE MOBILE RADIO EQUIPMENT

Inventor(s): ITO FUMIO; NAKAYAMA KEIICHI ± (ITO FUMIO, ; NAKAYAMA KEIICHI)

Applicant(s): MATSUSHITA ELECTRIC IND CO LTD ± (MATSUSHITA ELECTRIC IND CO LTD)

Classification: **- international:** ***H04B1/04; H04B1/3822; H04B1/40; H04W52/02; H04W88/02;*** (IPC1-7): H04B1/04; H04B1/40; H04Q7/38

- cooperative: Y02D30/70 (EP)

Application number: JP19960110568 19960408

Priority number (s): JP19960110568 19960408

Also published as: CN1169089 (A)

Abstract of JPH09275351 (A)

PROBLEM TO BE SOLVED: To provide a mobile radio equipment operated for plural mobile communication systems in which increase in current consumption of power amplifiers is suppressed by bypassing an isolator with respect to a mobile communication system not needing any isolator. SOLUTION: Signals received from I, Q modulation input terminals 14, 15 respectively pass trough low-pass filters 12, 13, modulated by an orthogonal modulator 11, given to a variable gain amplifier 10, in which the gain is adjusted, the resulting signal passes through a low-pass filter 9 and converted into a radio frequency by a transmission mixer 7. Then the signal is given to a variable gain amplifier 6, in which the gain is adjusted and the result is given to a power amplifier 5. The output of the power amplifier 5 is selected so as to be led to an isolator 3 or bypass the isolator 3 by a high frequency switch 4 selected depending on a mobile communication system. Then the transmission wave is given to a shared equipment 2 and sent from an antenna 1 as a radio wave to a radio base station.

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DESCRIPTION JPH09275351A

[0001]

INDUSTRIAL APPLICABILITY The present invention relates to a multi-mode mobile radio in which a modulation / demodulation method is switched to operate in a plurality of mobile communication systems, and the isolator is bypassed particularly for a mobile communication system that does not require an isolator. The present invention relates to a mobile radio that operates in a plurality of mobile communication systems that suppress an increase in current consumption of a power amplifier.

[0002]

FIG. 2 shows a configuration of a transmission circuit unit of a mobile radio operating in a plurality of mobile communication systems using different communication methods according to the conventional technology.

Hereinafter, the operation of this conventional example will be described with reference to FIG.

[0003]

In FIG. 2, the transmission circuit unit includes an antenna 1, a duplexer 2, an isolator 3, a power amplifier 5, a variable gain amplifier 6, a transmission mixer 7, a first local oscillator 8, and a low-pass filter 9. , Variable gain amplifier 10, orthogonal modulator 11, low-pass filter 12 for I-modulated input signal, low-pass filter 13 for Q-modulated input signal, I-modulated input terminal 14, and Q-modulated input terminal 15. And a local oscillator 16 for transmission modulation.

[0004]

The signals input from the I and Q modulation input terminals 14 and 15 pass through the low-pass filters 12 and 13, respectively, are modulated by the orthogonal modulator 11, gain is adjusted by the variable gain amplifier 10, and are low-pass filters. After passing through 9, the transmission mixer 7 converts the frequency into a radio frequency.

Then, after the gain is adjusted by the variable gain amplifier 6, it is input to the power amplifier 5.

After passing through the isolator 3, the output of the power amplifier 5 is input to the duplexer 2 and transmitted from the antenna 1 to the radio base station as radio waves.

[0005]

PROBLEM TO BE SOLVED: To solve a problem. In the above-mentioned conventional configuration, an isolator must be used, and the pass loss of the isolator cannot be ignored.

In other words, a power amplification level that takes this loss into consideration is required before the isolator, and there is a problem that the current consumption of the power amplifier is increased even for mobile communication systems that do not require an isolator, and the talk time is shortened. It was.

[0006]

The present invention solves such a conventional problem, and for a mobile communication system that does not require an isolator, a plurality of mobile communication systems that suppress an increase in current consumption of a power amplifier by bypassing the isolator. It is an object of the present invention to provide a mobile radio that operates in.

[0007]

In order to achieve the above object, the present invention provides a high frequency switch on the output side of a power amplifier, and bypasses an isolator for a mobile communication system that does not require an isolator. , The increase in the current consumption of the power amplifier is suppressed.

[0008]

BEST MODE FOR CARRYING OUT THE INVENTION FIG. 1 shows a block diagram of a transmission circuit unit of a mobile radio of the present invention operating in a plurality of mobile communication systems using different communication methods.

Hereinafter, the operation of this embodiment will be described with reference to FIG.

[0009]

In FIG. 1, the transmission circuit unit includes an antenna 1, a duplexer 2, an isolator 3, a high frequency switch 4, a power amplifier 5, a variable gain amplifier 6, a transmission mixer 7, a first local oscillator 8, and the like. A low-pass filter 9, a variable gain amplifier 10, an orthogonal modulator 11, a low-pass filter 12 for an I-modulated input signal, a low-pass filter 13 for a Q-modulated input signal, and an I-modulated input terminal 14. It is composed of a Q modulation input terminal 15 and a transmission modulation local oscillator 16.

[0010]

The signals input from the I and Q modulation input terminals 14 and 15 pass through the low-pass filters 12 and 13, respectively, are modulated by the orthogonal modulator 11, gain is adjusted by the variable gain amplifier 10, and the low-pass filter 9 is used. After passing through, the transmission mixer 7 converts the frequency into a radio frequency.

Then, after the gain is adjusted by the variable gain amplifier 6, it is input to the power amplifier 5.

The output of the power amplifier 5 is switched between interposing the isolator 3 and bypassing it by the high frequency switch 4 switched by the mobile communication system.

After that, the transmitted wave is input to the common device 2 and transmitted as a radio wave from the antenna 1 to the radio base station.

[0011]

In this configuration, for a mobile communication system that does not require the isolator 3 (for example, an analog cellular system), the isolator 3 can be bypassed, so that the pass loss of the isolator 3 (about 0.7 dB to 1.0 dB). The current consumption of the power amplifier 5 can be reduced by the amount of the above, and a mobile radio that operates in a plurality of communication methods with a long battery usage time (talk time) can be realized.

[0012]

INDUSTRIAL APPLICABILITY As is clear from the description of the embodiment, the present invention bypasses an isolator in a mobile communication system that does not require an isolator (for example, an analog cellular system), and reduces unnecessary current consumption of a power amplifier. In addition to suppressing the increase, in a mobile communication

system that requires an isolator (for example, a digital modulation cellular system), an isolator is interposed, and in a mobile communication system that does not require an isolator, the talk time can be lengthened. Have.

[0013]

A brief description of the drawing

[0014]

FIG. 1 Schematic block diagram showing an embodiment of a transmission circuit unit of the mobile radio of the present invention.

[0015]

FIG. 2 is a schematic block diagram showing a transmission circuit unit of a conventional mobile radio.

[0016]

Code description

[0017]

1 Antenna 2 Commoner 3 Isolator 4 High frequency switch 5 Power amplifier 6 Variable gain amplifier 7 Transmission mixer 8 1st local oscillator 9, 12, 13 Low frequency pass filter 10 Variable gain amplifier 11 Orthogonal modulator 14 I Signal modulation input terminal 15 Q Signal modulation input terminal 16 Local oscillator for transmission modulation

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CLAIMS JPH09275351A

1.

In a mobile radio operating in a plurality of communication methods in which a modulation / demodulation method can be switched and accessed by the plurality of mobile communication systems for a plurality of mobile communication systems using different communication methods, the output side of the power amplifier A feature is that a high-frequency switch that is switched by the plurality of mobile communication systems is provided, an isolator is interposed for a mobile communication system that requires an isolator, and an isolator is bypassed for a mobile communication system that does not require an isolator. Multi-mode mobile radio.

Espacenet

Bibliographic data: JPH0660158 (A) — 1994-03-04

PICTURE FILE STORAGE MEDIUM AND PICTURE FILE DEVICE

Inventor(s): OBA AKIHIKO; MATSUMOTO KIYOSHI ± (OBA AKIHIKO, ; MATSUMOTO KIYOSHI)

Applicant(s): HITACHI LTD ± (HITACHI LTD)

Classification: **- international:** ***G06T1/00; G06T9/00; H04N5/92;*** (IPC1-7): G06F15/62; G06F15/66; H04N5/92

- cooperative:

Application number: JP19920213957 19920811

Priority number (s): JP19920213957 19920811

Abstract of JPH0660158 (A)

PURPOSE:To quicken the operation when compressed picture information is retrieved visually by recording information of a low frequency component of the picture compression information in a management information storage area on which recording addresses of picture information or the like are stored. CONSTITUTION:When the retrieval of picture is commanded by a host computer, an optical disk drive reads management information 3 of certain picture information and stores the information to the host computer. The optical disk drive reads low frequency component information 4 of the compressed picture information from the picture information whose management information 3 is read continuously and transfers the information 4 to a picture information processing section. The picture information processing section expands the low frequency component information of the compressed picture information and displays the result onto a monitor. Since the picture is recognized by using only the low frequency component of the picture information based on the visual characteristic of human being, whether or not the picture is the desired picture is discriminated from the picture displayed on the monitor. When the desired picture is not obtained, the similar operation is repeated to succeeding picture information.

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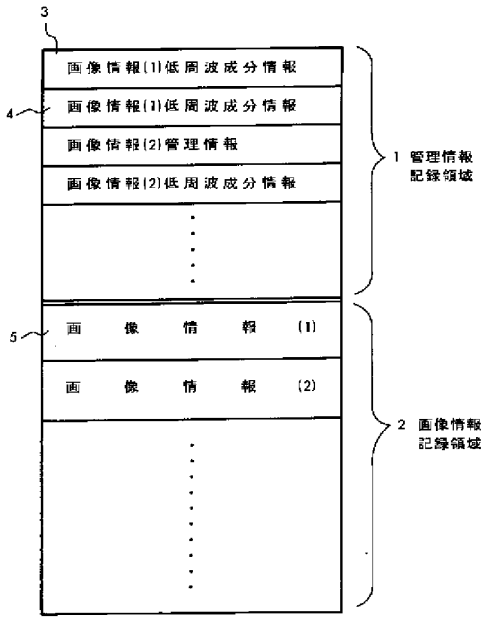
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(54)【発明の名称】　画像ファイル用記憶媒体および画像ファイル装置

(57)【要約】
【目的】圧縮された画像情報をビジュアルに検索する動作を高速化した画像ファイル装置を提供する。
【構成】画像情報の記録アドレスなどが記録されている管理情報記録領域１に、圧縮画像情報の低周波成分情報４を記録した画像ファイル用記憶媒体。
【効果】圧縮された画像情報をビジュアルに検索を行う時、画像表示動作が従来例に比較して簡易で高速にできるため、検索がスムーズに行える。

図　1



【特許請求の範囲】
【請求項１】画像情報を直交変換を用いて周波数成分に変換し、前記画像情報を圧縮して記録する記憶媒体であって、前記画像圧縮情報を前記記憶媒体に記録するときに、前記画像圧縮情報の低周波成分の情報を、前記記憶媒体の前記画像情報のアドレス情報などが記録されている管理情報記録領域に記録することを特徴とする画像ファイル用記憶媒体。
【請求項２】請求項１において、前記画像圧縮情報の低周波成分の情報が画像の管理情報と連続して記録されている画像ファイル用記憶媒体。
【請求項３】請求項１における画像ファイル用記憶媒体に記録されている前記画像圧縮情報の低周波成分の情報を用いて、画像検索する画像ファイル装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は主に動画，静止画などの画像情報を圧縮して記録再生する光ディスク，磁気ディスクなどの画像ファイル用記憶媒体及び画像ファイル装置に関する。
【０００２】
【従来の技術】静止画，動画などの莫大な容量と高速転送速度を必要とする画像情報を蓄積，伝送するために画像情報圧縮（高能率符号化）の研究が盛んに行われている。これらの圧縮した画像情報の各情報機器での互換性を保つために、国際標準の規格もまとまりつつある。現状では、静止画の圧縮方式の規格はＪＰＥＧ（JointPhotographic Experts Group）、動画の圧縮方式の規格はＭＰＥＧ（MovingPicture Experts Group)が認められている。いずれの規格も、ＤＣＴ（離散コサイン変換）で画像情報を周波数成分に変換し、最適なビット配分をすることにより画像情報の圧縮を図っている。このため、現在はＤＣＴによる画像の圧縮が主流であり、将来的にも画像圧縮技術の主流になると考えられている。このように、画像情報を蓄積するには画像圧縮技術は必須であり、画像ファイル装置のメモリに記憶できる画像情報の量も膨大になってきている。このため、膨大な画像情報の中から所望の画像を高速に得るための検索方法が望まれており、特に画像情報に適したビジュアルな高速検索方法が必要とされている。
【０００３】従来、画像情報を光ディスク，磁気ディスクなどの記憶媒体に記録再生する画像ファイル装置では、画像情報を記録する場合、スキャナ，カメラなどから入力した画像情報が圧縮，符号化されて記憶媒体に記録されるとともに、その画像情報が記録されているアドレスなどの管理情報が記憶媒体に記録される。
【０００４】図４は従来の画像ファイル装置における記憶媒体のボリューム構造を示す。１は記録されている画像情報のアドレスなどを記録する管理情報記録領域、２は圧縮した画像情報の記録領域である。
【０００５】図５はこのような画像ファイル装置で、画像をモニタ上に表示し、ビジュアルに画像の検索を行う手順に示す。まず、任意の一つの画像情報の記録アドレス情報が管理情報記録領域から再生ヘッドで読み出され、それに基づき画像情報記録領域の所定のアドレスに再生ヘッドがアクセス（５１）し、そこで圧縮された全画像情報が読み出され（５２）、この全画像情報が伸張され（５３）、モニタ上に画像が表示される。このモニタ上に表示された画像が所望の画像でないならば、次の画像について同じ動作を繰り返す。
【０００６】
【発明が解決しようとする課題】上記従来技術は一つの画像情報について、管理情報の読み出し，画像情報領域へのアクセス，全画像情報の読み出し，全画像情報の伸張，画像のモニタへの表示を行い、所望の画像が得られるまでこの動作を繰り返す。この中で特に画像情報領域へのアクセス，全画像情報の伸張は他の動作に比較して時間がかかるため、所望の画像を検索するまでに多大な時間を要するという問題があった。また、複数の縮小画像を画面に表示して検索を行うマルチ画面検索においても、同様の理由から多大な時間を要していた。
【０００７】本発明の目的は、圧縮された画像情報をビジュアルに検索する動作を高速化した画像ファイル装置を提供することにある。
【０００８】
【課題を解決するための手段】本発明は、上記目的を達成するために、画像情報を離散コサイン変換などの直交変換を用いて周波数成分に変換し、前記画像情報を圧縮して記録する記憶媒体において、画像情報の記録アドレスなどが記録されている管理情報記録領域に、前記画像圧縮情報の低周波成分の情報を記録したものである。
【０００９】
【作用】人間の視覚特性から、画像を認識するには画像の低周波成分だけを表示すれば十分である。このことから、本発明の画像ファイル用記憶媒体を用いると、画像圧縮情報の低周波成分の情報が管理情報記録領域に記録されているため、圧縮された画像情報をビジュアルに検索する時、画像情報領域へのアクセス，全画像情報の伸張が不要になり、従来、多大な時間を要した検索時間を大幅に高速化することができる。
【００１０】
【実施例】図１は本発明の一実施例を示す画像ファイル用記憶媒体のボリューム構造である。１は管理情報記録領域、２は画像情報記録領域であり、管理情報記録領域１には画像情報５の記録アドレス、検索項目などの管理情報３と圧縮画像情報の低周波成分情報４が図示のように、順次、記録される。管理情報３と圧縮画像情報の低周波成分情報４との順序は特に規定はなく、管理情報記録領域１に記録されていればよい。
【００１１】図２は本発明による光ディスクを用いた画

像ファイル装置の構成例である。画像入力装置はカメラ１１、及びスキャナ１２，画像出力装置はモニタ９、及びプリンタ１０，情報の記録再生は記憶媒体に光ディスクを用いた光ディスクドライブ８で行う。カメラ１１もしくはスキャナ１２から入力した画像情報は、画像処理部７で圧縮を行うとともに、検索表示に十分な低周波成分を抽出し、ホストコンピュータ６から指定される画像情報の管理情報とともに、光ディスクに記録される。また、光ディスクから再生した圧縮画像情報を伸張する作業も、画像処理部７で行う。これら全ての装置は専用バス１３でホストコンピュータ６に接続され、ホストコンピュータ６がシステム全体の制御を行う。

【００１２】このように構成された画像ファイル装置において、本発明による図１のボリューム構造の光ディスクを用いた場合のビジュアルな画像検索動作を説明する。

【００１３】図３は本発明の画像検索動作の概略フローチャートである。まず最初にホストコンピュータ６により画像検索の指示を行うと、光ディスクドライブ８である一つの画像情報の管理情報３を読み出し、この情報はホストコンピュータ６に記憶される。連続して光ディスクドライブ８では管理情報を読み出した画像情報の圧縮画像情報の低周波成分情報４を読み出し、画像情報処理部７へ転送する。画像情報処理部７では圧縮画像情報の低周波成分情報を伸張し、モニタ９に表示する。

【００１４】人間の視覚特性より、画像情報の低周波成分だけで画像を認識することができるため、モニタ９に表示された画像で所望の画像かどうかを判断することができる。ここで、所望の画像が得られなかった場合は、次の画像情報について同様の動作を行い、所望の画像が得られるまで繰り返す。モニタ９上で画像検索を行い所望の画像が得られたときは、ホストコンピュータ６は選定された画像の管理情報３から、光ディスクドライブ８へ画像情報５の記録アドレスを指示し、所望の画像情報５を読み出す。読み出された画像情報はモニタ９に１画面表示するか、またはプリンタ１０で紙に印刷する。

【００１５】以上が圧縮された画像情報をビジュアルな検索方法によって所望の画像を得るまでの概略である。本実施例と従来例による画像検索動作を示す図５とを比較すると、本発明では画像情報領域へのアクセスが不要になり、画像情報の読みだし、伸張も全画像情報の一部で済むため、画像検索が非常に高速に行えることが分かる。

【００１６】なお本実施例では光ディスクを記憶媒体に用いたが、磁気ディスクなど他の記憶媒体にも同様に適用できる。また、例えば、複数枚の縮小した画像情報を画面に表示して検索するマルチ画面検索など、本実施例と異なる画像検索方法でもビジュアルな画像検索方法であれば本発明の効果は得られる。

【００１７】

【発明の効果】本発明によれば、離散コサイン変換などの直交変換を用いて周波数成分に変換し圧縮された画像情報を、ビジュアルに検索を行う時、画像表示動作が従来例に比較して簡易で高速にできるため、検索がスムーズに行える。

【図面の簡単な説明】

【図１】本発明の一実施例を示す画像ファイル用記憶媒体の説明図。

【図２】画像ファイル装置のブロック図。

【図３】本発明による画像検索動作のフローチャート。

【図４】従来の画像ファイル用記憶媒体の説明図。

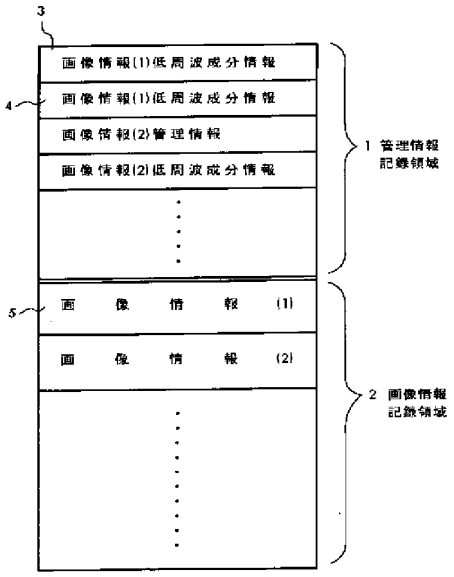
【図５】従来例による画像検索動作のフローチャート。

【符号の説明】

１…管理情報記録領域、２…画像情報記録領域、３…管理情報、４…圧縮画像情報の低周波成分情報、５…画像情報。

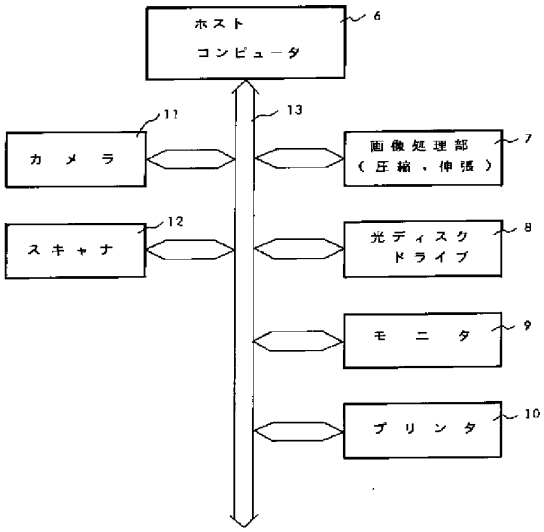
【図１】

図　1



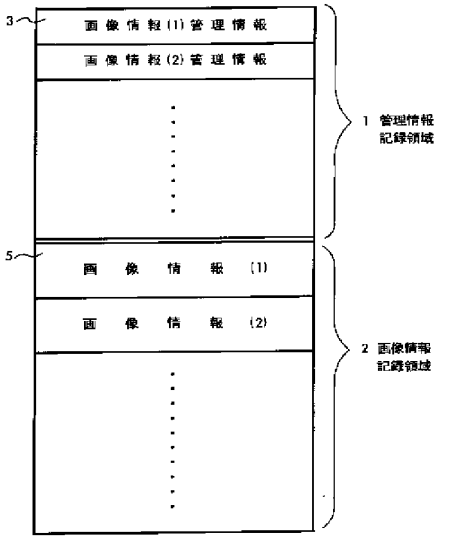
【図２】

図　2



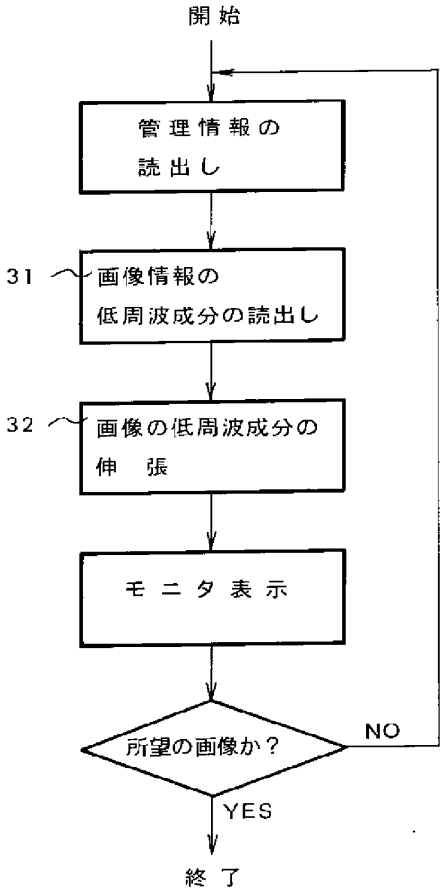
【図４】

図　4



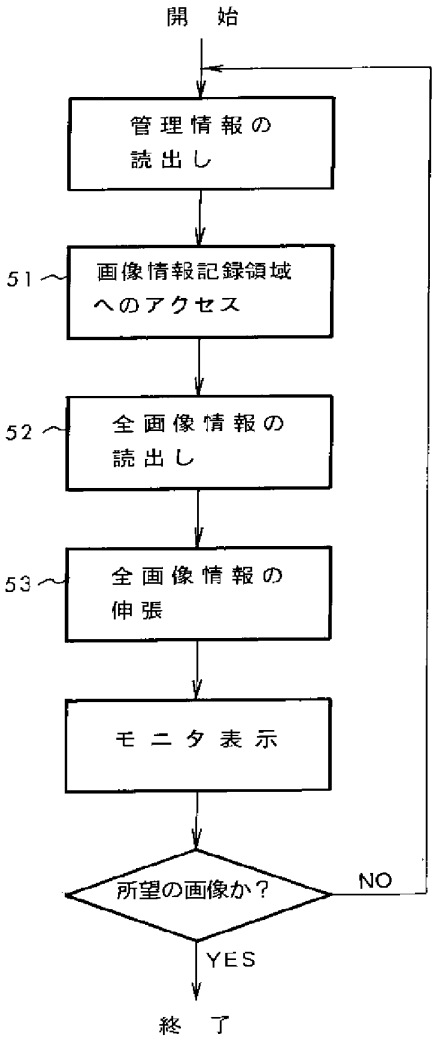
【図３】

図　３


開始
管理情報の読出し
31
画像情報の低周波成分の読出し
32
画像の低周波成分の伸張
モニタ表示
所望の画像か？
NO
YES
終了

【図５】

図　５


開始
管理情報の読出し
51
画像情報記録領域へのアクセス
52
全画像情報の読出し
53
全画像情報の伸張
モニタ表示
所望の画像か？
NO
YES
終了

Espacenet

Bibliographic data: JPH0660158 (A) — 1994-03-04

PICTURE FILE STORAGE MEDIUM AND PICTURE FILE DEVICE

Inventor(s): OBA AKIHIKO; MATSUMOTO KIYOSHI ± (OBA AKIHIKO, ; MATSUMOTO KIYOSHI)

Applicant(s): HITACHI LTD ± (HITACHI LTD)

Classification: **- international:** ***G06T1/00; G06T9/00; H04N5/92;*** (IPC1-7): G06F15/62; G06F15/66; H04N5/92

- cooperative:

Application number: JP19920213957 19920811

Priority number (s): JP19920213957 19920811

Abstract of JPH0660158 (A)

PURPOSE:To quicken the operation when compressed picture information is retrieved visually by recording information of a low frequency component of the picture compression information in a management information storage area on which recording addresses of picture information or the like are stored. CONSTITUTION:When the retrieval of picture is commanded by a host computer, an optical disk drive reads management information 3 of certain picture information and stores the information to the host computer. The optical disk drive reads low frequency component information 4 of the compressed picture information from the picture information whose management information 3 is read continuously and transfers the information 4 to a picture information processing section. The picture information processing section expands the low frequency component information of the compressed picture information and displays the result onto a monitor. Since the picture is recognized by using only the low frequency component of the picture information based on the visual characteristic of human being, whether or not the picture is the desired picture is discriminated from the picture displayed on the monitor. When the desired picture is not obtained, the similar operation is repeated to succeeding picture information.

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DESCRIPTION JPH0660158A

[0001]

INDUSTRIAL APPLICABILITY The present invention mainly relates to storage media for image files such as optical disks and magnetic disks for compressing and recording / reproducing image information such as moving images and still images, and image file devices.

[0002]

[Conventional Technology] Research on image information compression (high-efficiency coding) is being actively conducted in order to store and transmit image information such as still images and moving images that requires a huge capacity and high-speed transfer speed.

International standards are being put together to maintain compatibility of these compressed image information with each information device. Currently, JPEG (JointPhotographic Experts Group) is recognized as the standard for still image compression, and MPEG (Moving Picture Experts Group) is recognized as the standard for video compression. In each standard, image information is converted into frequency components by DCT (discrete cosine transform), and image information is compressed by optimal bit allocation. For this reason, image compression by DCT is currently the mainstream, and it is considered that it will become the mainstream of image compression technology in the future. As described above, image compression technology is indispensable for accumulating image information, and the amount of image information that can be stored in the memory of the image file device is becoming enormous. Therefore, a search method for obtaining a desired image at high speed from a huge amount of image information is desired, and a visual high-speed search method particularly suitable for image information is required.

[0003]

Conventionally, in an image file device that records and reproduces image information on a storage medium such as an optical disk or a magnetic disk, when recording the image information, the image information input from a scanner, a camera, or the like is compressed and encoded and recorded on the storage medium. At the same time, management information such as the address where the image information is recorded is recorded in the storage medium.

[0004]

FIG. 4 shows the volume structure of the storage medium in the conventional image file device.

1 is a management information recording area for recording the address of the recorded image information and the like, and 2 is a compression image information recording area.

[0005]

FIG. 5 shows a procedure for displaying an image on a monitor and visually searching for an image with such an image file device.

First, the recording address information of any one image information is read from the management information recording area by the playback head, and based on this, the playback head accesses (51) the predetermined address of the image information recording area, and all compressed there. The image information is read (52), the entire image information is decompressed (53), and the image is displayed on the monitor.

If the image displayed on this monitor is not the desired image, the same operation is repeated for the next image.

[0006]

PROBLEM TO BE SOLVED: To solve a problem in the above-mentioned prior art, for one image information, reading management information, accessing an image information area, reading all image information, expanding all image information, and displaying an image on a monitor. This operation is repeated until a desired image is obtained.

Among these, there is a problem that it takes a lot of time to search for a desired image because it takes time to access the image information area and expand all the image information as compared with other operations. Further, in the multi-screen search in which a plurality of reduced images are displayed on the screen for the search, a large amount of time is required for the same reason.

[0007]

An object of the present invention is to provide an image file device that accelerates the operation of visually searching for compressed image information.

[0008]

According to the present invention, in order to achieve the above object, image information is converted into frequency components by using orthogonal transform such as discrete cosine transform, and the image information is compressed and recorded. In the medium, the information of the low frequency component of the image compression information is recorded in the management information recording area in which the recording address of the image information and the like are recorded.

[0009]

[Action] From the visual characteristics of human beings, it is sufficient to display only the low frequency components of an image in order to recognize the image.

From this, when the storage medium for an image file of the present invention is used, the information of the low frequency component of the image compression information is recorded in the management information recording area, so that when the compressed image information is visually searched, the image is displayed. Access to the information area and decompression of all image information are no longer required, and the search time, which used to take a lot of time, can be greatly increased.

[0010]

[Example] FIG. 1 is a volume structure of a storage medium for an image file showing an embodiment of the present invention.

1 is a management information recording area, 2 is an image information recording area, and management information 3 such as a recording address of image information 5 and search items and low frequency component information 4 of compressed image information are illustrated in the management information recording area 1. As such, it is recorded sequentially.

The order of the management information 3 and the low-frequency component information 4 of the compressed image information is not particularly specified, and may be recorded in the management information recording area 1.

[0011]

FIG. 2 is a configuration example of an image file device using an optical disc according to the present invention.

The image input device is a camera 11, a scanner 12, an image output device is a monitor 9, a printer 10, and information recording / reproduction is performed by an optical disk drive 8 using an optical disk as a storage medium.

The image information input from the camera 11 or the scanner 12 is compressed by the image processing unit 7, and low-frequency components sufficient for search display are extracted, and the image information management information specified by the host computer 6 is stored on the optical disk. Recorded. The image processing unit 7 also performs the work of decompressing the compressed image information reproduced from the optical disk. All of these devices are connected to the host computer 6 by a dedicated bus 13, and the host computer 6 controls the entire system.

[0012]

In the image file device configured as described above, a visual image search operation when the optical disk having the volume structure of FIG. 1 according to the present invention is used will be described.

[0013]

FIG. 3 is a schematic flowchart of the image search operation of the present invention.

First, when an image search instruction is given by the host computer 6, the management information 3 of one image information of the optical disk drive 8 is read out, and this information is stored in the host computer 6.

The optical disk drive 8 continuously reads the low-frequency component information 4 of the compressed image information of the image information from which the management information has been read, and transfers the management information to the image information processing unit 7. The image information processing unit 7 expands the low-frequency component information of the compressed image information and displays it on the monitor 9.

[0014]

Since the image can be recognized only by the low frequency component of the image information from the human visual characteristics, it is possible to determine whether or not the image displayed on the monitor 9 is a desired image.

Here, when a desired image is not obtained, the same operation is performed for the next image information, and the process is repeated until a desired image is obtained. When a desired image is obtained by performing an image search on the monitor 9, the host computer 6 instructs the optical disk drive 8 to record the image information 5 from the selected image management information 3, and obtains the desired image information. Read 5 The read image information is displayed on one screen on the monitor 9 or printed on paper by the printer 10.

[0015]

The above is an outline of obtaining a desired image by a visual search method for compressed image information.

Comparing the present embodiment with FIG. 5 showing the image search operation according to the conventional example, in the present invention, access to the image information area becomes unnecessary, and the image information can be read and expanded only as a part of the entire image information. , You can see that image search can be done very fast.

[0016]

Although an optical disc is used as a storage medium in this embodiment, it can be similarly applied to other storage media such as a magnetic disk.

Further, the effect of the present invention can be obtained even with an image search method different from that of the present embodiment, such as a multi-screen search in which a plurality of reduced image information is displayed on a screen for searching, as long as it is a visual image search method.

[0017]

According to the present invention, when visually searching for image information that has been converted into frequency components and compressed by using an orthogonal transform such as a discrete cosine transform, the image display

operation is compared with that of a conventional example. Since it can be done easily and at high speed, the search can be performed smoothly.

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Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS JPH0660158A

1.

A storage medium that converts image information into frequency components using orthogonal conversion and compresses and records the image information. When the image compression information is recorded in the storage medium, the low frequency of the image compression information is recorded. A storage medium for an image file, characterized in that information on components is recorded in a management information recording area in which address information of the image information of the storage medium is recorded.

2.

The storage medium for an image file according to claim 1, wherein the information of the low frequency component of the image compression information is continuously recorded with the image management information.

3.

An image file device for performing an image search using information on low-frequency components of the image compression information recorded in the image file storage medium according to claim 1.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the foregoing NOTICE OF CONCURRENT PROCEEDINGS, AND INFORMATION DISCLOSURE STATEMENT, including submitted references (provided on USB flash drive), is being served in its entirety via First Class Mail, postage prepaid, on the following counsel of record:

Jennifer C. Bailey
ERISE IP, P.A.
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211

on this 17th day of May, 2021.

/Brooklyn Grossbard/
Brooklyn Grossbard

Docket No.: 009379.00002\US
(*EX PARTE* REEXAMINATION)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Ex parte* Reexamination of:
U.S. Patent No.: 8,339,493

Control No.: 90/014,628

Inventor: Nakano, *et al*

Application Serial No.: 12/845,266
Filed: July 28, 2010
Issue Date: December 25, 2012

For: Electric Camera

Examiner: Peng Ke

Group Art Unit: 3992

Confirmation No.: 6100

NOTICE OF PRIOR AND CONCURRENT PROCEEDINGS, AND INFORMATION DISCLOSURE STATEMENT

Mail Stop *Ex Parte* Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.565, Patent Owner hereby provides notice of proceedings involving the subject '493 patent, both prior and concurrent. Further, pursuant to 37 C.F.R. § 1.555, the attention of the Office is hereby directed to the references listed in the attached Form PTO/SB/42. The listed references are references not yet of record in this proceeding (e.g., as cited by Requester), or included among the "References Cited" on the subject patent. Pursuant to 37 C.F.R. § 1.98, copies of those of the listed references that are neither U.S. patents nor published applications are enclosed.

The listed references were cited in documents from related proceedings, as identified below. Except as otherwise indicated, copies of the citing documents are not included, due to their voluminous and non-material argumentative nature (e.g., third party invalidity contentions).

This is believed to be consistent with MPEP 2282 addressing the notification requirement for prior and concurrent proceedings and providing that "papers filed in the court from litigations or other proceedings involving the patent will not be entered into the record (and will be expunged if already entered) if they provide a party's arguments."

I. USPTO Proceedings

A. *Apple Inc. v. Maxell, Ltd.*, IPR2020-00597.

1. Status: Institution Denied on September 24, 2020; appeal dismissed and request for mandamus denied by the Court of Appeals for Federal Circuit on October 30, 2020 (Case: 2021-1033).

B. *Olympus Corporation v. Maxell, Ltd.*, IPR2018-00904.

1. Status: proceeding terminated pre-institution; Petitioner's unopposed motion to terminate filed December 18, 2018, pursuant to settlement agreement between the parties. Motion granted and proceedings terminated by Board Decision entered December 26, 2018.

C. *ZTE Corporation v. Maxell, Ltd.*, IPR2018-00236.

1. Status: Institution Denied on June 1, 2018.

D. Application No. 10/660,710 (parent), now US 8,059,177.

E. Application No. 09/520,836 (parent), now US 6,765,616.

F. Application No. 13/681,495 (child), now US 8,736,729.

G. Application No. 14/264,243 (child), now US 9,100,604.

H. Application No. 14/661,227 (child), now US 9,544,517.

I. Application No. 15/386,656 (child), now US 10,554,917.

J. Application No. 15/959,774 (child), now US 10,462,403.

K. Application No. 10/660,711 (child of Application No. 09/520,836), now US 7,403,226.

II. District Court and ITC Proceedings

A. *Maxell, Ltd. v. Apple Inc.*, 5-19-cv-00036 [EDTX].

1. Status: joint motion to dismiss filed March 24, 2021 pursuant to settlement agreement between the parties entered into on March 22, 2021. Joint motion to dismiss granted April 7, 2021 (case dismissed).

2. Claim construction Memorandum and Order, entered March 18, 2019.

3. Defendant Apple Inc.'s Invalidity Contentions served August 14, 2019.

4. Defendant Apple Inc.'s First Supplemental Invalidity Contentions served March 4, 2020.

5. Opening Expert Report of Dr. Alan C. Bovik Regarding Invalidity of U.S. Patent No. 8,339,493.

B. *Maxell, Ltd. v. ZTE Corporation*, 5-18-cv-00080 [EDTX].

1. Status: joint motion to dismiss with prejudice granted March 12, 2019 (case dismissed).

C. *Maxell, Ltd. v. ZTE Corporation et al.*, 5-16-cv-00179 [EDTX].

1. Status: joint motion to dismiss with prejudice granted March 12, 2019 (case dismissed).

2. Claim construction Memorandum and Order, entered January 31, 2018.

3. Expert report of Dr. Barmak Mansoorian, Ph.D. Regarding Invalidity of U.S. Patent Nos. 8,339,493 & 8,736,729, served January 5, 2018.

4. Defendant ZTE's Provisional Preliminary Invalidity Contentions (6,748,317, 8,339,493, 6,408,193), dated April 17 2017.

5. Defendant ZTE's Supplemental Invalidity Contentions (6,748,317, 8,339,493, 6,408,193), dated June 30, 2017.

III. Corresponding Foreign Applications/Patents[1]

A. Japanese Patent No. 3991543 [Japanese Patent Application No. 00-006064].

[1] As shown on Espacenet and/or JPO websites.

Patent Owner submits this information so that the Office may determine any materiality thereof to the claimed invention. It is respectfully requested that the listed references be formally considered during this reexamination and be made of record herein.

Respectfully submitted,

By: /Scott M Kelly/
Scott M. Kelly
Registration No. 65,121

BANNER & WITCOFF, LTD
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Dated: May 17, 2021

Exhibit E

(*EX PARTE* REEXAMINATION)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket No. 009379.00002\US

In re *Ex parte* Reexamination of:
U.S. Patent No. 8,339,493

Examiner: Ke, Peng

Control No. 90/014,628

Group Art Unit: 3992

Inventor: Takahiro Nakano et al.

Confirmation No. 6100

Application Serial No. 12/845,266

Filed: July 28, 2010

Issue Date: December 25, 2012

For: Electric Camera

DECLARATION UNDER 37 CFR 1.131

Commissioner for Patents
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

I , Masanobu Sakata declare the following:

1. In late 1999 and early 2000, I worked in the IP department of Hitachi, Ltd. during preparation of the Japanese priority application of the above-identified patent. I was the IP department' s patent engineer responsible for filing this Japanese priority application.

2. On October 27, 1999, co-inventors Takahiro Nakano, Ryuji Nishimura and Toshiro Kinugasa jointly submitted application request forms (1) and (2) along with a thirty-six page document including Invention Expansion Sheet and □Specification□ to the IP department for a potential patent, attached in Exhibit C, pages 1-2 and 4-39. On information and belief, Exhibit A, pages 1-2 and 4-31, are accurate English language translations of the co-inventors' submitted documents. In addition, on information and belief, Exhibit A, page 3 is an accurate English

language translation of records from the IP department relating to the patent application. A certificate of translation accuracy is provided in Exhibit B.

3 Based on reviewing the records attached in Exhibit C, and as reflected on pages 1-2, the application request form was assigned application request reception no. of 219901023 by the IP department.

4. Patent Application Preparation Record Table as shown on page 3 of Exhibit C was created by the IP department for application request reception no. 219901023. The Patent Application Preparation Record Table for application request reception no. 219901023 details the steps taken towards application filing. As shown in the Patent Application Preparation Record Table, the Japanese priority application was diligently and continuously pursued until application filing, as reflected by the activity set forth and minimal time between receipt from inventors and filing.

5. Creation of a Patent Application Preparation Record Table for new patent applications was standard practice for new applications received by the IP department.

6. An Invention Expansion Sheet, as shown on Page 4 of Exhibit C, was created by the co-inventors. It was submitted to the IP department on October 27, 1999, for application request reception no. 219901023.

7. On October 29, 1999, an internal assessment was conducted on the submitted application request forms (1) and (2) and the thirty-five page document including □Specification□

8. On November 9, 1999, I participated in a conference with the inventors to further clarify inventive concepts of the invention and to reflect such clarifications in the patent application.

9. Based on reviewing the Patent Application Preparation Record Table attached in Exhibit C, I recall that on November 23, 1999, at least bibliographic matters regarding the patent application was corrected.

10. Based on reviewing the Patent Application Preparation Record Table attached in Exhibit C, I recall that the patent application specification was revised and forwarded to the inventors on December 13, 1999, via email, for further review and comment.

11. Based on reviewing the Patent Application Preparation Record Table attached in Exhibit C, I recall that on December 14, 1999, additional corrections based on inventor comments were incorporated into the patent application specification.

12. Further, during parts of December, 1999, and early January, 2000, I and the inventors were on holidays as is typically the case for Hitachi every year in December.

13. On January 11, 2000, the above application was filed with the Japanese Patent Office as Japanese Application No. 2000-006064. U.S. Patent No. 8,339,493 claims foreign priority to the filed Japanese Application No. 2000-006064.

14. To the best of my knowledge, the inventors and I worked diligently to go through the various processes and required approvals to prepare and file Japanese Application No. 2000-006064 from the date the invention disclosure form was filled out to the date when the application was formally filed.

15. At the time of the above activity, I lived in Japan, and all of the activity referenced above was conducted by us in Japan.

16. I represent that I am over 18 years of age and of competent mind.

17. All statements made of my own knowledge are true and all statements made on information and belief are believed to be true; and further, these statements were made with the knowledge that willful, false statement so made are punishable by fine or imprisonment or both, under 18 U.S.C. § 1001 and that such willful, false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

Respectfully submitted,

/Masanobu Sakata/	April 26, 2021
Masanobu Sakata	Date

Exhibit D

(*EX PARTE* REEXAMINATION)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket No. 009379.00002\US

In re *Ex parte* Reexamination of:
U.S. Patent No. 8,339,493

Examiner: Ke, Peng

Control No. 90/014,628

Group Art Unit: 3992

Inventor: Takahiro Nakano et al.

Confirmation No. 6100

Application Serial No. 12/845,266

Filed: July 28, 2010

Issue Date: December 25, 2012

For: Electric Camera

DECLARATION UNDER 37 CFR 1.131

Commissioner for Patents
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

We, Takahiro Nakano, Ryuji Nishimura and Toshiro Kinugasa, jointly declare the following:

1. We are the named co-inventors on the above issued U.S. Patent No. 8,339,493, and co-invented the inventions recited in claims 1-14 of U.S Patent No. 8,339,493.

2. We were employed by Hitachi, Ltd. during the development of the above-identified patent.

3. Prior to October 27, 1999, we conceived of various concepts for an electric camera and prepared a thirty-six page document including □Invention Expansion Sheet□ and □Specification□detailing those concepts for a potential patent.

4. On October 27, 1999, we submitted application request forms (1) and (2) along with the thirty-six page document including "Invention Expansion Sheet" and "Specification" to our IP department of our employer for a potential patent, a copy of which is attached in Exhibit C, pages 1-2 and 4-39. On information and belief, Exhibit A, pages 1-2 and 4-31 are accurate English language translations of our submitted documents. In addition, on information and belief, Exhibit A, page 3 is an accurate English language translation of records from our IP department relating to our patent application. A certificate of translation accuracy is provided in Exhibit B.

5. Based on reviewing the records attached in Exhibit C, the application request was given application request reception no. of 219901023.

6. Attached Exhibit C shows that, prior to October 27, 1999, we had conceived of the features recited in at least claims 5 and 6, the claims under current reexamination. For example,

- Claim 5 features are supported by at least the following pages (page cites are to Exhibit A):

> An electric camera comprising:
>
> an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines; (¶2-3, Page 9; ¶ 2-3, Page 11).
>
> a signal processing unit that generates image signals by processing the output signals of the image sensing device; (Claim 4, Page 5; "signal processing circuit" Figure 1, Page 24; "signal processing circuit" Figure 7, Page 28) and
>
> a display unit with a display screen, that displays an image corresponding to the image signals; (Claim 9, Page 6; Lines 25-26, Page 7).
>
> wherein when recording an image in a static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in all N number of vertically arranged pixel lines of the image sensing device, to provide N pixel lines; (Claims 1, 3,4, 6,7, 9, 11, Pages 5-

6; "operation mode switch 14", Figure 1, Page 24; ¶2 Page 11; lines 8-13, Page 17, ¶2-4, Page 16).

wherein when monitoring the image in the static image mode, the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance; ("operation mode switch 14", Figure 1, Page 24; Claims 1, 3-4, Page 5; ¶2, Page 9; ¶2, Page 11; ¶2 Page 12; ¶2, Page 14; Page 15; ¶1-2, Page 16; lines 8-13, Page 17) and

wherein when recording the image in a moving video mode, the signal processing unit generates the image signals by using a portion of, or the entirety of, pixel lines which have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a second distance, where the second distance is different from the first distance. ("operation mode switch 14", Figure 1, Page 24; Claims 1, 3-4, Page 5; ¶2, Page 9; ¶2, Page 11; ¶2-¶3 Page 12; ¶2, Page 14; ¶1-2, Page 16; lines 8-13, Page 17).

- Claim 6 features are supported by at least the following pages (page cites are to Exhibit A):

An electric camera according to the claim 5, further comprising:

an image-instability detector which detects an image-instability of the electric camera; (Claim 8, Page 6; ¶8, Page 10; ¶3, Page 12; ¶1, Page 14; ¶2, Page 19; "shaking determination circuit 17", Figure 1, Page 24) and

wherein when recording in the moving video mode, in order to correct the image-instability, the signal processing unit generates the image signals by changing the pixel lines used, and the portion of the pixel lines used, according to an amount of image-instability detected by the instability detector. (Claim 8, Page 6; ¶8, Page 10; ¶3, Page 12; ¶1, Page 14; ¶2, Page

19; □shaking determination circuit 17□, Figure 1, Page 24; □operation mode switch 14□, Figure 1, Page 24; □signal processing circuit□, Figure 7, Page 28).

7. Based on reviewing the records attached in Exhibit C, we understand that on October 29, 1999, an internal assessment was conducted on the submitted application request forms (1) and (2) and the thirty-six page document including □Invention Expansion Sheet□and □Specification.□

8. Based on reviewing the records attached in Exhibit C, we recall that we participated in a conference that was held on November 9, 1999, with Mr. Sakata, who is an member of our IP department, to further clarify inventive concepts of the invention and to reflect such clarifications in the patent application.

9. Based on reviewing the records attached in Exhibit C, we recall that we reviewed the application specification on November 23, 1999, and certain bibliographic information was corrected.

10. Based on reviewing the records attached in Exhibit C, we recall that the application specification was revised by December 13, 1999, and provided to us via email for further review and comment.

11. On information and belief, we understand that on December 14, 1999, additional corrections based on our comments were incorporated into the application specification.

12. On January 11, 2000, the above application was filed with the Japanese Patent Office as Japanese Application No. 2000-006064. U.S. Patent No. 8,339,493 claims foreign priority to the filed Japanese Application No. 2000-006064.

13. At the time of the above activity, we all lived in Japan, and all of the activity referenced above was conducted by us in Japan.

14. Each of us individually represent that we are over 18 years of age and of competent mind.

15. All statements made of our own knowledge are true and all statements made on information and belief are believed to be true; and further, these statements were made with the knowledge that willful, false statement so made are punishable by fine or imprisonment or both, under 18 U.S.C. § 1001 and that such willful, false statements may jeopardize the validity of the above-identified application or any patent issuing thereon. In addition to reviewing this declaration in English, counsel also explained to us the statements in this declaration in our native language (Japanese), and we confirm that we understand the statements made herein.

Respectfully submitted,

/Takahiro Nakano/	April 26,2021
Takahiro Nakano	Date
/Ryuji Nishimura/	April 24, 2021
Ryuji Nishimura	Date
/Toshiro Kinugasa/	April 25,2021
Toshiro Kinugasa	Date

Electronic Acknowledgement Receipt

EFS ID:	42579686
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	28-APR-2021
Filing Date:	10-DEC-2020
Time Stamp:	15:09:57
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Timely Patent Owner's Stmnt in Resp to Order	493_Patent_-_Reexam_90014628_-_Patent_Owner_Statement_21210703.PDF	13330197 4bd2880212471f0ddf5215d5c2dce85fe9c55914	no	91
Warnings:					

Information:					
2	Reexam Certificate of Service	Certificate_of_Service_20210716.PDF	137049 8ecedc6cb7e339db04034aa4f66a15a7ce5b3d5f	no	1
Warnings:					
Information:					
3	Affidavit-Rule 131-pre-AIA (FTI) ONLY	Exhibit_E_-_Sakata_1131_Declaration_Final_Signed_21210275.PDF	129758 d2fba61b265a8e8b5e0cd5b0cdbd765d639867b6	no	4
Warnings:					
Information:					
4	Affidavit-Rule 131-pre-AIA (FTI) ONLY	Exhibit_D_-_Inventor_1131_Declaration_Final_Signed_21210274.PDF	163786 7fe6522374d341636c1496635eae8e4a567578d2	no	6
Warnings:					
Information:					
		Total Files Size (in bytes):	13760790		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the PATENT OWNER'S STATEMENT UNDER 37 C.F.R. § 1.530 filed in Reexamination Control Number 90/014,628 is being served in its entirety via First Class Mail, postage prepaid, on the following counsel of record:

Jennifer C. Bailey
ERISE IP, P.A.
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211

on this April 28, 2021.

Respectfully submitted,

By: /Brooklyn Grossbard/
Brooklyn Grossbard

Docket No.: 009379.00002\US
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

Nakano, *et al.*

Reexamination Control No. 90/014,628

Patent Under Reexamination: U.S. Pat. No. 8,339,493 Confirmation No.: 6100

Issue Date: December 25, 2012 Art Unit: 3992

Title: Electric Camera Examiner: Peng Ke

PATENT OWNER'S STATEMENT UNDER 37 C.F.R. § 1.530

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Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box. 1450
Alexandria, VA 22313-1450

Commissioner,

Patent Owner respectfully submits this Patent Owner's Statement under 37 C.F.R. § 1.530 within the time period set by the Order Granting Request for *Ex Parte* Reexamination dated January 28, 2021 (the "Order") and extended by the Decision On Petition for Extension of Time dated March 29, 2021. The patentability of all challenged claims (claims 5 and 6) of U.S. Patent No. 8,339,493 (the "'493 Patent") should be confirmed. Selected determinative points are addressed at this stage. Patent Owner reserves the right to present additional evidence and arguments.

Remarks begin on page 2.

The Commissioner is hereby authorized to charge any required fees or credit any overpayment of fees to Deposit Account No. 19-0733.

REMARKS

In response to the Order Granting Request for *Ex Parte* Reexamination dated January 28, 2021 (the "Order"), which is based on the Request for *Ex Parte* Reexamination filed by third party Apple Inc. on December 10, 2020, (the "Request"), Patent Owner provides the following remarks along with the following attachments:

- Exhibit A – Certified Translation of Hitachi, Ltd.'s internal file including at least the invention disclosure form ("Application Request Form"), specification submitted by the inventors on October 27, 1999, and a Patent Application Preparation Record Table summarizing the events that led to the preparing and filing of the patent application;
- Exhibit B – Certification of Translation Accuracy corresponding to Exhibit A; and
- Exhibit C – Original Japanese version of Hitachi, Ltd.'s internal file corresponding to Exhibit A.
- Exhibit D – Rule 1.131 Affidavit by the '493 Patent's inventors (Messrs. Nakano, Nishimura, and Kinugasa) ("Inventor Decl.");
- Exhibit E – Rule 1.131 Affidavit by former IP legal department employee of Hitachi, Ltd., Masanobu Sakata, who was responsible for filing the Japanese priority application of the '493 Patent ("Sakata Decl.");

As shown by the enclosed Rule 1.131 Affidavits, Patent Owner respectfully submits that Casio[1] is not prior art to the '493 Patent, and that all rejections based on the Casio reference cannot stand. Specifically, the rejections of claims 5 and 6 of the '493 Patent both rely on Casio, *see* Order at 8-9, but the enclosed Rule 1.131 Affidavits show that Patent Owner conceived of the concepts in claims 5 and 6 before Casio's date of public availability (November 1, 1999) and diligently reduced those concepts to practice through the filing of the '493 Patent's Japanese priority application (JP 2000-006064).

Accordingly, Patent Owner respectfully requests that the Examiner confirm the patentability of claims 5 and 6 through a reexamination certificate.

[1] The Casio LCD Digital Camera QV-800SX User's Guide ("Casio") was publically available no earlier than November 1, 1999. Order at 3.

The '493 Patent's Inventors Conceived of the Inventions of at Least Claims 5 and 6 Prior to the Earliest Public Availability of the Casio Reference.

The enclosed affidavits establish that the '493 Patent's inventors—Messrs. Nakano, Nishimura, and Kinugasa—jointly conceived of the inventions of at least claims 5 and 6 of the '493 Patent prior to November 1, 1999 (the earliest priority date of the Casio reference).

At some time before October 27, 1999, these inventors conceived of the details for several new, inventive concepts for an electric (or, digital) camera while working at Hitachi, Ltd. (the original assignee of the '493 Patent). Inventor Decl. at ¶ 3. Among these concepts were the features of at least claims 5 and 6 of the '493 Patent. *Id.* at ¶ 6.

On October 27, 1999, the inventors submitted application request forms, along with a "Specification" to the IP legal department at Hitachi for potential patenting. *Id.* at ¶ 4; Sakata Decl. at ¶ 2; Ex. C at 1-2, 5-31.[2] With reference to Exhibit A, the features of claims 5 and 6 of the '493 Patent are disclosed in at least the following portions of the specification the inventors submitted to the Hitachi IP department on October 27, 1999:

'493 Patent Claim Limitation	**Corresponding Disclosure in Exhibit A**
[5.pre] An electric camera comprising:	At least page 2 ("there is a growing need for a camera which can photograph both video and still images with a large number of pixels").
[5.a] an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines;	At least ¶¶ 2-3 on page 9 and ¶¶ 2-3 on page 11.
[5.b] a signal processing unit that generates image signals by processing the output signals of the image sensing device;	At least claim 4 on page 5 (a "signal processing circuit"), as well as Figure 1 (page 24) and Figure 7 (page 28).
[5.c] a display unit with a display screen, that displays an image corresponding to the image signals;	At least claim 9 on page 6 and lines 25-26 on page 7.

[2] Exhibit A includes an accurate English translation of the inventors' submissions of Exhibit C. A certificate of translation confirming the accuracy of this translation is provided in Exhibit B.

'493 Patent Claim Limitation	**Corresponding Disclosure in Exhibit A**
[5.d] wherein when recording an image in a static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in all N number of vertically arranged pixel lines of the image sensing device, to provide N pixel lines;	At least claims 1, 3, 4, 6, 7, 9, and 11 (pages 5-6, including descriptions of "operation mode switch 14"); Figure 1 (page 24); ¶ 2 on page 11; lines 8-13 on page 17; and ¶¶ 2-4 on page 16.
[5.e] wherein when monitoring the image in the static image mode, the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance;	At least claims 1, 3, and 4 (page 5); Figure 1 (page 24, including "operation mode switch 14"); ¶ 2 on page 9; ¶ 2 on page 11; ¶ 2 on page 12; ¶ 2 on page 14; page 15; ¶¶ 1-2 on page 16; and lines 8-13 on page 17.
[5.f] wherein when recording the image in a moving video mode, the signal processing unit generates the image signals by using a portion of, or the entirety of, pixel lines which have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a second distance, where the second distance is different from the first distance.	At least claims 1, 3, and 4 (page 5); Figure 1 (page 24, including "operation mode switch 14"); ¶ 2 on page 9; ¶ 2 on page 11; ¶¶ 2-3 on page 12; ¶ 2 on page 14; ¶¶ 1-2 on page 16; and lines 8-13 on page 17.
[6.pre] An electric camera according to the claim 5, further comprising:	See above.
[6.a] an image-instability detector which detects an image-instability of the electric camera;	At least claim 8 on page 6; ¶ 8 on page 10; ¶ 3 on page 12; ¶ 1 on page 14; ¶ 2 on page 19; and Figure 1 (page 24, including "shaking determination circuit 17").
[6.b] wherein when recording in the moving video mode, in order to correct the image-instability, the signal processing unit generates the image signals by changing the pixel lines used, and the portion of the pixel lines used, according to an amount of image-instability detected by the instability detector.	At least claim 8 on page 6; ¶ 8 on page 10; ¶ 3 on page 12; ¶ 1 on page 14; ¶ 2 on page 19; and Figures 1 and 7 (pages 24, 28, including "shaking determination circuit 17," "operation mode switch 14," and "signal processing circuit").

See Inventor Decl. at ¶ 6.

Accordingly, the inventors conceived of the inventions of at least claims 5 and 6 of the '493 Patent no later than October 27, 1999—prior to the earliest public accessibility of Casio.

The '493 Patent's Inventors Were Reasonably Diligent in Constructively Reducing the Invention to Practice in the Form of the Japanese Priority Application.

After reviewing the inventors' October 27, 1999 disclosures, Hitachi's IP department began diligently and continuously prosecuting these disclosures into a Japanese patent application. Sakata Decl. at ¶¶ 3-14.

For instance, after submission, the invention disclosure was assigned a request reception number by Hitachi's IP legal department. *Id.* at ¶ 3. On October 29, 1999, the legal department conducted an internal assessment of the inventors' submissions. *Id.* at ¶ 7. On November 9, 1999, members of Hitachi's IP legal department, including Mr. Sakata, held a conference call with the inventors to discuss the disclosures and their invention. *Id.* at ¶ 8. At this point, work on preparing a patent application had already begun in earnest, and that work continued throughout November 1999. *Id.* at ¶¶ 4-6, 9.

By December 13, 1999, a draft patent application specification was sent to the inventors for their review and comment. *Id.* at ¶ 10; Inventor Decl. at ¶ 10. The inventors' comments were received the following day. Sakata Decl. at ¶ 11; Inventor Decl. at ¶ 10. Shortly after the December holidays, Hitachi filed a patent application with the Japanese Patent Office on January 11, 2000. Sakata Decl. at ¶¶ 12-13; *see* '493 Patent at (30).

At all times between October 27, 1999, and January 11, 2000, the inventors and the members of the Hitachi IP legal department handling the matter worked diligently to constructively reduce the inventions to practice by preparing and filing a patent application with the Japanese Patent Office. Sakata Decl. at ¶ 13.

Accordingly, the enclosed affidavits show that the inventors and the in-house legal team at Hitachi acted diligently at all times between October 27, 1999, and January 11, 2000, when the inventions of at least claims 5 and 6 of the '493 Patent were constructively reduced to practice by the filing of Japanese Patent Application No. 2000-006064.

Conclusion

Accordingly, Patent Owner respectfully submits that the challenged claims of the '493 Patent are novel and nonobvious over the references cited in the Order at least because Casio is

not prior art to the '493 Patent. Patent Owner thus respectfully requests that the Office promptly issue a Notice of Intent to Issue Reexamination Certificate confirming in the validity of all challenged claims of the '493 Patent.

If there are any questions, the Examiner is invited to contact the undersigned at (202) 824-3158.

Dated: April 28, 2021

Respectfully submitted,

By: /Scott M Kelly/
Scott M. Kelly
Registration No.: 65,121

BANNER & WITCOFF, LTD.
1100 13th St. NW
STE 1200
Washington, DC 20005
(202) 824-3000

Encl.: Exhibits A-E

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the PATENT OWNER'S STATEMENT UNDER 37 C.F.R. § 1.530 filed in Reexamination Control Number 90/014,628 is being served in its entirety via First Class Mail, postage prepaid, on the following counsel of record:

Jennifer C. Bailey
ERISE IP, P.A.
7015 College Boulevard, Suite 700
Overland Park, Kansas 66211

on this April 28, 2021.

Respectfully submitted,

By: /Brooklyn Grossbard/
Brooklyn Grossbard

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,628	12/10/2020	8339493	2638-19.00	6100

177632 7590 03/29/2021

BANNER & WITCOFF, LTD.
1100 13th STREET, N.W.
SUITE 1200
WASHINGTON, DC 20005-4051

EXAMINER	
KE, PENG	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
03/29/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patents and Trademark Office
P.O.Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS

ERISE IP, PA
7015 COLLEGE BLVD.
SUITE 700
OVERLAND PARK, KS 66211

Date: March 29, 2021

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. : 90/014,628
PATENT NO. : 8,339,493 B2
ART UNIT : 3992

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified ex parte reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the ex parte reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Decision on Petition for Extension of Time in Reexamination	Application No. 90/014,628	Applicant(s) 8,339,493 B2	
	Examiner Peng KE	Art Unit 3992	

1. THIS IS A DECISION ON THE PETITION FILED March 25, 2021.

2. THIS DECISION IS ISSUED PURSUANT TO:
   A. ☒ 37 CFR 1.550(c) – The time for taking any action by a patent owner in a third party requested *ex parte* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified.
   B. ☐ 37 CFR 1.550(c) – The time for taking action by a patent owner in a patent owner requested *ex parte* reexamination proceeding will only be extended for more than two months for sufficient cause and for a reasonable time specified.
   C. ☐ 37 CFR 1.956 – The time for taking any action by a patent owner in an *inter partes* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified.

   The petition is before the Central Reexamination Unit for consideration.

3. FORMAL MATTERS
   Patent Owner requests that the period for filing an optional Patent Owner's Statement after the "***Order Granting Request for Ex Parte Reexamination***" mailed on January 28, 2021, which is a two (2) month period pursuant to 37 CFR 1.530(b) (i.e., due March 28, 2021), be extended by an additional one (1) month (i.e., due April 28, 2021).

   A. Petition fee per 37 CFR §1.17(g)):
      i. ☒ Petition includes authorization to debit a deposit account.
      ii. ☐ Petition includes authorization to charge a credit card account.
      iii. ☐ Other: _____.
   B. ☒ Proper certificate of service was provided. (Not required in reexamination where patent owner is requester.)
   C. ☒ Petition was timely filed.
   D. ☒ Petition properly signed.

4. DECISION (See MPEP 2265 and 2665)
   A. ☒ Granted or ☐ Granted-in-part for **one (1) month**. (See 37 CFR 1.550(c) and 37 CFR 1.956).
      i. ☒ Other/comment: See CONCLUSION below.
   B. ☐ Dismissed because:
      i. ☐ Formal matters (See unchecked box(es) (A, B, C and/or D) in section 4 above).
      ii. ☐ Petitioner failed to provide a factual accounting of reasonably diligent behavior by all those responsible for preparing a response to the outstanding Office action within the statutory time period.
      iii. ☐ Petitioner failed to explain why, in spite of the action taken thus far, the requested additional time is needed.
      iv. ☐ The statements provided fail to establish sufficient cause to warrant extension of the time for taking action (See attached).
      v. ☐ The petition is moot.
      vi. ☐ Other/comment: _____

5. CONCLUSION: **The time period for filing an optional Patent Owner's Statement after the mailing of the January 28, 2021 "*Order Granting Request for Ex Parte Reexamination*" is hereby extended by one (1) additional month from March 28, 2021 to April 28, 2021. Accordingly, the optional Patent Owner's Statement is now due by the end of the day on Wednesday, April 28, 2021**.

   Telephone inquiries with regard to this decision should be directed to Gay Ann Spahn at 571-272-7731 in the CRU.

	/Gay Ann Spahn/ Supervisory Patent Reexamination Specialist Central Reexamination Unit

Electronic Patent Application Fee Transmittal					
Application Number:	90014628				
Filing Date:	10-Dec-2020				
Title of Invention:	ELECTRIC CAMERA				
First Named Inventor/Applicant Name:	8339493				
Filer:	Scott M Kelly/Brooklyn Grossbard				
Attorney Docket Number:	2638-19.00				
Filed as Large Entity					
Filing Fees for ex parte reexam					
Description		**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:					
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Patent-Appeals-and-Interference:					
Post-Allowance-and-Post-Issuance:					
Extension-of-Time:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PETITION FEE- 37 CFR 1.17(G) (GROUP II)	1463	1	220	220
Miscellaneous:				
		Total in USD ($)		**220**

Electronic Acknowledgement Receipt	
EFS ID:	42285386
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	177632
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	25-MAR-2021
Filing Date:	10-DEC-2020
Time Stamp:	16:48:48
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$220
RAM confirmation Number	E20213OG49153159
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Certificate of Service	Certificate_of_Service_-_Petition_for_EOT_21149891.PDF	94905 b64c7b5c99b9846cac7414ae409d68e790783304	no	1
Warnings:					
Information:					
2	Reexam Request for Extension of Time	Petition_for_Extension_of_Time_with_Appendices_-_009379_21149828.PDF	415074 377c38fb2f122e3347cfa9023e242f630f0a6630	no	25
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30172 b0a351410ff8557bb41fb851c8be3887faf460f9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	540151		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
90/014,628	12/10/2020	8339493	2638-19.00

CONFIRMATION NO. 6100

177632
BANNER & WITCOFF, LTD.
1100 13th STREET, N.W.
SUITE 1200
WASHINGTON, DC 20005-4051

POA ACCEPTANCE LETTER

OC000000123588982

Date Mailed: 02/24/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/18/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/rbell/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
90/014,628	12/10/2020	8339493	2638-19.00

CONFIRMATION NO. 6100

24956
MATTINGLY & MALUR, PC
1800 DIAGONAL ROAD
SUITE 210
ALEXANDRIA, VA 22314

POWER OF ATTORNEY NOTICE

OC000000123588864

Date Mailed: 02/24/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/18/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/rbell/

Electronic Acknowledgement Receipt	
EFS ID:	41981326
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	24956
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	22-FEB-2021
Filing Date:	10-DEC-2020
Time Stamp:	12:42:42
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Certificate of Service	CERTIFICATE_OF_SERVICE_-_009379_21060531.pdf	20800 037511cdb13be860594940945 0b59c2f5a8e4c0d	no	1

Warnings:

Information:	
Total Files Size (in bytes):	20800

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/81B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

REEXAMINATION OR SUPPLEMENTAL EXAMINATION – PATENT OWNER POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS FOR REEXAMINATION OR SUPPLEMENTAL EXAMINATION AND PATENT

Control Number(s)	90/014,628
Filing Date(s)	December 10, 2020
First Named Inventor	Takahiro Nakano
Title	ELECTRIC CAMERA
Patent Number	8,339,493
Examiner Name	Peng Ke
Attorney Docket No(s)	009379.00002\US

I. Power of Attorney. This form may be used to change the Power of Attorney in a reexamination or supplemental examination proceeding (or multiple proceedings where merged). This form may also be used to change the Power of Attorney in the patent file; in such a case, a copy of this form will be placed in both the patent file and the reexamination or supplemental examination proceeding.

A. Revocation of Previous Power of Attorney. I hereby revoke all previous patent owner powers of attorney, if any, given:

☒ in the above-identified reexamination or supplemental examination proceeding control number(s) (more than one may be changed only if the proceedings are merged).

☐ in the file of the above-identified patent.

(check BOTH boxes if change in BOTH the patent file and the reexamination or supplemental examination proceeding is requested).

B. Designation of Power of Attorney.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) to prosecute the proceeding(s)/patent identified above and selected in section I(A), and to transact all business in the United States Patent and Trademark Office connected therewith:

177632

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the proceeding(s) identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Authorization for the Power of Attorney is provided by the signature on page 2 of this form.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 15 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

II. Change of Correspondence Address

Please recognize or change the correspondence address for the above-identified reexamination or supplemental examination proceeding control number(s) (more than one may be changed **only** if they are merged proceedings) **and for the file of the above-identified patent** to be:

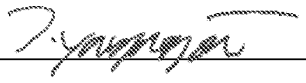
■ The address associated with the above-identified Customer Number.
OR
☐ The address associated with the Customer Number identified in the box at right: ☐
OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

NOTE: THE CORRESPONDENCE ADDRESS FOR THE REEXAMINATION OR SUPPLEMENTAL EXAMINATION PROCEEDING CONTROL NUMBER(S) MUST BE THE SAME AS THAT FOR THE PATENT. SEE 37 CFR 1.33.

III. Authorization for Power of Attorney and (if selected) Change of Correspondence Address

I am the:
☐ Inventor, having ownership of the patent being reexamined.
OR
■ Patent owner.
Statement under 37 CFR 3.73(c) (Form PTO/AIA/96) submitted herewith or filed on _____.

Signature of Inventor or Patent Owner		Date	February 17, 2021
Name	Tatsuya Yamamoto	Telephone	
Title and Company	General Manager, Maxell, Ltd.		

NOTE: Signatures of all the inventors or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

■ A total of 2 forms are submitted. *If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	41960550
Application Number:	90014628
International Application Number:	
Confirmation Number:	6100
Title of Invention:	ELECTRIC CAMERA
First Named Inventor/Applicant Name:	8339493
Customer Number:	24956
Filer:	Scott M Kelly/Brooklyn Grossbard
Filer Authorized By:	Scott M Kelly
Attorney Docket Number:	2638-19.00
Receipt Date:	18-FEB-2021
Filing Date:	10-DEC-2020
Time Stamp:	16:51:17
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	90014628_-_Rule_373_Statement_-_00937900002_PTO_AIA_96_20991379.PDF	122474 924e3a8eda251a3e66dfd71a148b4c97b0878133	no	3

Warnings:

Information:					
2	Power of Attorney	Executed_-_90014628_-_POA_-_00937900002_PTO_AIA_81B_21050919.PDF	514084 9e06899bf53ef98907f6a9a009fdffab3d1ea9b3	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	636558		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Maxell, Ltd.

Application No./Patent No.: 8339493 Filed/Issue Date: December 25, 2012

Titled: ELECTRIC CAMERA

Maxell, Ltd., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: TAKAHIRO NAKANO et al. To: HITACHI, LTD.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 010631, Frame 0900, or for which a copy thereof is attached.

2. From: HITACHI, LTD. To: HITACHI CONSUMER ELECTRONICS CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 030648, Frame 0217, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: HITACHI CONSUMER ELECTRONICS CO., LTD. To: HITACHI MAXELL, LTD.

The document was recorded in the United States Patent and Trademark Office at
Reel 033694, Frame 0745, or for which a copy thereof is attached.

4. From: HITACHI MAXELL, LTD. To: MAXELL, LTD.

The document was recorded in the United States Patent and Trademark Office at
Reel 045142, Frame 0208, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Scott M Kelly/	February 18, 2021
Signature	Date
Scott M. Kelly	65,121
Printed or Typed Name	Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,628	12/10/2020	8339493	2638-19.00	6100

24956 7590 01/28/2021

MATTINGLY & MALUR, PC
1800 DIAGONAL ROAD
SUITE 210
ALEXANDRIA, VA 22314

EXAMINER	
KE, PENG	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
01/28/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

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Apple Inc.
One Apple Park Way
Cupertino, CA 95014

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,628* .

PATENT UNDER REEXAMINATION *8339493* .

ART UNIT *3992* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Order Granting Request For Ex Parte Reexamination	Control No. 90/014,628	Patent Under Reexamination 8339493	
	Examiner PENG KE	Art Unit 3992	AIA (FITF) Status No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

The request for *ex parte* reexamination filed 12/10/2020 has been considered and a determination has been made. An identification of the claims, the references relied upon, and the rationale supporting the determination are attached.

Attachments: a)☑ PTO-892, b)☑ PTO/SB/08, c)☐ Other: ____

1. ☑ The request for *ex parte* reexamination is GRANTED.

RESPONSE TIMES ARE SET AS FOLLOWS:

For Patent Owner's Statement (Optional): TWO MONTHS from the mailing date of this communication (37 CFR 1.530 (b)). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**

For Requester's Reply (optional): TWO MONTHS from the **date of service** of any timely filed Patent Owner's Statement (37 CFR 1.535). **NO EXTENSION OF THIS TIME PERIOD IS PERMITTED.** If Patent Owner does not file a timely statement under 37 CFR 1.530(b), then no reply by requester is permitted.

cc:Requester (if third party requester)

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Detail Action

2. On 12/10/20, Third Party Requester ("Requester") filed a request ("Request") for 90/014,628 *ex parte* reexamination of claims 5 and 6 of US Patent 8,339,493 ("the '493 patent") which was filed on 09/12/03 with application number 12/845,266 (" '266 application"), which is a continuation of application 10/660,710 ("'710 application"), which is a division of 09/520,836 ("'836 application") that became Patent 6,765,616 ("'616 patent").

Priority

3. Based upon a review of the '493 patent, the Examiner finds that the '493 patent claims the following domestic priority:

4. This '266 application is a continuation of U.S. Ser. No. 10/660,710, filed 09/12/2003, now US Patent 8059117, ("the '117 patent") which is a division of U.S. Ser. No. 09/520,836, filed on 03/08/2000, now U.S. Pat. No. 6,765,616, which claims foreign priority to application JP 2000006064 filed on January 11, 2000.

PRIOR OR CONCURRENT PROCEEDINGS

5. Based upon Examiner's review of the '493 patent itself, the Request, and its prosecution history, the Examiner finds that:

6. Maxell Ltd. v. Apple Inc, No 5:19-cv-0036-RWS (E.D. Tex) (Complaint, EX. 1025) which is schedule for trial on April 2021.

7. Inter Partes Reviews:

a. IPR2018-00236, the Board declined to institute.

b. IPR2018-00904, the request was terminated prior to an institution decision.

c. IPR2020-00597, the Board declined to institute and a Petitioner Notice of Appeal was filed.

REFERENCES

References cited:

i. Casio LCD Digital Camera QV-800SX User's Guide ("Casio") is new art that provides new, non-cumulative technological teachings that were not previously considered and discussed on the record during prosecution of '493 Patent;

The Casio Camera and its user's guide was provided to David Etchells on November 1, 1999 without a non-disclosure agreement or any other restriction. (see Etchells's declaration, paragraph 10) David Etchells had full control of the camera and was able to disclose functionality of the camera. (see Etchells's declaration paragraphs 9 and 11) Therefore, it is determined that there was public use on November 1, 1999. [1]

[1] "**Public use**" of a claimed invention under pre-AIA 35 U.S.C. 102(b) occurs when the inventor allows another person to **use** the invention without limitation, restriction or obligation of secrecy to the inventor." *In re Smith*, 714 F.2d 1127, 1134, 218 USPQ 976, 983 (Fed. Cir. 1983). The presence or absence of a confidentiality agreement is not itself determinative of the **public use** issue, but is one factor to be considered along with the time, place, and circumstances of the **use** which show the amount of control the inventor retained over the invention. *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1265, 229 USPQ 805, 809 (Fed. Cir. 1986). See *Ex parte C*, 27 USPQ2d 1492, 1499 (Bd. Pat. App. & Inter. 1992) (inventor sold inventive

ii. U.S. Patent No. 7,903,162 to Juen ("Juen"), is new art that provides new, non-cumulative technological teachings that were not previously considered and discussed on the record during prosecution of '493 Patent.

iii. U.S. Patent No. 5,502,483 To Takase et al. ("Takase"), is new art that provides new, non-cumulative technological teachings that were not previously considered and discussed on the record during prosecution of '493 Patent.

iv. U.S. Patent No. 5,444,482 To Misawa et al. ("Misawa"), is new art that provides new, non-cumulative technological teachings that were not previously considered and discussed on the record during prosecution of '493 Patent.

PROSECUTION HISTORY

8. During the prosecution of application '266, which is the parent application of '493 patent, independent claim 5 was rejected under double patenting over claims 1 and 6; or claims 13 and 18 of Patent '616.

9. In the prosecution of Patent '616 as Application '836, on February 26, 2004, following amendments were made to claims 1 and 6; and claims 13 and 18 are added:

---

soybean seeds to growers who contracted and were paid to plant the seeds to increase stock for later sale. The commercial nature of the **use** of the seed coupled with the "on-sale" aspects of the contract and apparent lack of confidentiality requirements rose to the level of a "**public use**" bar.); *Egbert v. Lippmann,* 104 U.S. 333, 336 (1881) (**Public use** found where inventor allowed another to **use** inventive corset insert, though hidden from view during **use**, because he did not impose an obligation of secrecy or restrictions on its **use**.).

10. Claim 1 An electric camera comprising:

A color filter to pass first, second and third colors respectively arranged to cyclically appear horizontally at three-pixel interval and to pass the same colors arranged vertically;

An image sensing device with a light receiving surface having N vertically arranged pixels and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of display screen of a television system;

a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of every K pixels to produce a number of lines of out put signals which corresponds to the number of effective scanning lines M, K being at least one of integers equal to or less than an integral part of a quotient of N divided by M;

a signal processing unit to generate image signals by using the output signals of the image sensing device, and

a display unit with the display screen of the television system to display an image corresponding to the output signals;

wherein said driver vertically mixes or culls signal charges accumulated in individual pixels of every K1 pixels, when first images are displayed on said display unit;

wherein said driver vertically mixes or culls signal charges accumulated in individual pixels of every K2 pixels, when second images are displayed on said display unit, and

wherein a value of K1 is different from a value of K2.

Claim 6: An electric camera according to claim 1, wherein list and second image are moving images and still images, respectively, and wherein the value of K1 is smaller than the value of K2.

Then on March 09 2004, the Examiner issued a notice of allowance.

11. Claim 5 of the '493 patent has following limitations that contain subject matters overlaps with that of claim 1 of '616:

"... an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines;

a display unit with a display screen, that display an image corresponding to the image signals...

the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance..."

Substantial new question of patentability

12. Independent claim 5 is the determinative claim. The italicized sections below are utilized by the examiner to show how specific teachings of the proposed references create a substantial new question of patentability in light of the original prosecution history.

Claim 5: An electric camera comprising:

an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines;

a signal processing unit that generates image signals by processing the output signals of the image sensing device; and

a display unit with a display screen, that displays an image corresponding to the image signals;

wherein when recording an image in a static image mode, the signal processing unit generates the image signals by using all signal charges accumulated in all N number of vertically arranged pixel lines of the image sensing device, to provide N pixel lines;

wherein when monitoring the image in the static image mode, *the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance*; and

wherein when recording the image in a moving video mode, the signal processing unit generates the image signals by using a portion of, or the entirety of, pixel lines which have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a second distance, where the second distance is different from the first distance.

Issue I

Casio & Juen

13. Casio is determined to be in public use on November 1, 1999 and teaches usage of a digital camera. Juen is a continuation of 08/937,805 filed on September 25, 1997 and teaches . The Request shows that Casio and Juen teach following limitations of claim 5 in '493 patent:

- *an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines*; (see Request p 21-28; Casio 11-12, 49, 58, 59, 61, 118; Juen 1:35-42, 5:63-6:2, 7:51-58)
- *a display unit with a display screen, that displays an image corresponding to the image signals*; (see Request p33-35; Casio, 25, 46, 47, and 49)
- … *the signal processing unit generates the image signals by using pixel lines that have been mixed or culled from the N number of vertically arranged pixel lines to only include pixel lines separated from one another by intervals of a first distance*; (see Request p42-48, Casio 16, 58-59, 61, 71, 117; Juen 3:32-35, Fig. 1 3:38-44, 6:3-14, 9:52-58, 5:66)

It is agreed that the consideration of Casio and Juen raises an SNQ as to at least claim 5 of the '923 patent as pointed out above. There is a substantial likelihood that a reasonable examiner would consider the teachings of Casio and Juen important in deciding whether or not claim 5 is patentable.

Issue II

Casio, Juen, Takase & Misawa

14. Requester asserts a substantial new question of patentability involving claim 6 as being obvious over the combined teaching of Casio, Juen, Takase and Misawa. Casio raises a substantial new question of patentability with respect to independent claim 5, which claim 6 depends on. (see Issue I above). According, it is agreed that the combination of Casio, Juen, Takase and Misawa raise a substantial new question of patentability with respect to claim 6.

Scope of Reexamination

15. Claims 5 and 6 will be reexamined as requested in the Request and are hereby Ordered.

Conclusion

Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extension of time in ex parte reexamination proceedings are provided for in 37 CFR 1.550(c).

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving

Patent No. 9,423,923 throughout the course of this reexamination proceeding. See MPEP §§

2207, 2282 and 2286.

All correspondence relating to this ex parte reexamination proceeding should be directed as

follows:

By U.S. Postal Service Mail to:

Mail Stop Ex Parte Reexam
ATTN: Central Reexamination Unit Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to:
(571) 273-9900
Central Reexamination Unit

By hand to:
Customer Service Window
Randolph Building
401 Dulany St.
Alexandria, VA 22314

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EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

Any inquiry concerning this communication or earlier communications from the Reexamination Legal Advisor or Examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

/PENG KE/
Primary Examiner, Art Unit 3992

Conferees:

/DENNIS G BONSHOCK/
Primary Examiner, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Notice of References Cited	Application/Control No. 90/014,628	Applicant(s)/Patent Under Reexamination 8339493	
	Examiner PENG KE	Art Unit 3992	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A					
	B					
	C					
	D					
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	I					
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	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Prosecution History of Patent 6765616
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 90/014,628	Applicant(s)/Patent Under Reexamination 8339493	
	Examiner PENG KE	Art Unit 3992	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A					
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	C					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
Apple Inc. One Apple Park Way Cupertino, CA 95014

LITIGATION REVIEW ☑	PK (examiner initials)	13 January 2021 (date)
Case Name		Director Initials
Maxell, Ltd. v ZTE Corporation et al. 5:16 cv 179 (Closed)		
Maxell, Ltd. v Apple Inc et al. 5:19 cv 36 (Open)		
Maxell, Ltd. v. Huawei Technologies Co. Ltd. et al. 5:16cv179 (Closed)		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,628	8339493
	Examiner	Art Unit
	PENG KE	3992

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Prosecution History Review	01/13/2021	PK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Takahiro Nakano
Art Unit	
Examiner Name	
Attorney Docket Number	2638-19.00

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/P.K/	EX 1005	US-7903162 B2	2011-03-08	Juen	
	EX 1006	US-5444482	1995-08-22	Misawa et al.	
	EX 1013	US-5502483	1996-03-26	Takase et al.	
	EX 1014	US-4949117	1990-08-14	Van Heyningen et al.	
	EX 1015	US-5150109	1992-09-22	Berry	
	EX 1016	US-6335760 B1	2002-01-01	Sato	
	EX 1017	US-5642171	1997-06-24	Baumgartner et al.	
	EX 1019	US-4740828	1988-04-26	Kinoshita	
	EX 1020	US-6018363	2000-01-25	Horii	
	EX 1022	US-6512541 B2	2003-01-28	Dunton et al.	
	EX1023	US-6563535 B1	2003-05-13	Anderson	
	EX 1024	US-4612575	1986-09-16	Ishman et al.	
	EX 1028	US-6963361	2005-11-08	Kawahara et al.	
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] -Number[4] -Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
/P.K/	EX 1021	EP 0802688 B1	2006-08-09	Hitachi, Ltd.		

Examiner Signature	/PENG KE/	Date Considered	01/13/2021

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /P.K/

PTO/SB/08b (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Takahiro Nakano
Art Unit	
Examiner Name	
Attorney Docket Number	2638-19.00

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
/P.K/	EX 1002	File History of U.S. Patent No. 8,339,493 (12/845,266)	
/P.K/	EX 1004	Casio LCD Digital Camera QV-8000SX User's Guide	
/P.K/	EX 1011	File History for U.S. Application Serial No. 15/959,774	
/P.K/	EX 1012	File History for U.S. Application Serial No. 15/386,656	
/P.K/	EX 1018	Holst, Gerald C., "CCD Arrays, Cameras, and Displays," 2d. Ed., JCD Publ. 1998.	
/P.K/	EX 1025	Complaint for Patent Infringement, Maxell Ltd. v. Apple Inc, No. 5:19-cv-0036-RWS (E.D. Tex. Mar. 15, 2019), Document No. 1.	
/P.K/	EX 1026	Claim Construction Memorandum and Order, Maxell Ltd. v. Apple Inc, No. 5:19-cv-0036-RWS (E.D. Tex. Mar. 18, 2020), Document No. 235.	
/P.K/	EX1027	Patent Owner Preliminary Response to Petition for Inter Partes Review of U.S. Patent 8,339,493, Apple Inc. v. Maxell, Ltd., IPR2020-00597, Paper 6.	

Examiner Signature	/PENG KE/	Date Considered	01/13/2021

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO:**

Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,628	12/10/2020	8339493	2638-19.00	6100

24956 7590 01/08/2021

MATTINGLY & MALUR, PC
1800 DIAGONAL ROAD
SUITE 210
ALEXANDRIA, VA 22314

EXAMINER	
KE, PENG	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
01/08/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

ERISE IP, P.A.
7015 COLLEGE BLVD., STE 700
OVERLAND PARK, KS 66211

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,628* .

PATENT UNDER REEXAMINATION *8,339,493* .

ART UNIT *3992* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Ex Parte Reexamination Interview Summary – Pilot Program for Waiver of Patent Owner's Statement	Control No. 90/014,628	Patent Under Reexamination is Requested 8,339,493	
	Examiner Simon Ke	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

All participants (USPTO official and patent owner):

(1) Mattingly & Malur, PC (3) _____

(2) Renee Preston CRU Paralegal (4) _____

Date of Telephonic Interview: 05 January 2021.

A. The USPTO official requested waiver of the patent owner's statement pursuant to the pilot program for waiver of patent owner's statement in *ex parte* reexamination proceedings.*

☐ The patent owner **agreed** to waive its right to file a patent owner's statement under 35 U.S.C. 304 in the event reexamination is ordered for the above-identified patent.

☐ The patent owner **did not agree** to waive its right to file a patent owner's statement under 35 U.S.C. 304 at this time.

☑ USPTO personnel were unable to reach the patent owner.**

B. The Patent Owner of record telephoned the Office and indicated they would like to participate in the pilot program for waiver of patent owner's statement in *ex parte* reexamination proceedings.*

☐ The Patent owner of record telephoned the Office and **agreed** to waive its right to file a patent owner's statement under 35 U.S.C. 304 in the event reexamination is ordered for the above-identified patent.

The patent owner is not required to file a written statement of this telephone communication under 37 CFR 1.560(b) or otherwise. However, any disagreement as to this interview summary must be brought to the immediate attention of the USPTO, and no later than one month from the mailing date of this interview summary. Extensions of time are governed by 37 CFR 1.550(c).

*For more information regarding this pilot program, see *Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings, 75 Fed. Reg.* 47269 (August 5, 2010), available on the USPTO Web site at http://www.uspto.gov/patents/law/notices/2010.jsp.

**The patent owner may contact the USPTO personnel at (571) 272-7705 or at the telephone number provided below if the patent owner decides to waive the right to file a patent owner's statement under 35 U.S.C. 304.

/RENEE M PRESTON/
Primary Examiner, OCRU (571)272-1607
Signature and telephone number of the USPTO official, who contacted, was contacted by, or attempted to contact the patent owner.

cc: Requester (if third party requester)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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Bib Data Sheet

CONFIRMATION NO. 6100

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
90/014,628	12/10/2020 RULE	348	3992	2638-19.00

AIA (First Inventor to File): YES

INVENTORS

8339493, Residence Not Provided;
MAXELL, LTD., OTOKUNI-GUN KYOTO, JAPAN;
APPLE INC. (3RD PTY REQ.), CUPERTINO, CA;

APPLICANTS

ERISE IP, PA, OVERLAND PARK, KS

**** CONTINUING DATA ***************************

This application is a REX of 12/845,266 07/28/2010 PAT 8339493
which is a CON of 10/660,710 09/12/2003 PAT 8059177
which is a DIV of 09/520,836 03/08/2000 PAT 6765616

**** FOREIGN APPLICATIONS *********************

JAPAN 2000006064 01/11/2000

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no			14	3
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS
24956

TITLE

ELECTRIC CAMERA

FILING FEE RECEIVED	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time)

12600	No. _____ for following:	❑ 1.18 Fees (Issue) ❑ Other _____ ❑ Credit

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Alexandria, Virginia 22313-1450
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REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,628	12/10/2020	8339493

CONFIRMATION NO. 6100

REEXAM ASSIGNMENT NOTICE

24956
MATTINGLY & MALUR, PC
1800 DIAGONAL ROAD
SUITE 210
ALEXANDRIA, VA 22314

OC000000122301615

Date Mailed: 12/29/2020

NOTICE OF ASSIGNMENT OF REEXAMINATION REQUEST

The above-identified request for reexamination has been assigned to Art Unit 3992. All future correspondence to the proceeding should be identified by the control number listed above and directed to the assigned Art Unit.

A copy of this Notice is being sent to the latest attorney or agent of record in the patent file or to all owners of record. (See 37 CFR 1.33(c)). If the addressee is not, or does not represent, the current owner, he or she is required to forward all communications regarding this proceeding to the current owner(s). An attorney or agent receiving this communication who does not represent the current owner(s) may wish to seek to withdraw pursuant to 37 CFR 1.36 in order to avoid receiving future communications. If the address of the current owner(s) is unknown, this communication should be returned within the request to withdraw pursuant to Section 1.36.

NOTICE OF USPTO EX PARTE REEXAMINATION PATENT OWNER STATEMENT WAIVER PROGRAM

The USPTO has implemented a pilot program where, after a reexamination proceeding has been granted a filing date and before the examiner begins his or her review, the patent owner may orally waive the right to file a patent owner's statement. See *"Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings,"* 75 FR 47269 (August 5, 2010). One goal of the pilot program is to reduce the pendency of reexamination proceedings and improve the efficiency of the reexamination process.

Ordinarily when ex parte reexamination is ordered, the USPTO must wait until after the receipt of the patent owner's statement and the third party requester's reply, or after the expiration of the time period for filing the statement and reply (a period that can be as long as 5 to 6 months), before mailing a first determination of patentability. The USPTO's first determination of patentability is usually a first Office action on the merits or a Notice of Intent to Issue Reexamination Certificate (NIRC).

Under the pilot program, the patent owner's oral waiver allows the USPTO to act on the first determination of patentability immediately after determining that reexamination will be ordered, and in a suitable case issue the reexamination order and the first determination of patentability (which could be a NIRC if the claims under reexamination are confirmed) at the same time.

Benefits to the Patent Owner for participating in this pilot program include reduction in pendency.

To participate in this pilot program, Patent Owners may contact the USPTO's Central Reexamination Unit (CRU) at 571-272-7705. The USPTO will make the oral waiver of record in the reexamination file in an interview summary and a copy will be mailed to the patent owner and any third party requester.

cc: Third Party Requester(if any)
ERISE IP, PA
7015 COLLEGE BLVD.
SUITE 700
OVERLAND PARK, KS 66211

/rbell/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,628	12/10/2020	8339493

CONFIRMATION NO. 6100

ERISE IP, PA
7015 COLLEGE BLVD.
SUITE 700
OVERLAND PARK, KS 66211

REEXAMINATION REQUEST NOTICE

OC000000122301613

Date Mailed: 12/29/2020

NOTICE OF REEXAMINATION REQUEST FILING DATE

(Third Party Requester)

Requester is hereby notified that the filing date of the request for reexamination is 12/10/2020, the date that the filing requirements of 37 CFR § 1.510 were received.

A decision on the request for reexamination will be mailed within three months from the filing date of the request for reexamination. (See 37 CFR 1.515(a)).

A copy of the Notice is being sent to the person identified by the requester as the patent owner. Further patent owner correspondence will be the latest attorney or agent of record in the patent file. (See 37 CFR 1.33). Any paper filed should include a reference to the present request for reexamination (by Reexamination Control Number).

cc: Patent Owner
24956
MATTINGLY & MALUR, PC
1800 DIAGONAL ROAD
SUITE 210
ALEXANDRIA, VA 22314

/rbell/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

Litigation Search Report CRU 3999

Reexamination Control No. 90/014,628

To: Examiner	From: Renee Preston
Location: CRU	Location: CRU 3999 / REM 4C75
Art Unit: 3992	Phone: (571) 272-1607
Date: 12/22/2020	E-mail: renee.preston@uspto.gov

Search Notes

U.S. Patent No. 8,339,493

1. Performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.
2. Performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.
3. Performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.
4. Performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.
5. Performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

Litigation: Cases Found

Status	Docket	Description
Closed	5:16cv179	Maxell, Ltd. V. Zte Corporation Et Al
Open	5:19cv36	Maxell Ltd. V. Apple Inc
Open	IPR2020-00597	Apple Inc. Vs. Maxell, Ltd.
Open	IPR2018-00236	ZTE Corporation Vs. Maxell, Ltd.
Closed	IPR2018-00904	Olympus Corporation Vs. Maxell Ltd.
Closed	5:16cv178	Maxell, Ltd. V. Huawei Technologies Co. Ltd. Et Al
Closed	IPR2018-00909	Olympus Corporation Vs. Maxell, Ltd.
Closed	IPR2018-00910	Olympus Corporation Vs. Maxell, Ltd.
Closed	IPR2018-00908	Olympus Corporation Vs. Maxell, Ltd.

Paper No. 11/22/2020

297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,

v.

HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.

Maxell Ltd., Plaintiff,

v.

ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

*690 Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27), (3:30–31), block 604 in Fig. 2, (4:4–16), (2:66–3:6), (5:3–7).	**Function:** : (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See e.g., '292 Pat. 6:8; block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (See e.g., '292 Patent 3:6–11, 4:15–42, Block 605 in Fig. 2); (4:15–42), (3:9–11), (5:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

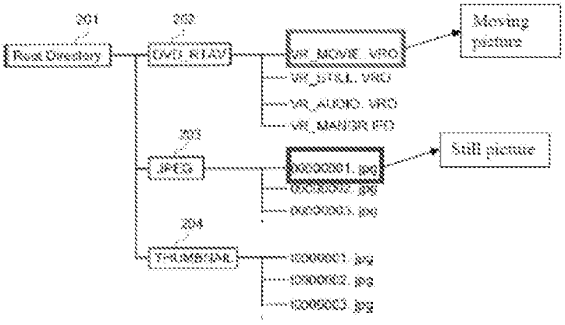
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

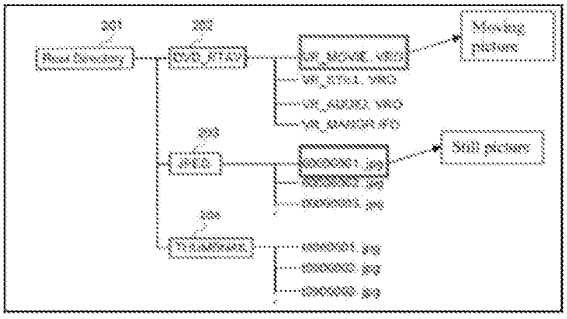
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

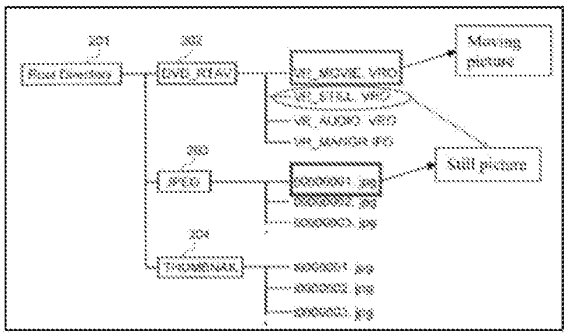
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[3]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:1–8, 4:48–7:32 & 7:48–8:5; 10:42–11:21, and 13:5–16).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" (10:8); "microphone" (10:8); "temperature sensor" (10:23); "cameras" (Figs. 3A and 3D)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723 Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

***724**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (claim 59) See also 4:66–5:9, 13A, and 13B; 6:17–22; 15:23–35

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

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'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 **Patent claim 1)**

*727

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" **('729 Patent claim 1)**

Maxell's Proposed Construction	ZTE's Proposed Construction
"an amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

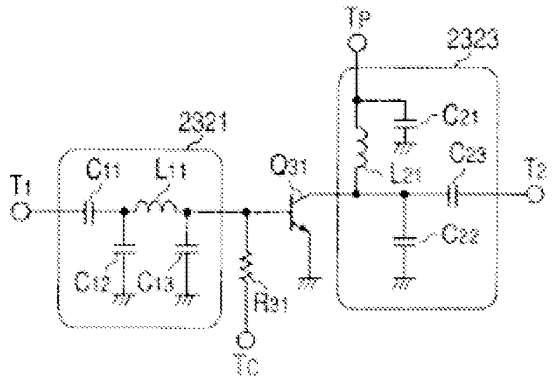
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"hardware, software, or a combination of the two that sometimes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1-S3-8), Fig. 5 (including steps S3, S3-1-S3-8) and corresponding citations in the specification at 5:65–6:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read only memory and the first memory, running the algorithm of Figs. 4 and 5, for [the 7:54 to

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
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Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding to said memory from outside said memory" **Structure**: as claimed ('695 Pat. col. 33 l. 1 – col. 34 l. 3) controller of one bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (col. 30 l. 7-51).

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

297 F.Supp.3d 668, 2018 Markman 1527870

Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,

v.

HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.

Maxell Ltd., Plaintiff,

v.

ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⇐ Functions, means, and results of invention

Patents ⇐ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⇐ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⇐ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 600 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 600); (2:12–17), (5:3–7).	**Function:** combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 600 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding sections in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27); (3:30–31; block 604 in Fig. 2); (4:4–16); (2:66–3:6); (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See, e.g., 12:66–67, block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (3:6–11; 4:15–42; Fig. 2), (4:15–42), (3:6–11; 4:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

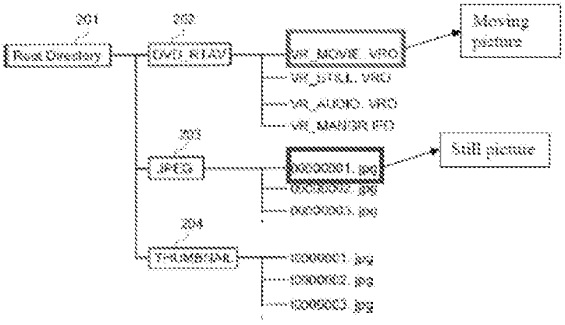
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

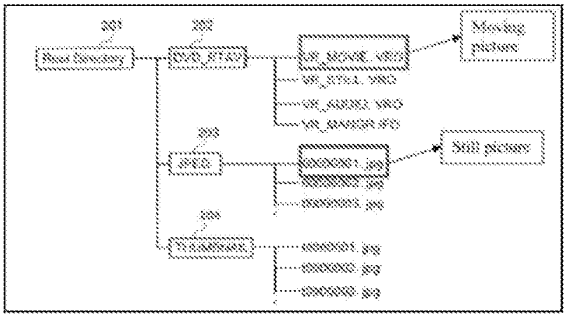
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

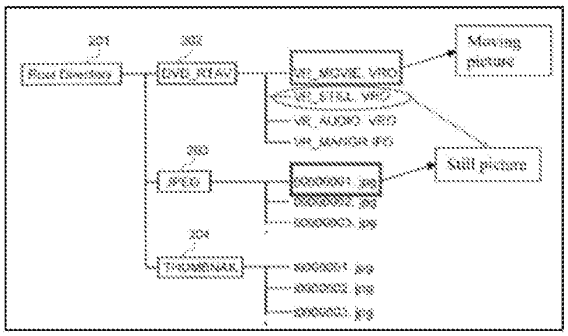
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[3]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:1–8, 4:48–7:32 & 7:48–8:5; 10:42–11:21, and 13:5–16).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** an image sensor, a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof	This term is written as a means-plus-function element **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 Patent at 11:58); "microphone" ('443 Patent at 12:2); "temperature sensor" ('443 Patent at 12:3); "cameras" (Figs. 3A and 3B)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

***724**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an equal number of vertically arranged pixel lines" (claim 59) See also 4:66-5:6, 7:8A, and 7:8B (in 47-22); 15:28, 35)

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

***725**

'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"an amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

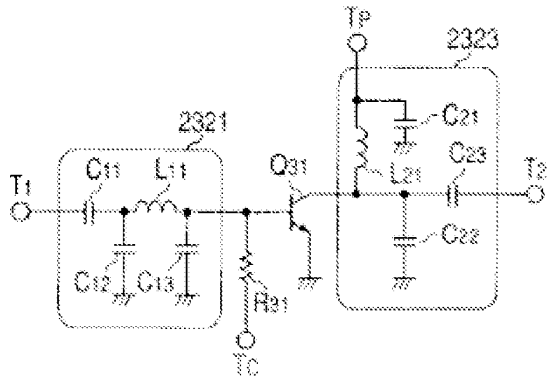
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that sometimes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** "At least one processor, such as a CPU" programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a processor (FIG 1) connected via a bus between a read-only memory and the first memory, running the algorithm of Figs. 4 and 5, (at 3:6–7:54)"

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
>
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 Patent claims 1 and 4)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure:** as claimed ('695 Patent at 33:3) connects of one bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (6:30–7:54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

297 F.Supp.3d 668, 2018 Markman 1527870

Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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APPLE INC., Petitioner,

v.

MAXELL, LTD., Patent Owner.

Patent Trial and Appeal Board.
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Attorneys and Law Firms

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Before MINN CHUNG, KEVIN C. TROCK, and JOHN A. HUDALLA, Administrative Patent Judges.

DECISION

Granting Institution of *Inter Partes* Review

35 U.S.C. § 314

HUDALLA, Administrative Patent Judge.

***1** Apple Inc. ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review ("IPR") of claims 1–3 and 5–14 (the "challenged claims") of U.S. Patent No. 6,329,794 B1 (Ex. 1001, "the '794 patent"). Petitioner filed a Declaration of Louis Hruska (Ex. 1003) with its Petition. Patent Owner, Maxell, Ltd. ("Patent Owner"), filed a Preliminary Response (Paper 6, "Prelim. Resp.").

With our authorization (Paper 7), Petitioner also filed a Reply (Paper 8, "Pet. Reply") and Patent Owner filed a Sur-Reply (Paper 10, "PO Sur-reply") addressing whether we should exercise our discretion to deny institution under 35 U.S.C. § 314(a).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), we may not authorize an *inter partes* review unless the information in the petition and the preliminary response "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." For the reasons that follow, we institute an *inter partes* review as to claims 1–3 and 5–14 of the '794 patent on all grounds of unpatentability presented.

I. BACKGROUND

A. Real Parties-in-Interest

Petitioner identifies Apple Inc. as the real party-in-interest. Pet. 71. Patent Owner identifies Maxell, Ltd. as the real party-in-interest. Paper 5, 1.

B. Related Proceedings

The parties identify the following proceedings related to the '794 patent (Pet. 71; Paper 5, 1):

Maxell, Ltd. v. Apple Inc., No. 5:19-cv-00036 (E.D. Tex. Mar. 15, 2019) ("the underlying litigation");

Maxell, Ltd. v. ZTE Corp., No. 5:18-cv-00034 (E.D. Tex. Mar. 2, 2018); and

ZTE Corp. v. Maxell, Ltd., IPR2018-00241 (institution denied) ("the '241 IPR").

We further note that Petitioner's arguments reference two other cases involving the '794 patent (Pet. 6; *see also* Ex. 1010):

Maxell, Ltd. v. Huawei Device USA, Inc., No. 5:16-cv-00178 (E.D. Tex. Nov. 18, 2016) ("the Huawei litigation"); and

Maxell, Ltd. v. ZTE Corp., No. 5:16-cv-00179 (E.D. Tex. Nov. 18, 2016).

C. The '794 patent

The '794 patent is directed to controlling power consumption in a battery-operable information processing device. Ex. 1001, 1:6–11. Figure 1 of the '794 patent is reproduced below.

FIG.1

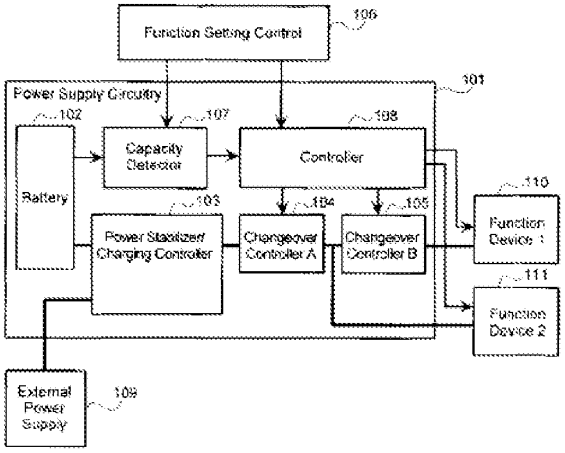


Figure 1 depicts power supply section 101, which supplies power to various functions in an information processing device. *Id.* at 3:23–25. Power supply section 101 includes battery 102 and power stabilizer/charging controller 103. *Id.* at 3:25–28. Capacity detector 107 detects the remaining capacity of battery 102. *Id.* at 3:34–35. Power supply section 101 is connected to function device 1 110 and function device 2 111, each of which implements functions of the information processing device. *Id.* at 3:42–44. As examples of such functions, the '794 patent mentions a modem function, an audio communication function, and a videophone function. *Id.* at 1:18–21, 1:31–35.

***2** Changeover controller A 104 switches between activation and stopping of power to function device 1 and function device 2, whereas changeover controller B 105 switches between activation and stopping of power to function device 1. *Id.* at 3:29–34. Controller 108 controls changeover controllers A, B and sends power consumption reduction instructions to function devices 1, 2. *Id.* at 3:35–38.

Priority levels are set for individual function devices and battery time can be maintained in a prioritized manner for function devices with higher priorities. *Id.* at 2:21–26. Power consumption reduction instructions are sent to function devices with lower usage priorities when battery capacity decreases below certain thresholds levels. *Id.* at 1:55–59. As a result, lower-priority function devices will be powered down before higher-priority function devices. *Id.* at 1:59–62. This power management method allows a user to continue using higher-priority functions for a longer period of time by reducing power to lower-priority functions as the battery capacity is depleted. *Id.* at 1:62–67.

The '794 patent issued from an application that was filed September 7, 2000, which claims priority to a Japanese patent application filed on May 22, 2000. *Id.*, codes (22), (30). As discussed below, Petitioner attempts to establish that, at a minimum, its asserted references qualify as prior art relative to either the May 22, 2000, filing date of the Japanese application (i.e., the earliest possible effective filing date) or the September 7, 2000, filing date of the U.S. application.

D. Illustrative Claim

Of the challenged claims, claims 1 and 9 are independent. Claims 2, 3, and 5–8 depend directly or indirectly from claim 1, and claims 10–14 depend directly or indirectly from claim 9. Claim 1 is illustrative of the challenged claims and recites:

> 1. An information processing device comprising:
> at least two function devices equipped with independent functions; and
> a power supply circuit for supplying power to each of said function devices, said power supply circuit including a battery, a capacity detector for detecting a remaining capacity of said battery, and a controller for controlling operation of said function devices based on said remaining capacity;
> wherein when said capacity detector detects remaining battery capacities NA and NB (where NA>NB), said controller sends a power consumption reduction instruction to each function device included in a set GA if NA is detected, each function device of the set GA having a lower usage priority, and to each function device of a set GB if NB is detected, each function device of set GB is not included in said set GA.

Ex. 1001, 8:29–46.

E. Prior Art

Petitioner relies on the following prior art:

- Japanese Patent Application Publication No. H10-289038, published Oct. 27, 1998 (Ex. 1004, "Hikishima");[1]
- Japanese Utility Model Application Publication No. U3064314, published Sept. 16, 1999 (Ex. 1005, "Tagoshi");[2]
- Japanese Patent Application Publication No. H7-281798, published Oct. 27, 1995 (Ex. 1006, "Tanaka");[3]
- U.S. Patent No. 4,933,785, filed Mar. 1, 1988, issued June 12, 1990 (Ex. 1007, "Morehouse");
- U.S. Patent No. 6,314,308 B1, filed July 2, 1998, issued Nov. 6, 2001 (Ex. 1008, "Sheynblat"); and

U.S. Patent No. 5,870,685, filed Sept. 4, 1996, issued Feb. 9, 1999 (Ex. 1009, "Flynn").

*3 Petitioner challenges claims 1–3 and 5–14 of the '794 patent on the following grounds (Pet. 5):

F. The Asserted Grounds

Claims Challenged	35 U.S.C. §	References
1–3, 8–10, 14	103(a)[4]	Hikishima, Tagoshi
5, 6, 11, 12	103(a)	Hikishima, Tagoshi, Tanaka
6, 12	103(a)	Hikishima, Tagoshi, Tanaka, Morehouse
7, 13	103(a)	Hikishima, Tagoshi, Sheynblat
1–3, 8–10, 14	103(a)	Hikishima, Tagoshi, Flynn
5, 6, 11, 12	103(a)	Hikishima, Tagoshi, Flynn, Tanaka
6, 12	103(a)	Hikishima, Tagoshi, Flynn, Tanaka, Morehouse
7, 13	103(a)	Hikishima, Tagoshi, Flynn, Sheynblat

II. ANALYSIS

We now consider Petitioner's asserted grounds and Patent Owner's arguments in the Preliminary Response to determine whether Petitioner has met the "reasonable likelihood" standard for institution under 35 U.S.C. § 314(a).

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

B. Level of Ordinary Skill in the Art

Citing testimony from Mr. Hruska, Petitioner contends a person having ordinary skill in the art would have had

> a Bachelor of Science degree in an Engineering discipline relevant to the technology area of the '794 Patent that involves coursework relating to power supply, control systems, or related technologies (e.g., Electrical Engineering, Computer Engineering, Computer Science, Chemical Engineering, or equivalent) with at least two years of experience in power supply, control systems, or related technologies.

Pet. 3 (citing Ex. 1003 ¶ 26). Patent Owner does not dispute Petitioner's definition of the level of ordinary skill in the art. Prelim. Resp. 22. For purposes of this Decision, we adopt Petitioner's definition. On the present record, we are satisfied that this definition comports with the level of skill necessary to understand and implement the teachings of the '794 patent and the asserted prior art.

C. Claim Interpretation

In an *inter partes* review, we construe each claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R.

§ 42.100(b) (2019). Accordingly, our claim construction standard is the same as that of a district court. *See id.* Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). "There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

***4** Construing a claim term under 35 U.S.C. § 112 ¶ 6 involves two steps: identifying the claimed function and then determining what structure, if any, disclosed in the specification corresponds to the claimed function. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1351 (Fed. Cir. 2015). To determine whether § 112 ¶ 6 applies to a claim limitation, the essential inquiry is "whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure." *Id.* at 1348. If the limitation uses the word "means," "there is a rebuttable presumption that § 112, para. 6 applies; if not, there is a rebuttable presumption that the provision does not apply." *Diebold Nixdorf, Inc. v. Int'l Trade Comm'n*, 899 F.3d 1291, 1298 (Fed. Cir. 2018).

1. "Function Device" and "Component Device" (Claims 1 and 9)

Petitioner proposes constructions of the limitations "function devices equipped with independent functions" (claim 1) and "component devices for performing different functions" (claim 9) based on a previous construction by a district court in a case between Patent Owner and other parties. Pet. 6–7; *see also* Ex. 1010, 98–103 (construction of these limitations by district court in the Huawei litigation). The constructions, which apply 35 U.S.C. § 112 ¶ 6, are set forth below (Pet. 6–7; Ex. 1010, 98–103):

"function devices equipped with independent functions" (claim 1)	Function: equipped with independent functions Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.
"component devices for performing different functions" (claim 9)	Function: performing different functions Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

Petitioner notes that the parties have agreed to apply these constructions in the underlying litigation. Pet. 6; Ex. 1011, 3. Indeed, the court in the underlying litigation ultimately adopted these constructions in its Claim Construction Memorandum and Order. *See* Ex. 1048, 6–8. Patent Owner does not dispute these constructions at this juncture. Prelim. Resp. 22.

Petitioner's constructions under 35 U.S.C. § 112 ¶ 6 appear to be premised on the idea that the terms "function device" and "component device" have no recognizable structural connotation to an ordinarily skilled artisan. Indeed, the specification of the '794 patent provides a vague description that ties these terms to their function. *See* Ex. 1001, 6:15–18 ("The devices specific to the functions 1, 2 are provided through the function devices 1, 2."). In addition, Patent Owner acknowledged in the Huawei litigation that "both terms are means-plus-function terms having the same construction." Ex. 1010, 98. As such, we find that treatment under § 112 ¶ 6 is appropriate.

Petitioner contends the claimed functions are "equipped with independent functions" and "performing different functions" based on the language of the claims themselves (Pet. 7); we see no reason to depart from those constructions. For corresponding structure, Petitioner proposes "modem devices, audio communication devices and videophone devices, or equivalents thereof." *Id.* These structures are supported in the specification of the '794 patent. *See* Ex. 1001, 1:18–21, 1:31–35; *see also* Ex. 1010, 101–02 (analysis of the corresponding structure by the court in the Huawei litigation).

Accordingly, we adopt Petitioner's proposed constructions for "function device" and "component device" as set forth above.

2. "Capacity Detector" (Claims 1 and 9)

Petitioner contends the limitation "capacity detector [for] detecting a remaining capacity of said battery" in claims 1 and 9 should be construed under 35 U.S.C. § 112 ¶ 6 because "capacity detector" is a nonce word. Pet. 7–8. Patent Owner does not contest Petitioner's construction here, but in the underlying litigation Patent Owner contended that the term should be given its plain and ordinary meaning. Ex. 1011, 27–29; Ex. 1048, 19–20. As noted by Petitioner in its Reply (Pet. Reply 10), the court in the underlying litigation ultimately found that § 112 ¶ 6 did not apply and, rather, applied the plain and ordinary meaning of "capacity detector." Ex. 1048, 23.

***5** The lack of the words "means for" in this limitation creates a rebuttable presumption that § 112 ¶ 6 does not apply. *See Diebold*, 899 F.3d at 1298. Furthermore, the specification of the '794 patent describes capacity detector circuit 107 as a part of power supply circuitry 101. *See, e.g.*, Ex. 1001, 3:25–38, 4:48, Fig. 1. On the present record, we are satisfied that is evidence of sufficiently definite structure for the term "capacity detector." *See Williamson*, 792 F.3d at 1348. Thus, we do not apply § 112 ¶ 6, and we instead apply the plain and ordinary meaning to this limitation.

3. Whether Sending a Power Consumption Reduction Instruction to a Function Device Includes Cutting Off Power to the Function Device

Claims 1 and 9 both recite a controller sending a "power consumption reduction instruction" to a function device. *See* Ex. 1001, 7:39–45, 9:17–24. Petitioner's arguments require us to consider whether cutting off power to a function device is within the scope of sending power consumption reduction instructions to a function device. *See* Pet. 35–36, 42 (both mapping "said controller sends a power consumption reduction instruction to each function device" to the control of a power switch feeding power to a function device). Patent Owner argues that a controller opening a switch and stopping power to a function device is not the same as sending a power consumption reduction instruction to the function device. *See* Prelim. Resp. 34.

The specification of the '794 patent expressly states that, in one of its embodiments, "*a power consumption reduction instruction is assumed to mean cutoff from the power supply.* Thus, in the following description the power consumption reduction instruction will be referred to as a power supply cutoff warning." Ex. 1001, 4:52–56 (emphasis added). In this way, the specification equates the act of cutting off power to a "power consumption reduction instruction." This is also reflected in the specification's treatment discussion of changeover controller A 104 and changeover controller B 105:

> The power supply section 101 includes: ... a changeover controller A 104 *capable of switching between activation and stopping of power* to a function device 1 and a function device 2; a changeover controller B 105 *capable of switching between activation and stopping of power* to the function device 1; ... and a controller 108 controlling the changeover controllers A, B and *sending power consumption reduction instructions* to the function devices 1, 2.

Id. at 3:25–38 (emphases added). As such, changeover controllers A, B may stop power to the function devices, which is associated with the sending of a "power consumption reduction instruction" to the function devices. Accordingly, for purposes of this decision, we determine that cutting off power to a function device is within the scope of sending a "power consumption reduction instruction" to a function device.

4. Other Terms

Based on the current record, we determine that no other terms require explicit construction. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy' ...." (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Patent Owner's Arguments Regarding Discretionary Denial

Patent Owner contends we should exercise our discretion to deny institution under 35 U.S.C. § 314(a) based on the duplicative nature and advanced stage of the underlying litigation. Prelim. Resp. 2–19; PO Sur-reply 1–10. Petitioner contends it filed its Petition timely and that there is little overlap with the underlying litigation. Pet. 8–11; Pet. Reply 1–10.

***6** Institution of *inter partes* review is discretionary. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) ("[T]he [Office] is permitted, but never compelled, to institute an [*inter partes* review] proceeding.");

35 U.S.C. § 314(a) ("The Director *may not* authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." (emphasis added)). In *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv*"), the Board discussed potential applications of *NHK Spring Co., Ltd. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential) ("*NHK*"), as well as a number of other cases dealing with discretionary denial under § 314(a). *Fintiv* identifies a non-exclusive list of factors parties may consider addressing, particularly where there is a related, parallel district court action and whether such action provides any basis for discretionary denial. *Fintiv* at 5–16. Those factors include:

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board's exercise of discretion, including the merits.

Id. at 5–6. We authorized the parties to address these factors in the Reply and Sur-reply. Paper 7.

We now consider these factors to determine whether we should exercise discretion to deny institution under 35 U.S.C. § 314(a). In evaluating the factors, we take a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review. *Fintiv* at 6.

1. Stay in the Underlying Litigation

Although Petitioner moved for a stay in the underlying litigation (*see* Pet. Reply 6; Ex. 1045), the court recently denied Petitioner's motion. PO Sur-reply 2–3. We have entered the court's order denying Petitioner's motion into the record as Exhibit 3001. Notably, the court denied the motion without prejudice and stated that it could not say, in the event that we instituted this IPR, whether "the late stage [of proceedings] would necessarily outweigh the potential simplification of issues following institution decisions" in this and other *inter partes* review cases. Ex. 3001, 6 (citing a prior case by the court in which a stay was granted three weeks before trial upon the institution of IPRs). In other words, the court signaled its willingness to entertain a renewed motion for stay from Petitioner if we were to issue decisions granting institution. Notwithstanding, the court stated that, were a renewed motion for stay requested, the late stage of proceedings "will certainly weigh against granting a stay." *Id.* Given the court's inclination to reconsider a motion for stay for the potential simplification of issues, but also considering the court's comment about how the late stage of proceedings would affect its consideration of any such renewed motion, we view this factor as neutral.

2. The Trial Date in the Underlying Litigation

Trial in the underlying litigation is currently set for October 26, 2020. Pet. Reply 7; PO Sur-reply 1; Ex. 3001, 4. Nevertheless, Petitioner contends "[l]itigation will continue" after any Final Written Decision here. Pet. Reply 7. Petitioner notes that it filed a petition for writ of mandamus related to the court's denial of Petitioner's motion to transfer the underlying litigation. *Id.* Petitioner also notes the COVID-19 pandemic may affect the trial schedule. *Id.*

***7** Patent Owner argues that trial "will be complete eight months before a Final Written Decision issues" here and that a delay in the trial date is unlikely. PO Sur-reply 3. Patent Owner cites a standing order in the court of the underlying litigation "to keep cases moving" despite the COVID-19 pandemic. *Id.* at 3 (quoting Ex. 2020). And, according to Patent Owner, even if the trial date were delayed by three months, the trial would still precede the Final Written Decision by five months. *Id.* at 4. Patent Owner additionally notes the U.S. Court of Appeals for the Federal Circuit recently denied Petitioner's petition for writ of mandamus. *Id.* at 3–4 (citing *In re Apple Inc.*, No. 2020-115 (Fed. Cir. Apr. 22, 2020)).

The trial in the underlying litigation is currently set to occur months before any Final Written Decision in this case will issue. Although we consider delays due to the COVID-19 pandemic to be a real possibility despite the court's standing order, we agree with Patent Owner that even a delayed trial might precede a Final Written Decision. This factor favors the exercise of discretionary denial.

3. Investment by the Court and the Parties in the Underlying Litigation

Petitioner contends that, aside from claim construction proceedings, "the district court has not invested other substantive efforts and the litigation is not 'advanced.' " Pet. Reply 8. Petitioner notes that summary judgment is still months away and fact discovery and depositions are ongoing. *Id.* According to Petitioner, the court is not likely to analyze invalidity until trial. *Id.*

As evidence of the court's investment in the underlying litigation, Patent Owner highlights the court's claim construction hearing and order and its rulings on Petitioner's motion to dismiss and motion to transfer. PO Sur-reply 5 (citing Exs. 1048, 2013–2015). Patent Owner also notes that fact discovery has closed and that expert discovery is underway and closes June 25, 2020. *Id.* (citing, *inter alia*, Ex. 2016).

At least some of the work underway or already completed in the underlying litigation may have relevance to issues in the Petition, including claim construction and expert discovery. Nevertheless, the potential relevance of such work is diminished by the fact that Petitioner's unpatentability challenges here do not overlap significantly with Petitioner's invalidity contentions in the underlying litigation. *See infra* § II.D.4 (analyzing the lack of overlap). In addition, the present record does not show how the court's rulings on the motion to dismiss or the motion to transfer bear on the patentability issues presented here. Considering that at least some of the investment by the court and the parties in the underlying litigation may be relevant to this case, we find this factor moderately favors the exercise of discretionary denial.

4. Overlap of the Issues

Petitioner contends there is little overlap between the issues in this case and those in the underlying litigation. Pet. Reply 9–10. Petitioner emphasizes that the primary reference in this case, Hikishima, is not asserted in the underlying litigation. *Id.* at 9 (citing Ex. 1047, 3). Petitioner also notes that Tagoshi, which is asserted in the underlying litigation, is used "only as an alternative teaching" here. *Id.* Petitioner additionally notes that Flynn, a secondary reference in the underlying litigation, was used here "in the event [Patent Owner] took a position that it ended up not taking in the preliminary response." *Id.* Petitioner further notes that Nonogaki, a primary reference in the underlying litigation, is not asserted here. *Id.* Finally, Petitioner notes that only claims 1 and 14 are challenged in the underlying litigation, which is a subset of the 13 claims challenged here. *Id.* at 9–10.

***8** Patent Owner argues "[t]he issues in this proceeding are substantially the same as in the District Court Action." PO Sur-reply 7, 9–10. Patent Owner notes that there was substantial overlap between the two proceedings prior to Patent Owner's Final Election of Asserted Claims and Petitioner's Final Election of Prior Art in the underlying litigation. *Id.* at 7 (citing Exs. 1047, 2018). Patent Owner argues that Petitioner's "*Tagoshi* chart from the District Court Action reveals [Petitioner] relies on many of the same citations in the Petition." *Id.* Patent Owner also notes that Nonogaki is part of the record here and is cited by Mr. Hruska in his declaration. *Id.* at 7 (citing Ex. 1003 ¶ 46; Ex. 1022). Patent Owner additionally notes it was required to narrow the set of asserted claims in the underlying litigation, so Patent Owner argues Petitioner cannot "avoid denial simply by challenging extraneous unasserted claims that that raise the same invalidity issues as the asserted ones." *Id.* at 8.

We agree with Petitioner that there is very little overlap in the prior art and claims asserted in the underlying litigation and in this proceeding. Every asserted ground in this case is based primarily on Hikishima, which is not asserted in the underlying litigation. *See* Pet. 5. We view this difference in prior art as a significant distinction between this case and the underlying litigation. In addition, we agree with Petitioner (Pet. Reply 9) that Tagoshi and Flynn play minor roles in this case. In the main obviousness ground here, Petitioner adds teachings of "usage priority" from Tagoshi "to the extent [Patent Owner] contends *Hikishima* does not teach" it. Pet. 38–40. Moreover, the minor issue for which Petitioner added citations to Flynn—namely, a specific unit of measurement for the recited "remaining capacity of said battery" (*see* Pet. 61–62)—is not contested by Patent Owner at this time. Prelim. Resp. 42. Furthermore, Petitioner does not assert Nonogaki here despite the fact that its declarant briefly discusses Nonogaki in describing the state of the art. *See* Ex. 1003 ¶¶ 29, 46. Finally, claims 2, 3, and 5–13 are being challenged here, but not in the underlying litigation, which favors institution. On balance, we view this factor as strongly weighing against exercising discretion to deny.

5. Identity of Petitioner and the Defendant in the Underlying Litigation

"If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion." *Fintiv* at 13–14. Both parties acknowledge that Petitioner here is the defendant in the underlying litigation. Pet. Reply 10; PO Sur-reply 10. Thus, this factor does not weigh against exercising discretionary denial.

6. Other Circumstances

The final *Fintiv* factor is a catch-all that takes into account any other relevant circumstances. The decision whether to exercise discretion to deny institution under § 314(a) is based on "a balanced assessment of all relevant circumstances in the case, including the merits." Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019) ("Consolidated Trial Practice Guide"), *available at* https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf, at 58. Considering the merits of the unpatentability arguments in the Petition and Patent Owner's arguments in the Preliminary Response, as discussed below, we determine Petitioner has established a reasonable likelihood that Petitioner would prevail with respect to the challenged claims. As discussed below, Petitioner cites the primary reference, Hikishima, for teaching a portable device with a video image processing function and an audio processing function that are stopped in succession when the power supply voltage falls below certain reference voltages. *See infra* § II.E.3. Based on the present record, Hikishima alone appears to teach most, if not all, limitations of the challenged independent claims. Accordingly, the particularly strong merits of the challenges presented in the Petition favor institution.

***9** Patent Owner argues that Petitioner unreasonably delayed in filing the Petition. PO Sur-reply 1–2, 8–10. The district court in the underlying litigation also stated that Petitioner "has not sufficiently explained its delay in filing the petitions ... nine months after [Patent Owner] filed suit and six months after [Patent Owner] served its initial infringement contentions." Ex. 3001, 4–5.

Petitioner notes that the underlying litigation initially involved 10 different patents and "132 possibly-asserted claims"; Petitioner argues that it needed time to locate relevant prior art and prepare petitions for *inter partes* review. Pet. Reply 7–8. Petitioner's explanation is consistent with the AIA's legislative history as to the one-year statutory bar under § 315(b). *See* 157 Cong. Rec. S5429 (daily ed. Sept. 8, 2011) (statement of Senator Kyl) ("High-technology companies, in particular, have noted that they are often sued by defendants asserting multiple patents with large numbers of vague claims, making it difficult to determine in the first few months of the litigation which claims will be relevant and how those claims are alleged to read on the defendant's products.... [I]t is important that the section 315(b) deadline afford defendants a reasonable opportunity to identify and understand the patent claims that are relevant to the litigation."). We also note that Patent Owner made its Preliminary Election of Asserted Claims in the underlying litigation on November 18, 2019. *See* Ex. 2002. The instant Petition was filed one month later, i.e., on December 19, 2019. *See* Paper 3, 1. Having considered the particular factual circumstances of this case, we do not consider Petitioner's filing untimely.

Patent Owner also references its analysis of the factors enumerated in *General Plastic Industries Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (PTAB May 4, 2016) (precedential) ("*General Plastic*"). Prelim. Resp. 5–19; PO Sur-reply 10. Although most of Patent Owner's *General Plastic* analysis involves the same facts regarding the underlying litigation discussed above with respect to the other *Fintiv* factors, Patent Owner additionally contends Petitioner "used the '241 IPR filed by ZTE against [Patent Owner], [Patent Owner's] preliminary response thereto, and the Board's denial of institution, as a roadmap and gained unfair tactical advantage here." PO Sur-reply 10; *see also* Prelim. Resp. 16–18. Nevertheless, as correctly noted by Petitioner (Pet. 8–9), the '241 IPR involved a different petitioner and different prior art. As such, the '241 IPR is not relevant to the instant analysis.

Finally, we note that Petitioner includes extensive policy arguments against the Board's application of *Fintiv* and *NHK* in determining whether to exercise discretion under § 314(a). Pet. 10–11; Pet. Reply 1–6. We need not address these arguments, as the Under Secretary of Commerce for Intellectual Property and Director of the U.S. Patent and Trademark Office has made *Fintiv* and *NHK* precedential decisions of the Board.

The only "other consideration" that bears on our decision whether to exercise discretionary denial is the strength of Petitioner's patentability challenges on the preliminary record, which favors institution. Thus, this factor weighs against exercising discretionary denial.

7. Conclusion

A few of the *Fintiv* factors weigh in favor of exercising our discretion to deny institution, including the impending trial date and the investment in the underlying litigation (e.g., the court's completion of claim construction). Nevertheless, we consider the lack of overlap in the issues and Petitioner's relatively strong preliminary showing of unpatentability to outweigh these other factors, because Petitioner's unpatentability grounds based primarily on Hikishima would

never be considered if we were to exercise our discretion to deny institution in this case. We also note that the court in the underlying litigation has left open the possibility of entertaining a stay if we were to institute this and other related proceedings. In our view, these considerations outweigh concerns about inefficiency based on the posture of the underlying litigation. For these reasons, we decline to exercise our discretion under 35 U.S.C. § 314(a) to deny *inter partes* review.

E. Obviousness Ground Based on Hikishima and Tagoshi

***10** Petitioner contends the subject matter of claims 1–3, 8–10, and 14 would have been obvious over the combination of Hikishima and Tagoshi. Pet. 15–52. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 24–36.

1. Hikishima

Hikishima is a Japanese patent application publication directed to "a portable information terminal device that can prevent communication from suddenly being interrupted when the remaining battery capacity is reduced." Ex. 1004, code (57). The translated version of Hikishima's Figure 1 is reproduced below.

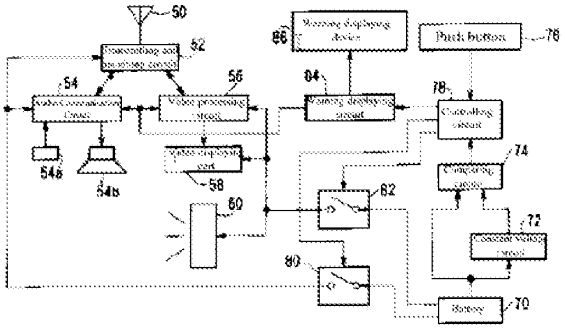


Figure 1 is a block diagram illustrating an electrical configuration of a portable information terminal device. *Id.* at 7. Transmitting and receiving circuit 52 demodulates signals from antenna 50, outputs received audio signals to audio calling circuit 54, and outputs received image signals to video image processing circuit 56. *Id.* ¶ 18. Audio calling circuit 54 expands the audio signal output from transmitting and receiving circuit 52, converts the signal into an analog signal, and then outputs the signal to connected speaker 54b. *Id.* Video image processing circuit 56 performs image processing, such as expanding an image signal output from transmitting and receiving circuit 52, and displays images on video image display 58, which has its own backlight 60. *Id.* ¶ 19.

Power source switch 80 connects or disconnects battery 70 to transmitting and receiving circuit 52 and audio calling circuit 54 based on a control signal output from controlling circuit 78. *Id.* ¶ 21. Likewise, power source switch 82 connects or disconnects battery 70 to video image processing circuit 56, video image display 58, and backlight 60 based on a control signal output from controlling circuit 78. *Id.* Comparing circuit 74 compares the power supply voltage of battery 70 with certain reference voltages output from the constant voltage circuit 72 and outputs comparison signals. *Id.* ¶ 20.

The translated version of Hikishima's Figure 3 is reproduced below.

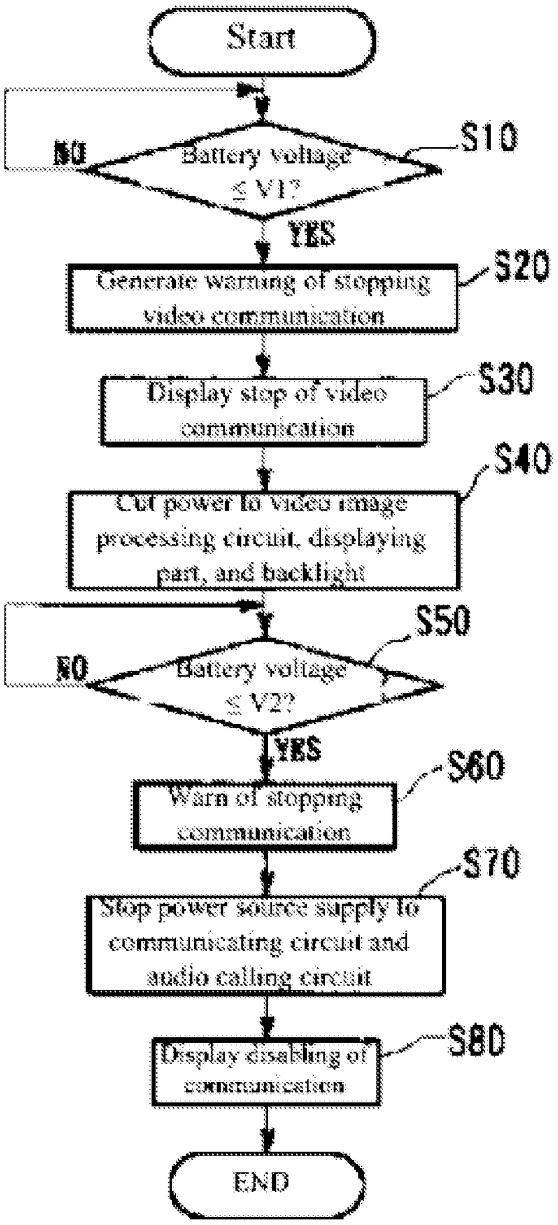


Figure 3 is a flowchart showing an operation of a portable information terminal device. *Id.* at 7. In step S10, controlling circuit 78 determines whether the power supply voltage of battery 70 is lower than reference voltage V_1 based on a comparison signal output from comparing circuit 74. *Id.* ¶ 25. If so, controlling circuit 78 commands warning displaying circuit 84 to indicate to an operator that video image communication will end (step S20). *Id.* ¶¶ 26–27. Next, in step S30, controlling circuit 78 commands warning displaying circuit 84 to display that video image communication will be stopped.[5] *Id.* ¶ 27. Then, in step S40, controlling circuit 78 stops operation of video image processing circuit 56, video image display 58, and backlight 60 by opening power source switch 82. *Id.* ¶ 28. Notwithstanding, battery 70 still supplies power to audio calling circuit 54 and transmitting and receiving circuit 52 so audio communication can continue. *Id.* In step S50, controlling circuit 78 determines whether the power supply voltage of battery 70 is lower than reference voltage V_2 based on a comparison signal output from comparing circuit 74. *Id.* ¶ 29. If so, controlling circuit 78 commands warning displaying circuit 84 to indicate to an operator that audio communication will end (step S60). *Id.* ¶ 30. Next, in step S70, controlling circuit 78 stops operation of transmitting and receiving circuit 52 and audio calling circuit 54 by opening power source switch 80. *Id.* ¶ 31. Then, in step S80, controlling circuit 78 commands warning displaying circuit 84 to indicate on warning display 86 that communication currently cannot be performed. *Id.*

***11** Petitioner contends Hikishima qualifies as prior art under 35 U.S.C. § 102(b) based on its publication date. Pet. 11. Patent Owner does not contest the prior art status of Hikishima. For purposes of this Decision, we determine that Hikishima qualifies as prior art under 35 U.S.C. § 102(b) because Hikishima's publication date of October 27, 1998, is more than one year before the U.S. filing date of the challenged claims, which is September 7, 2000. Ex. 1001, code (22); Ex. 1004, code (43).

2. Tagoshi

Tagoshi is a Japanese utility model application publication directed to battery mounted device that can selectively stop a function and secure an important function to a user for as long as possible. Ex. 1005, code (57). When battery voltage is below a predetermined level, functions that cause electrical power consumption are gradually suspended or stopped to delay reduction in voltage. *Id.* ¶ 17. Functions with a lower level of importance are stopped earlier, and functions with a higher level of importance are stopped later. *Id.* ¶ 24. Tagoshi describes an example where normal operation of the device is modified at a succession of decreasing voltage levels by stopping data receiving, stopping calling and data transmitting, stopping memory input registration, and stopping the display and keyboard. *Id.* ¶¶ 13–16, Fig. 2.

Petitioner contends Tagoshi qualifies as prior art under 35 U.S.C. § 102(a) based on its publication date. Pet. 12. Patent Owner does not contest the prior art status of Tagoshi. On the present record, we have no evidence of an invention date other than the earliest possible effective filing date of

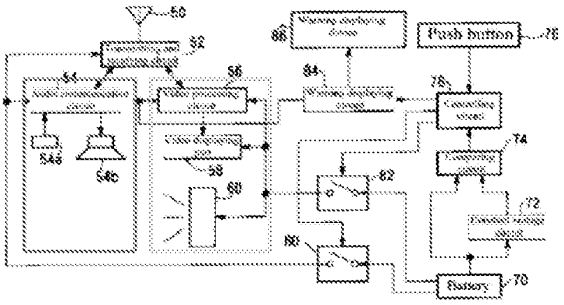
the challenged claims. For purposes of this Decision, we determine that Tagoshi qualifies as prior art under 35 U.S.C. § 102(a) because Tagoshi's publication date of January 14, 2000, is before the earliest possible effective filing date of the challenged claims, which is May 22, 2000. Ex. 1001, code (30); Ex. 1005, code (43).

3. Claim 1

a. Preamble and Claim Limitations

The preamble of claim 1 recites "[a]n information processing device." Ex. 1001, 8:29. Petitioner cites Hikishima's "portable information terminal device" such as "mobile telephones, PHS telephones, laptop-style personal computers, and the like." Pet. 15 (citing Ex. 1004 ¶¶ 13, 17, code (57)). Patent Owner does not dispute Petitioner's analysis of the preamble of claim 1. Neither party addresses whether the preamble is limiting. Because Petitioner has shown that the combination of Hikishima and Tagoshi teaches the preamble, we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Claim 1 further recites "at least two function devices equipped with independent functions." Ex. 1001, 8:30–31. We construe "function device" under 35 U.S.C. § 112 ¶ 6 as set forth above. *See supra* § II.C.1. Petitioner cites Hikishima's "video image processing device" and "audio processing device" for teaching the recited "function devices." Pet. 15–16 (citing Ex. 1004 ¶¶ 16, 18, 19, 28). To further explain its analysis, Petitioner provides an annotated version of Hikishima's Figure 1, which is reproduced below.



In this annotated version of Hikishima's Figure 1, Petitioner has indicated video image processing device in a green box and the audio processing device in a red box. Pet. 16. According to Petitioner, the video image processing device comprises video processing circuit 56, video display 58, and backlight 60. *Id.* (citing Ex. 1003 ¶ 86). Petitioner contends the video image processing device is a videophone device (i.e., a corresponding structure for the recited "function device") because it performs "moving image communication." *Id.* at 17 (quoting Ex. 1004 ¶¶ 1, 14 and citing Ex. 1003 ¶¶ 92–93). Petitioner further contends the audio processing device comprises audio calling circuit 54, microphone 54a, and speaker 54b. *Id.* at 16 (citing Ex. 1003 ¶ 85). Petitioner contends the audio processing device is an audio communication device (i.e., another corresponding structure for the recited "function device") based on its mobile telephone capabilities. *Id.* at 17 (citing Ex. 1003 ¶¶ 87–90; Ex. 1004 ¶¶ 2, 18).

***12** For the claimed function "equipped with independent functions," Petitioner contends an ordinarily skilled artisan would have considered Hikishima's processing of video image signals to be an independent function from processing an audio signals. *Id.* at 18 (citing Ex. 1003 ¶ 96). In support of this, Petitioner notes Hikishima's teaching that audio communication can continue even when the transmission and receipt of video has stopped. *Id.* (citing Ex. 1004 ¶ 28).

Patent Owner does not dispute Petitioner's analysis of the "function devices" limitation. Based on Petitioner's analysis, which shows that Hikishima teaches the recited function and the corresponding structures (*see supra* § II.C.1), we are persuaded that the combination of Hikishima and Tagoshi teaches this limitation.

Claim 1 further recites "a power supply circuit for supplying power to each of said function devices, said power supply circuit including a battery." Ex. 1001, 8:33–36. Petitioner cites Hikishima's battery 70, constant voltage circuit 72, comparing circuit 74, controlling circuit 78, and power source switches 80, 82 for the recited power supply circuit and battery. Pet. 20–21 (citing Ex. 1004 ¶¶ 20–21, Fig. 1). Petitioner notes that these elements of Hikishima supply power to the video image processing device and the audio processing device. *Id.* at 20 (citing Ex. 1003 ¶¶ 102–103). Patent Owner does not dispute Petitioner's analysis of the "power supply circuit" limitation. Based on Petitioner's analysis, we are persuaded that the combination of Hikishima and Tagoshi teaches this limitation.

Claim 1 further recites "a capacity detector for detecting a remaining capacity of said battery." Ex. 1001, 8:35–36. As discussed above, we apply the plain and ordinary meaning to this limitation. *See supra* § II.C.2. Petitioner cites Hikishima's teaching of storing two reference power supply voltage values, V_1 and V_2, in constant voltage circuit 72. Pet. 23 (citing Ex. 1004 ¶¶ 20, 23, 35, Figs. 1, 3).

Petitioner notes that comparing circuit 74 compares these reference voltages to the power supply voltage of battery 70. *Id.* Petitioner refers to this as the "Figure 1 embodiment." Petitioner also cites Hikishima's teaching (with reference to Figure 5) of a conventional portable information terminal device in with "power supply voltage detecting circuit 36 that detects a voltage of a portable battery provided in the portable information terminal device." *Id.* at 24 (citing Ex. 1004 ¶ 11, Fig. 5). Alternatively, Petitioner contends "it would have been obvious to modify *Hikishima's* Fig. 1 embodiment to include *Hikishima's* 'power supply voltage detecting circuit 36' disclosed for *Hikishima's* Fig. 5 embodiment" because an ordinarily skilled artisan would have known such a device was needed to detect battery voltage. *Id.* at 25 (citing Ex. 1003 ¶ 120).

Many of Patent Owner's arguments against Petitioner's analysis of the "capacity detector" are tied to Petitioner's proposed application of 35 U.S.C. § 112 ¶ 6 to this limitation, which we reject above. *See supra* § II.C.2. Such arguments, which focus on Petitioner's analysis of corresponding structure, do not negate or undermine Petitioner's showing. Based on Petitioner's showing, we are persuaded preliminarily that an ordinarily skilled artisan would have modified Hikishima's comparing circuit 74 for comparing battery voltage to reference voltages so that it further included power supply voltage detecting circuit 36; this would have allowed the voltage comparison discussed with reference to Hikishima's Figure 1 embodiment. *See* Ex. 1003 ¶ 120; Ex. 1004 ¶¶ 11, 20. We do not agree with Patent Owner's argument (Prelim. Resp. 26–28) that the disclosed use of power supply voltage detecting circuit 36 in a prior art application somehow makes it unfit for usage in a different application that compares reference voltages to battery voltage in a different way. Furthermore, even without Petitioner's proposed modification of Hikishima's embodiments, Hikishima's teachings about comparing reference voltages to the battery voltage appear to render obvious the recited "capacity detector" for the battery. *See* Ex. 1003 ¶ 119; Ex. 1004 ¶ 20. Specifically, "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton," *KSR*, 550 U.S. at 421, and such a person considering the totality of Hikishima would have known to implement a voltage detecting circuit to perform the voltage comparisons taught in Hikishima's Figure 1 embodiment. Thus, Petitioner establishes sufficiently that the combination of Hikishima and Tagoshi teaches the "capacity detector" limitation.

***13** Claim 1 further recites "a controller for controlling operation of said function devices based on said remaining capacity." Ex. 1001, 8:36–38. Petitioner cites Hikishima's controlling circuit 78, which "controls each part of the portable information terminal device." Pet. 28 (citing Ex. 1004 ¶¶ 16, 21, Fig. 1). Petitioner notes that controlling circuit 78 "receives a comparison signal from the comparing circuit 74 ..., and based on the comparison signal, controls power to the video image processing device and audio processing device." *Id.* (citing Ex. 1003 ¶¶ 132–134; Ex. 1004 ¶¶ 25, 28, 29, 31, Fig. 3). As discussed above, Petitioner likens Hikishima's video image processing device and audio processing device to the recited "function devices." Patent Owner does not dispute Petitioner's analysis of the "controller" limitation. Based on Petitioner's analysis, we are persuaded that the combination of Hikishima and Tagoshi teaches this limitation.

Claim 1 further recites

> wherein when said capacity detector detects remaining battery capacities NA and NB (where NA>NB), said controller sends a power consumption reduction instruction to each function device included in a set GA if NA is detected, each function device of the set GA having a lower usage priority, and to each function device of a set GB if NB is detected, each function device of set GB is not included in said set GA.

Ex. 1001, 8:39–46. Regarding the detected remaining battery capacities NA and NB, where NA>NB, Petitioner notes Hikishima's teaching of "a first reference voltage, V_1, and a second reference voltage, V_2, where $V_1>V_2$." Pet. 29–30 (citing Ex. 1004 ¶¶ 20, 23). According to Petitioner, "[r]emaining battery capacity NA is met by any battery capacity lower than V_1, and similarly, remaining battery capacity NB is met by any battery capacity lower than V_2." *Id.* at 32 (citing Ex. 1003 ¶¶ 141–142). Petitioner cites Hikishima's video image processing device as function device in set GA. *Id.* at 34 (citing Ex. 1003 ¶¶ 92–93). Petitioner cites Hikishima's audio processing device as a function device in set GB. *Id.* at 42 (citing Ex. 1003 ¶ 168).

For the power consumption reduction instructions, Petitioner cites Hikishima's Figure 3 embodiment. For the particular power consumption reduction instruction associated with the detection of NA and set GA, Petitioner contends that "controlling circuit 78 ... makes the determination [whether] the battery voltage, i.e., the remaining battery capacity, is $\leq V_1$" at step S10. Pet. 31–32 (citing Ex. 1004 ¶ 25, Fig. 3). When this is true, the method proceeds to three other actions

that Petitioner cites for the "power consumption reduction instruction": (1) controlling circuit 78 outputting a signal to video image processing circuit 56 indicating video image communication will be stopped as part of step S20 (Pet. 34 (citing Ex. 1003 ¶ 148; Ex. 1004 ¶ 27)); (2) controlling circuit 78 commanding warning displaying circuit 84 to display that video communication will be stopped in step S30 (Pet. 35 (citing Ex. 1003 ¶ 48; Ex. 1004 ¶ 27)); and (3) controlling circuit 78 opening power switch 82 to stop operation of the video image processing device in step S40 (Pet. 35–36 (citing Ex. 1003 ¶ 150; Ex. 1004 ¶ 28)).

Regarding the particular power consumption reduction instruction associated with the detection of NB and set GB, Petitioner contends that "controlling circuit 78 determines whether or not the power supply voltage of the battery 70 is lower than reference voltage V_2" at step S50. Pet. 41–42 (citing Ex. 1004 ¶¶ 29–31, Fig. 3). When this is true, the method proceeds to two other actions that Petitioner cites for the "power consumption reduction instruction": (1) controlling circuit 78 outputting a signal to audio calling circuit 54 indicating that audio communication will be stopped in step S60 (Pet. 42 (citing Ex. 1003 ¶ 169; Ex. 1004 ¶ 30)); and (2) controlling circuit 78 opening power source switch 80 to stop operation of transmitting and receiving circuit 52 and audio calling circuit 54 in step S70 (Pet. 42 (citing Ex. 1003 ¶ 169; Ex. 1004 ¶ 31[6])).

***14** Regarding the limitation "each function device of the set GA having a lower usage priority" than those in set GB, Petitioner cites Hikishima's teaching of powering off the video image processing device before shutting off power to the audio processing device. Pet. 37 (citing Ex. 1003 ¶¶ 155, 157; Ex. 1004 ¶¶ 13, 16, 28). According to Petitioner, turning off the video image processing device (in set GA) before the audio processing device (in set GB) establishes a "lower usage priority." *Id.* at 37–38 (citing Ex. 1003 ¶ 156). Petitioner additionally cites Tagoshi's teaching of selectively stopping certain functions and securing an important function for as long as possible. *Id.* at 38 (citing Ex. 1005, code (57)). Petitioner also cites Tagoshi's teaching that functions are deemed to have a high level of importance or a lower level of importance. *Id.* (citing Ex. 1005 ¶ 24, claim 2). According to Petitioner, less important functions in Tagoshi are suspended or stopped when battery voltage drops below certain predetermined levels. *Id.* (citing Ex. 1005 ¶¶ 14–15, 17).

Patent Owner disputes that Hikishima teaches sending a "power consumption reduction instruction" to a function device. Prelim. Resp. 31–35.[7] Patent Owner argues "*Hikishima*'s system controls the warning displaying circuit 84, which indicates to an operator, not the claimed function device, that communication will end." *Id.* at 34. Patent Owner notes that this instruction is sent to both audio calling circuit 54 and video image processing circuit 56 rather than only the function device included in a particular set (GA or GB). *Id.* Patent Owner further argues that to the extent an instruction is sent at all, "it is sent to power switch 80 or 82" (thus opening a switch) and not to function devices. *Id.*

We do not agree with Patent Owner's arguments. Rather, we are persuaded that Hikishima's controlling circuit 78 opening power switch 82 or 80 to stop operation of either the video image processing device or the audio processing device, respectively, teaches the sending of a "power consumption reduction instruction" to a function device. *See* Ex. 1004 ¶¶ 28 ("the controlling circuit 78 performs a process stopping operation of the video image processing circuit 56, video image displaying part 58, and backlight 60 by opening the power source switch 82"), 31 ("the controlling circuit 78 performs a process stopping operation of the transmitting and receiving circuit 52 and audio calling circuit 54 by opening the power source switch 80"). This is consistent with our construction above (*see supra* § II.C.3) that cutting off power to a function device is within the scope of sending a "power consumption reduction instruction" to a function device. Moreover, contrary to Patent Owner's arguments (Prelim. Resp. 34–35), each instruction to cut off power is associated with a function device in one set, i.e., either the video image processing device in set GA by opening switch 82 or the audio processing device in set GB by opening switch 80. *See* Ex. 1004 ¶¶ 28, 31. This ensures that each instruction is only sent to a particular set of function devices (GA or GB). Thus, Petitioner establishes sufficiently that Hikishima teaches the "power consumption reduction instruction" limitations.

Patent Owner does not challenge any other aspects of Petitioner's analysis for the "wherein" clause of claim 1. We are persuaded by Petitioner's showing that the method disclosed in Hikishima's Figure 3, with its comparisons between battery voltage and reference voltages V_1 and V_2, teaches the detection of NA and NB. *See* Ex. 1004 ¶¶ 25, 29, Fig. 3. We also are persuaded that both Hikishima and Tagoshi teach reducing power to function devices having a lower usage priority. *See* Ex. 1004 ¶ 28 (teaching that audio communication may continue after video image processing

has stopped); Ex. 1005 ¶ 24 ("a function with a lower level of important [sic] for a user of a device is stopped earlier, and a function with a high level of importance is stopped later").

***15** Based on the present record, Petitioner has established that the combination of Hikishima and Tagoshi teaches all limitations of claim 1.

b. Reasons for the Combination

Citing testimony from Mr. Hruska, Petitioner contends an ordinarily skilled artisan would have modified Hikishima "to include *Tagoshi's* categorizing of some functions with a lower importance and selectively powering off first the lower importance functions before powering off higher importance functions." Pet. 40 (citing Ex. 1003 ¶¶ 163–165; Ex. 1005 ¶ 24[8], claim 2) (internal quotations omitted). Specifically, Petitioner contends an ordinarily skilled artisan "would have found it obvious to order the function devices taught in *Hikishima* according to the importance of the function for operation of the portable device." *Id.* (citing Ex. 1003 ¶ 163). Petitioner asserts that an ordinarily skilled artisan would have been motivated to make the combination because Tagoshi's classification of "low importance" and "high importance" functions improves Hikishima's power-management system to "provide a portable information terminal device that can prevent communication from suddenly being interrupted when the remaining battery capacity is reduced." *Id.* (citing Ex. 1003 ¶ 165; Ex. 1004, code (57)). According to Petitioner, Tagoshi's classification scheme is compatible with Hikishima's teachings on power management, which "prevent communication from suddenly being interrupted when the remaining battery capacity is reduced." *Id.* (citing Ex. 1003 ¶ 165). Petitioner additionally contends an ordinarily skilled artisan would have expected success in making the combination because it would have utilized "well-known software techniques to generalize the solution for managing two devices into a solution for managing multiple classes of devices." *Id.* at 41 (citing Ex. 1003 ¶ 165).

Patent Owner does not dispute Petitioner's reasons for combining Tagoshi with Hikishima. We are persuaded by Petitioner's reasons as set forth above. Thus, based on the present record, Petitioner has established preliminarily that an ordinarily skilled artisan would have had reasons to combine Hikishima and Tagoshi.

c. Conclusion Regarding Claim 1

Petitioner has persuasively shown that the combination of Hikishima and Tagoshi teaches all limitations of claim 1. Petitioner has also put forth persuasive reasons for combining these references. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claim 1 would have been obvious over the combination of Hikishima and Tagoshi.

4. Claims 2, 3, 8–10, and 14

We have reviewed Petitioner's analysis for claims 2, 3, 8–10, and 14. Pet. 44–52. Patent Owner relies on the same arguments discussed above. *See* Prelim. Resp. 35–36. Based on the present record, Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claims 2, 3, 8–10, and 14 would have been obvious over the combination of Hikishima and Tagoshi.

F. Obviousness Ground Based on Hikishima, Tagoshi, and Tanaka

***16** Petitioner contends the subject matter of claims 5, 6, 11, and 12 would have been obvious over the combination of Hikishima, Tagoshi, and Tanaka. Pet. 53–56. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 37–40.

1. Tanaka

Tanaka is a Japanese patent application publication directed to an information processing device that is capable of controlling power supply to peripheral devices in response to a detected remaining battery level. Ex. 1006 ¶ 6. An operator may decrease the power supply to peripheral devices or designate the order for cutting off the power supply for each device in response to the remaining battery level. *Id.* ¶¶ 60, 64. The operator may designate the order by arranging icons representing each device on an "energy saving device designation operation screen" (graphical user interface). *Id.* ¶¶ 60–66, Figs. 3, 4.

Petitioner contends Tanaka qualifies as prior art under 35 U.S.C. § 102(b) based on its publication date. Pet. 13. Patent Owner does not contest the prior art status of Tanaka. For purposes of this Decision, we determine that Tanaka qualifies as prior art under 35 U.S.C. § 102(b) because Tanaka's publication date of October 27, 1995, is more than one year before the U.S. filing date of the challenged claims, which is September 7, 2000. Ex. 1001, code (22); Ex. 1006, code (43).

2. Claim 5

Claim 5 depends from claim 1 and recites "wherein at least a portion of said usage priorities can be set up by a user using a function settings procedure." Ex. 1001, 8:61–63. Petitioner cites Tanaka's teaching of allowing a user to designate "power supply order supplied from a battery to control a power supply order for each device." Pet. 53 (citing Ex. 1003 ¶ 189; Ex. 1006 ¶¶ 6, 7, 30, 31, 33, 51, 70). Petitioner also cites Tanaka's disclosed user interface that allows the user to designate the order by arranging icons. *Id.* at 53–54 (citing Ex. 1003 ¶¶ 187–188; Ex. 1006 ¶¶ 64–66, Figs. 3–4).

Petitioner contends an ordinarily skilled artisan "would have found it obvious and been motivated to incorporate into *Hikishima's* system *Tanaka's* functionality of a user setting the usage priorities for various function devices with the function setting procedure of arranging icons based on the desired order." Pet. 54 (citing Ex. 1003 ¶¶ 190–191). Petitioner contends this would have improved Hikishima's system "by permitting 'control [over] the power supply order for each device in the order designated by the user.' " *Id.* (quoting Ex. 1006 ¶ 9) (alteration by Petitioner).

Patent Owner argues Petitioner relies not on express disclosure in Tanaka for teaching a "functions setting procedure," but rather on citations to its declarant. Prelim. Resp. 38–39. Although Petitioner does cite Mr. Hruska's testimony, Petitioner also cites Tanaka's teachings and drawing figures of a user interface in which icons can be arranged to set power supply order. Pet. 53–54 (citing Ex. 1006 ¶¶ 64–66 and reproducing *id.* at Figs. 3–4). Thus, we do not agree with Patent Owner's argument.

Patent Owner also argues that Petitioner's reasons for combining the references are unclear insofar as they do not address Tanaka expressly, which Patent Owner considers to be a violation of 37 C.F.R. § 42.104(b)(4). Prelim. Resp. 38. We do not agree with Patent Owner, however, because we understand Petitioner's reasons for combining Tanaka with Hikishima to apply equally to the combination of Hikishima and Tagoshi that is discussed with respect to claim 1; Petitioner's analysis necessarily incorporates its analysis from claim 1 because claim 5 depends from claim 1. We are persuaded at this stage that an ordinarily skilled artisan would have added Tanaka's user-established priorities to the combination of Hikishima and Tagoshi as a desirable improvement. *See* Ex. 1003 ¶¶ 190–191.

***17** Otherwise, Patent Owner relies on the same arguments we have discussed above. Petitioner has persuasively shown that the combination of Hikishima, Tagoshi, and Tanaka teaches all limitations of claim 5. Petitioner has also put forth persuasive reasons for combining these references. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claim 5 would have been obvious over the combination of Hikishima, Tagoshi, and Tanaka.

3. Claim 6

Claim 6 depends from claim 5 and recites "wherein if said user does not set up said usage priorities for said function devices, pre-set values are used as usage priorities for said function devices." Ex. 1001, 8:64–67. Petitioner cites Hikishima's teaching of a preset order for cutting power to the video image processing device before cutting power to the audio processing device. Pet. 55 (citing Ex. 1004 ¶ 13). Petitioner also cites a pre-set order of powering down various devices that is taught by Tagoshi. *Id.* (citing Ex. 1005 ¶¶ 14–16). Citing testimony from Mr. Hruska, Petitioner contends an ordinarily skilled artisan would have found it obvious to revert to a pre-set order when a user does not set usage priority values as a basic consideration of device operability. *Id.* at 55–56 (citing Ex. 1003 ¶¶ 193–194).

Patent Owner argues that the order of Hikishima's cutting power to the video image processing device before cutting power to the audio processing device "is not the claimed pre-set values." Prelim. Resp. 39. We disagree. The '794 patent does not appear to give the term "values" any specific meaning other than some indicator of order. Hikishima teaches "values" insofar as the audio processing device has first priority and the video image processing device has second priority. *See* Ex. 1004 ¶ 28 (allowing audio communication to continue after video communication has stopped). In addition, we agree that using a default order would have been the most likely option known to an ordinarily skilled artisan to maintain operability where no usage priorities had been specified. *See* Ex. 1003 ¶ 194.

Otherwise, Patent Owner relies on the same arguments we have discussed above. Petitioner has persuasively shown that the combination of Hikishima, Tagoshi, and Tanaka teaches all limitations of claim 6. Petitioner also has put forth persuasive reasons for combining these references. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in

showing that the subject matter of claim 6 would have been obvious over the combination of Hikishima, Tagoshi, and Tanaka.

4. Claims 11 and 12

Claims 11 and 12 include the same limitations as claims 5 and 6. Both parties rely on the same arguments discussed above. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claims 11 and 12 would have been obvious over the combination of Hikishima, Tagoshi, and Tanaka.

G. Obviousness Ground Based on Hikishima, Tagoshi, Tanaka, and Morehouse

Petitioner contends the subject matter of claims 6 and 12 would have been obvious over the combination of Hikishima, Tagoshi, Tanaka, and Morehouse. Pet. 56–57. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 40–41.

1. Morehouse

Morehouse is a U.S. patent directed to a disk drive apparatus with various power saving modes. Ex. 1007, 4:61–64. In one power saving mode, power is maintained to disk drive intelligent interface electronics, a disk controller, and a spin motor assembly while powering down virtually all other electronics. *Id.* at 4:64–67, 15:40–50. This power saving mode is invoked after a predetermined amount of time since the last disk access, e.g., 2–5 seconds, though this default time may be overridden and changed by the user. *Id.* at 15:53–60.

***18** Petitioner contends Morehouse qualifies as prior art under 35 U.S.C. § 102(b) based on its issue date. Pet. 13. Patent Owner does not contest the prior art status of Morehouse. For purposes of this Decision, we determine that Morehouse qualifies as prior art under 35 U.S.C. § 102(b) because Morehouse's issue date of June 12, 1990, is more than one year before the U.S. filing date of the challenged claims, which is September 7, 2000. Ex. 1001, code (22); Ex. 1007, code (45).

2. Claim 6

For the recited "pre-set values are used as usage priorities" in claim 6, Petitioner cites Morehouse's teaching of invoking a power-saving mode in a disk drive after a default time, such as 2–5 seconds. Pet. 56 (citing Ex. 1007, 4:61–5:35, 15:33–16:48, Figs. 11A–C). Petitioner further notes a user may select a different desired time for invoking the power-saving mode. *Id.* (citing Ex. 1007, 5:9–16, 5:18–29, 15:52–60, 16:1–6). Petitioner contends that,

> [i]n view of the user-designation versus user-default teaching from *Morehouse*, a[n ordinarily skilled artisan] would have found it obvious and been motivated to use the default setting (per *Morehouse*) for establishing usage priorities for those cases in which a user does not provide usage priorities through the function-setting procedure (per *Tanaka's* modification to the device of *Hikishima/Tagoshi*).

Id. at 57 (citing Ex. 1003 ¶ 196).

Patent Owner argues that Petitioner's reasons for the combination are conclusory, which is a fatal flaw in Petitioner's analysis. Prelim. Resp. 40. Notwithstanding, using a default value would have been a known option for implementing usage priorities based on the Morehouse's cited teachings. *See* Ex. 1007, 4:61–5:35, 15:33–16:48. In addition, we are persuaded preliminarily that an ordinarily skilled artisan considering Morehouse would have known to implement the default value as a matter of device operability. *See* Ex. 1003 ¶ 196. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claim 6 would have been obvious over the combination of Hikishima, Tagoshi, Tanaka, and Morehouse.

3. Claim 12

Claim 12 includes the same limitations as claim 6. Both parties rely on the same arguments discussed above. Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claim 12 would have been obvious over the combination of Hikishima, Tagoshi, Tanaka, and Morehouse.

H. Obviousness Ground Based on Hikishima, Tagoshi, and Sheynblat

Petitioner contends the subject matter of claims 7 and 13 would have been obvious over the combination of Hikishima, Tagoshi, and Sheynblat. Pet. 58–61. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 41–42.

1. Sheynblat

Sheynblat is a U.S. patent directed to power management in a cellular telephone. Ex. 1008, 1:6–9. A power control circuit

in the cellular telephone automatically places a transceiver into at least one low power mode, or shut-off mode, when the power level reaches a corresponding threshold level. *Id.* at 3:26–30. The low power mode also may disable selected capabilities of the transceiver based on a prespecified hierarchy. *Id.* at 3:41–43. Sheynblat describes a succession of low power modes at various threshold power levels that provide only enough power (1) to send and receive calls; (2) to initiate a call; (3) to receive a call; and (4) to make an emergency call. *Id.* at 6:29–50. Sheynblat also describes a lower power mode for an "enhanced 911" emergency call that activates circuitry necessary to determine the position of the cellular telephone and to complete the emergency call. *Id.* at 6:51–67.

***19** Petitioner contends Sheynblat qualifies as prior art under 35 U.S.C. § 102(e) based on its filing date. Pet. 14. Patent Owner does not contest the prior art status of Sheynblat. On the present record, we have no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. For purposes of this Decision, we determine that Sheynblat qualifies as prior art under 35 U.S.C. § 102(e) because Sheynblat's filing date of July 2, 1998, is before the earliest possible effective filing date of the challenged claims, which is May 22, 2000. Ex. 1001, code (30); Ex. 1008, code (22).

2. Claim 7

Claim 7 depends from claim 1 and recites "wherein if said function devices with high usage priorities require another function device, said other function device is reactivated if it is stopped due to reduced capacity." Ex. 1001, 9:1–4. Petitioner cites Sheynblat's teachings of "low power modes corresponding to one or more threshold battery power levels and hierarchically shutting off functionality of a cellular transceiver as each threshold power level is met." Pet. 58 (citing Ex. 1008, 1:7–9, 2:4–10, 6:30–50, code (57)). In particular, Petitioner cites Sheynblat's emergency call mode, which activates a minimum sub-set of circuitry in a cellular telephone to make an emergency call. *Id.* (citing Ex. 1003 ¶¶ 197–199; Ex. 1008, 2:24–31, 5:35–37, 6:51–59). According to Petitioner,

> [i]f the highest usage priority, i.e., the emergency call, requires another function device, i.e., "a minimum sub-set of circuitry in the cellular telephone that is used to make an emergency call," [a]ctivation of the minimal sub-set of circuitry for the emergency call (which includes voice data) reactivates the minimal sub-set of circuitry (i.e., the audio communication functionality of sending a call) previously stopped due to the reduced capacity.

Id. at 60 (citing Ex. 1003 ¶ 199).

Petitioner notes "*Sheynblat's* first through third low power modes that selectively shut of[f] power to the cellular transceiver's circuitry for sending and/or receiving calls are akin to *Hikishima's* step S70 of stopping operation of the transmitting and receiving circuit 52 and the audio calling circuit 54 when the voltage is V_2." *Id.* at 60 (citing Ex. 1003 ¶ 31). Petitioner contends an ordinarily skilled artisan would have improved Hikishima by incorporating Sheynblat's "additional low power mode beyond simply stopping audio communication, namely reactivation of a minimal sub-set of circuitry for sending an emergency call." *Id.* at 60–61 (citing Ex. 1003 ¶¶ 201–202; Ex. 1008, 5:18–20). In support of the combination, Petitioner cites Hikishima's teaching that "communication must be performed in the event of an emergency." *Id.* at 61 (citing Ex. 1004 ¶ 9).

Although Patent Owner acknowledges Sheynblat teaches activating circuitry at various low-power modes, Patent Owner argues Sheynblat "is not clear about the transceiver being reactivated after a previous stoppage during low power mode." Prelim. Resp. 41–42. We do not agree with Patent Owner's argument. Sheynblat teaches a succession of low-power modes at various battery power thresholds, each with more extreme restrictions that power down circuitry, and the most extreme of which is the emergency call mode. Ex. 1008, 6:29–50 (describing first, second, and third thresholds that allow some call functionality before a fourth threshold reserved for emergency calls). And, as Petitioner emphasizes (Pet. 59), Sheynblat's emergency call mode is said to "activat[e]" the cellular telephone for an emergency call. Ex. 1008, 3:40–55, 5:16–29, 7:9–11, code (57). At this stage, these teachings sufficiently show reactivation after a previous stoppage.

***20** Based on the present record, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing that the subject matter of claim 7 would have been obvious over the combination of Hikishima, Tagoshi, and Sheynblat.

3. Claim 13

Claim 13 recites a limitation similar to claim 7. Both parties rely on the same arguments discussed above. Based on the present record, we determine that Petitioner has established

a reasonable likelihood that it would prevail in showing that the subject matter of claim 13 would have been obvious over the combination of Hikishima, Tagoshi, and Sheynblat.

I. Obviousness Grounds That Add Flynn

Petitioner proposes adding Flynn[9] to all grounds described above for teaching the detection of the "remaining capacity of said battery" in a specific unit of measurement, namely milliamp hours (mAH). Pet. 61–66 (citing, *inter alia*, Ex. 1009, Fig. 7). Flynn is directed to management of the operations of a mobile station based on changes in its battery capacity. Ex. 1009, 1:7–12. Petitioner cites Flynn's teaching of application specific integrated circuit (ASIC) 204 for managing the operations of smart battery 200 connected to mobile station 100. Pet. 62 (citing Ex. 1009, 9:19–24, Fig. 4). Petitioner contends ASIC 204 detects and reports smart battery 200's remaining capacity to microprocessor 112 in mobile station 100 according to a known smart battery standard. *Id.* at 63 (citing Ex. 1003 ¶¶ 204–205; Ex. 1009, 9:37–57, 10:8–42).

Petitioner contends Flynn teaches a more sophisticated method of monitoring battery capacity (according to the smart battery standard) beyond checking battery terminal voltage. Pet. 64 (citing Ex. 1009, 13:46–61). Petitioner contends an ordinarily skilled artisan would have combined Flynn's "detailed guidance on detecting the battery capacity" to the system of Hikishima as a simple substitution. *Id.* at 64–65 (citing Ex. 1003 ¶ 208).

Patent Owner relies on the same arguments discussed above with respect to the other grounds. Prelim. Resp. 42. We are persuaded by Petitioner's showing at this stage than an ordinarily skilled artisan would have included Flynn's smart battery teachings, including its ASIC for managing battery operations, in Hikishima as a desirable improvement. *See* Ex. 1003 ¶ 208. Based on the present record, we determine that Petitioner has established a reasonable likelihood of prevailing on its grounds that add teachings from Flynn.

III. CONCLUSION

After considering the evidence and arguments presented in the current record, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to its unpatentability challenges. Accordingly, we institute an *inter partes* review on all of the challenged claims and all grounds presented in the Petition. At this stage of the proceeding, we have not made a final determination as to the patentability of these challenged claims.

IV. ORDER

***21** Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314, *inter partes* review is instituted as to claims 1–3 and 5–14 of the '794 patent with respect to all grounds of unpatentability presented in the Petition; and

FURTHER ORDERED that *inter partes* review is commenced on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

Footnotes

1 Hikishima is a Japanese-language publication (Ex. 1004, 10–16) that was filed with an English-language translation (*id.* at 2–8) and a declaration attesting to the accuracy of the translation (*id.* at 1). Our citations to Hikishima herein refer to the translation.

2 Tagoshi is a Japanese-language publication (Ex. 1005, 15–26) that was filed with an English-language translation (*id.* at 2–13) and a declaration attesting to the accuracy of the translation (*id.* at 1). Our citations to Tagoshi herein refer to the translation.

3 Tanaka is a Japanese-language publication (Ex. 1006, 12–20) that was filed with an English-language translation (*id.* at 2–10) and a declaration attesting to the accuracy of the translation (*id.* at 1). Our citations to Tanaka herein refer to the translation.

4 The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102, 103, and 112. Because the '794 patent was filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA versions of §§ 102, 103, and 112 apply.

5 In paragraph 27, the translation includes an incorrect reference number for controlling circuit 78.

6 Petitioner cites to paragraph 30, but the context makes clear Petitioner intended to cite to paragraph 31.

7 Our citations refer to Patent Owner's arguments for the limitation directed to set GA and the detection of NA. Patent Owner makes the same arguments with respect to the limitation directed to set GB and the detection of NB. *See* Prelim. Resp. 35.

8 Petitioner cites to paragraph 25, but there is no paragraph 25 in Tagoshi. The context and an earlier citation make clear Petitioner intended to cite paragraph 24. *See* Pet. 38.

9 Petitioner contends Flynn qualifies as prior art under 35 U.S.C. § 102(b) based on its issue date. Pet. 14. Patent Owner does not contest the prior art status of Flynn. For purposes of this Decision, we determine that Flynn qualifies as prior art under 35 U.S.C. § 102(b) because Flynn's issue date of February 9, 1999, is more than one year before the U.S. filing date of the challenged claims, which is September 7, 2000. Ex. 1001, code (22); Ex. 1009, code (45).

End of Document

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2020 WL 7365502 (Patent Tr. & App. Bd.)
Only the Westlaw citation is currently available.

APPLE INC., Petitioner,

v.

MAXELL, LTD., Patent Owner.

Patent Trial and Appeal Board.
IPR2020-00199
Patent 6,329,794 B1
Date: December 15, 2020

Attorneys and Law Firms

PETITIONER: Jennifer C. Bailey, Adam P. Seitz, Paul R. Hart, jennifer.bailey@eriseip.com, adam.seitz@eriseip.com, paul.hart@eriseip.com

PATENT OWNER: Robert G. Pluta, Amanda S. Bonner, Luiz Miranda, James A. Fussell, William J. Barrow, Saqib J. Siddiqui, rpluta@mayerbrown.com, asbonner@mayerbrown.com, lmiranda@mayerbrown.com, jfussell@mayerbrown.com, wbarrow@mayerbrown.com, ssiddiqui@mayerbrown.com

Before MINN CHUNG, KEVIN C. TROCK, and JOHN A. HUDALLA, Administrative Patent Judges.

DECISION

Denying Patent Owner's Request for Rehearing

37 C.F.R. § 42.71(d)

HUDALLA, Administrative Patent Judge.

***1** Apple Inc. ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review ("IPR") of claims 1–3 and 5–14 ("the challenged claims") of U.S. Patent No. 6,329,794 B1 (Ex. 1001, "the '794 patent"). Patent Owner, Maxell, Ltd. ("Patent Owner"), filed a Preliminary Response (Paper 6, "Prelim. Resp."). With our authorization (Paper 7), Petitioner also filed a Reply (Paper 8, "Pet. Reply") and Patent Owner filed a Sur-Reply (Paper 10, "PO Sur-reply") addressing whether we should exercise our discretion to deny institution under 35 U.S.C. § 314(a).

On June 19, 2020, we entered a Decision on Institution (Paper 11, "Dec.") that instituted *inter partes* review on all claims and all grounds presented in the Petition. As part of the Decision, we considered Patent Owner's arguments (Prelim. Resp. 2–19; PO Sur-reply 1–10) that we should exercise our discretion to deny institution under 35 U.S.C. § 314(a) based on the duplicative nature and advanced stage of the related case styled *Maxell, Ltd. v. Apple Inc.*, No. 5:19-cv-00036 (E.D. Tex. Mar. 15, 2019) ("the underlying litigation"). Dec. 2, 14–23. We based our discretionary denial analysis on the Board's precedential decision in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv*"). After weighing the factors identified in *Fintiv*, we declined to exercise our discretion under 35 U.S.C. § 314(a) to deny *inter partes* review. Dec. 23.

Patent Owner filed a Request for Rehearing (Paper 13, "Req. Reh'g") asking us to reconsider our analysis of the *Fintiv* factors and our decision not to exercise discretion to deny institution.[1] For the reasons stated below, we *deny* the Request for Rehearing.

I. ANALYSIS

When reconsidering a decision on institution, we review the decision for an abuse of discretion. *See* 37 C.F.R. § 42.71(c). An abuse of discretion may be determined if a decision is based on an erroneous interpretation of law, if a factual finding is not supported by substantial evidence, or if the decision represents an unreasonable judgment in weighing relevant factors. *See Star Fruits S.N.C. v. United States*, 393 F.3d 1277, 1281 (Fed. Cir. 2005); *Arnold P'ship v. Dudas*, 362 F.3d 1338, 1340 (Fed. Cir. 2004); *In re Gartside*, 203 F.3d 1305, 1315–16 (Fed. Cir. 2000). The party requesting rehearing has the burden of showing the decision should be modified, which includes specifically identifying all matters the party believes we misapprehended or overlooked. *See* 37 C.F.R. § 42.71(d).

In our Decision on Institution, we found that *Fintiv* Factor 4, i.e., overlap between issues raised in the Petition and in the underlying litigation, weighed strongly against exercising our discretion to deny institution. Dec. 18–20. Specifically, we noted that the primary reference for every ground in this case, Hikishima, is not asserted in the underlying litigation. *See id.* at 18–19 (citing, *inter alia*, Ex. 1047, 3). We viewed "this difference in prior art as a significant distinction between this case and the underlying litigation." *Id.* at 19. In weighing all of the *Fintiv* factors, we found that the lack of overlap in the issues and Petitioner's relatively strong preliminary showing of unpatentability outweighed concerns about inefficiency due to the impending trial date and the investment in the

underlying litigation, among other things. *See id.* at 23. We also noted that Petitioner's unpatentability grounds based on primarily on Hikishima would never be considered if we were to exercise our discretion under 35 U.S.C. § 314(a) to deny institution. *Id.* Thus, we declined to exercise our discretion to deny *inter partes* review. *Id.*

***2** Patent Owner contends our weighing of the *Fintiv* factors—particularly with regard to Factor 4—represents an unreasonable judgment. *See* Req. Reh'g 3–6. Specifically, Patent Owner argues that we should have considered the overlap only at the time the Petition was filed and that we should not have considered any developments affecting the overlap arising thereafter. *See id.* at 1–2, 4, 6–9. Patent Owner argues that there was complete overlap in prior art, challenged claims, and grounds at the time the Petition was filed. *Id.* at 2, 5; *see also id.* at 7 (timeline chart regarding overlap). Patent Owner also argues that Petitioner "selectively dropped" certain overlapping prior art references when it filed its Final Election of Prior Art in the underlying litigation. *Id.* at 1–2. Patent Owner notes that this election occurred four months after Petitioner filed the Petition in this case. *Id.* According to Patent Owner, our consideration of post-filing developments such as these "necessarily leads to gamesmanship, allowing petitioners to assert positions in the district court and the petition and then switch positions when it suits their purpose." *Id.* at 1; *see also id.* at 1–2, 4–9 (similar arguments).

We do not agree with Patent Owner that our analysis of *Fintiv* Factor 4 must be constrained to the facts as they existed when the Petition was filed. In the Board's informative *Sand Revolution* decision, the panel considered and gave weight to a petitioner's stipulation to withdraw certain prior art references from a related litigation if *inter partes* review was instituted. *Sand Revolution II, LLC v. Cont'l Intermodel Grp.–Trucking LLC*, IPR2019-01393, Paper 24 at 11–12 (June 16, 2020) (informative) ("*Sand Revolution*"). Importantly, the stipulation in *Sand Revolution* arose long after the Petition was filed. *Compare* IPR2019-01393, Paper 1, 88 (petition with July 25, 2019, filing date), *with* IPR2019-01393, Ex. 1015 (stipulation to withdraw prior art dated April 13, 2020). Just as in *Sand Revolution*, our consideration of post-filing developments here (i.e., Petitioner's Final Election of Prior Art in the underlying litigation) is consistent with the policy considerations underlying Factor 4 in *Fintiv*, namely, "concerns of inefficiency and the possibility of conflicting decisions." *Fintiv* at 12. Thus, we do not agree with Patent Owner that it was unreasonable for us to consider Petitioner's post-filing election of prior art, which greatly diminished the overlap between the underlying litigation and this case.

Patent Owner also argues we improperly "placed emphasis on Factor 4 when there was overlap present in the prior art grounds presented by [Petitioner] here and in the District Court." Req. Reh'g 2; *see also id.* at 5 (same argument). Patent Owner argues there is still overlap between this case and the underlying litigation in prior art and claims. *Id.* at 2, 5. Nevertheless, we expressly considered the overlap in two secondary prior art references, Tagoshi and Flynn, but we found them to "play minor roles in this case." Dec. 19. Although Patent Owner contends we "misapprehended and discounted this overlap" in a way that is not suggested by *Fintiv* (Req. Reh'g 13), the fact that these references play minor roles when combined with Hikishima directly leads to "materially different grounds [and] arguments," which favors institution.[2] *Fintiv* at 12–13. We also expressly considered the overlap in claims. *See* Dec. 18 ("Petitioner notes that only claims 1 and 14 are challenged in the underlying litigation, which is a subset of the 13 claims challenged here."), 20 ("[C]laims claims 2, 3, and 5–13 are being challenged here, but not in the underlying litigation...."). Patent Owner merely expresses its disagreement with our weighing of these facts with others as strongly favoring institution and does not state any persuasive reason why our judgment was unreasonable based on these facts. And, contrary to Patent Owner's contentions (Req. Reh'g 5), our Decision did not "require[ ] complete overlap in claims and prior art in its analysis of Factor 4" in order for this factor to favor denial of institution. No such statement appears in our Decision.

***3** Patent Owner also argues that Petitioner "failed to articulate a reason why it would be harmed" with respect to claims 2, 3, and 5–13, which are not challenged in the underlying litigation, if we were to deny institution here. *See* Req. Reh'g 2 (citing *Next Caller v. TRUSTID*, IPR2019-00961, Paper 10 at 14 (PTAB Oct. 14, 2019)), 6. Nevertheless, we are not aware of a requirement to show harm in this instance. Instead, we reasonably considered that eleven of thirteen asserted claims are absent in the underlying litigation (Dec. 20), which necessarily impacts how much overlap there is in the two proceedings. Correspondingly, Petitioner noted "the user ability to set up usage priorities recited in claims 5 and 11 and the pre-set values for usage priorities of claims 6 and 12," are "non-overlapping, notable limitations." Pet. Reply 10. As such, we reasonably considered the lack of overlap in the asserted claims here as one factor (among many) that impacted our Factor 4 analysis.

Patent Owner also alleges error in our analysis of other *Fintiv* factors. Req. Reh'g 9–12, 14–15. Regarding Factor 3, investment in the underlying litigation, Patent Owner argues that we "significantly discounted the time and effort the Court and the Parties have invested in the underlying litigation." *Id.* at 10. In particular, Patent Owner contends we were wrong to discount this factor based on "the fact that Petitioner's unpatentability challenges here do not overlap significantly with Petitioner's invalidity contentions in the underlying litigation." *Id.* at 10–11 (quoting Dec. 18). Patent Owner emphasizes that there was overlap prior to Petitioner's election of prior art in the underlying litigation. *Id.* at 11. Patent Owner also argues that "the Court issued substantive orders related to the '794 Patent." *Id.* As such, Patent Owner contends we should weigh Factor 3 as strongly, rather than moderately, favoring denial. *Id.*

Nevertheless, we consider whether the alleged investment in the underlying litigation is tethered to the merits of the parties' validity positions in that litigation and, by extension, their patentability positions here. *See Sand Revolution* at 10–11. We credited the investment in claim construction and expert discovery to the extent they "may have relevance to issues in the Petition," but noted that such relevance was diminished by the lack of overlap between Petitioner's invalidity contentions in the underlying litigation and unpatentability contentions here. Dec. 18. This reasonably reflects the fact that most of the investment after Petitioner's election of prior art would not have been relevant to issues here, because Petitioner no longer asserted the primary reference here, Hikishima. And Patent Owner acknowledges that this factor should be evaluated "at the time of the institution decision" (Req. Reh'g 11 (quoting *Fintiv* at 9–10)), by which time Petitioner had finalized its prior art elections in the underlying litigation. We also noted that it was unclear how "the court's rulings on the motion to dismiss or the motion to transfer bear on the patentability issues presented here." Dec. 18. This was appropriate, because not all orders touted by Patent Owner (*see* PO Sur-reply 5) were "substantive orders related to the '794 Patent." Thus, given these circumstances, we do not agree that it was unreasonable to find that Factor 3 moderately, rather than strongly, favored denial.

Regarding Factor 5, we quoted language from *Fintiv*: "If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion." Dec. 20 (quoting *Fintiv* at 13–14). We noted that Petitioner here is the defendant in the underlying litigation, so we found that Factor 5 does not weigh against exercising discretionary denial. *Id.* Patent Owner contends we should have found this factor to favor denial. Req. Reh'g 11–12. We disagree. We applied the direct language of *Fintiv*. Nonetheless, for added clarity, we view Factor 5 as neutral under the particular facts and circumstances of this case because the overlap between the claims and grounds here and in the underlying litigation is minimal, especially given that Hikishima is not asserted in the underlying litigation, as discussed above.[3]

***4** Patent Owner additionally argues that we "improperly discounted [Petitioner's] extreme delay in filing its Petition." Req. Reh'g 14; *see also id.* at 10–11. According to Patent Owner, Petitioner had already drafted invalidity contentions for all of the asserted claims here four months before the filing date of the Petition. *Id.* (citing Ex. 2003). Patent Owner also argues that Petitioner does not explain why "work being done in the District Court Action by a completely different law firm and experts had any bearing on delays in its filing of the IPR Petition." *Id.* at 14–15.

Nevertheless, *Fintiv* recognizes "that it is often reasonable for a petitioner to wait to file its petition until it learns which claims are being asserted against it in the parallel proceeding." *Fintiv* at 11. As stated in our Decision, this is consistent with the legislative history of the America Invents Act ("AIA") as to the one-year statutory bar under § 315(b), particularly with respect to complex underlying litigation. Dec. 21 (citing 157 Cong. Rec. S5429 (daily ed. Sept. 8, 2011) (statement of Senator Kyl)). Our Decision credited Petitioner's arguments about Patent Owner's initial assertion of 10 different patents and 132 claims in the underlying litigation as a reason why it took nine months for Petitioner to file its Petition here. Dec. 21–22. We also noted that Petitioner filed its Petition only one month after Patent Owner made a preliminary election of asserted claims in the underlying litigation. *Id.* In light of this, and considering the multiple patents and numerous claims in the underlying litigation, we did not find Petitioner's filing to be untimely. *Id.* at 22. The fact that multiple law firms and experts were involved does not negate the complexity of the underlying litigation. And, even if Petitioner had prepared invalidity charts earlier, *Fintiv* and the AIA's legislative history recognize why Petitioner reasonably may have waited to file here until after Patent Owner identified its asserted claims. Thus, we did not render an unreasonable judgment regarding the time of Petitioner's filing.

Patent Owner also disputes the manner in which we collectively weighed all of the *Fintiv* factors. *See* Req. Reh'g 9, 12. In particular, Patent Owner contends we placed undue weight on Factor 4. *Id.* at 9. Patent Owner also contends we should have weighed Factor 2 more than others based on the following statement from *Fintiv*: "[I]f the court['s trial] date is at [or] around the same time [as the projected statutory deadline] or [even] significantly after the [projected] statutory deadline, the decision whether to institute **will likely implicate other factors** discussed herein ...." *Id.* at 12 (quoting *Fintiv* at 9) (emphasis added by Patent Owner). As stated above, however, the Board's informative *Sand Revolution* decision supports our rationale for crediting Petitioner's post-filing election not to pursue certain prior art in the underlying litigation. Regarding Factor 2, we do not interpret the quote from *Fintiv* as suggesting that Factor 2 should be given more weight. Rather, it recognizes how other *Fintiv* factors likely come into play when a trial in related litigation is on a similar or slower timeline. And we credited the trial date in the underlying litigation as supporting the exercise of discretionary denial. Dec. 17, 23. Moreover, in our conclusion, we weighed these factors against each other per the guidance provided in *Fintiv*. Dec. 23; *see Fintiv* at 6 ("[I]n evaluating the factors, the Board takes a holistic view of whether efficiency and integrity of the [patent] system are best served by denying or instituting review."). Given that we reasonably accounted for the various factors, we do not agree with Patent Owner that we failed to conduct a balanced assessment of all relevant circumstances.

II. CONCLUSION

***5** For the reasons above, we conclude that Patent Owner has not met its burden of showing that we abused our discretion in evaluating and weighing the *Fintiv* factors as part of our decision not to exercise discretion under 35 U.S.C. § 314(a) to deny *inter partes* review. Therefore, we *deny* Patent Owner's requests to reweigh the *Fintiv* factors and to exercise our discretion to deny institution in this proceeding.

III. ORDER

Accordingly, it is

ORDERED that Patent Owner's Request for Rehearing is *denied*.

Footnotes

1 Patent Owner also requested rehearing by the Precedential Opinion Panel ("POP") to "clarify the date from which *Fintiv* Factor 4 should be analyzed, namely, the Petition's filing date." Req. Reh'g 1. POP denied Patent Owner's request for review. Paper 20. Notwithstanding, we consider Petitioner's arguments regarding *Fintiv* Factor 4 below.

2 Moreover, contrary to Patent Owner's argument (PO Sur-reply 9; Req. Reh'g 14), Petitioner's boilerplate reservation of rights regarding asserted prior art in the underlying litigation (*see* Ex. 1047, 2) has no impact on our analysis.

3 In our view, our treatment of Factor 5 as neutral in this case due to the lack of overlap of issues with the underlying litigation is not inconsistent with other Board decisions viewing Factor 5 as favoring denial when issues overlap with the related district court litigation. *See, e.g.*, *Apple Inc. v. Maxell, Ltd.*, IPR2020-00203, Paper 12 at 16 (PTAB July 6, 2020) (determining that Factor 5 favors the exercise of discretionary denial when "the trial court may reach the *overlapping issues* before the Board would in a final written decision" (emphasis added)).

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,
v.
HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.
Maxell Ltd., Plaintiff,
v.
ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⚭ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

Patents ⚭ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⚭ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⚭ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging / merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and its components within a mobile handset that performs processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27); (3:30–31; block 604 in Fig. 2); (4:4–16); (2:66–3:6); (5:3–7).	**Function:** : (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing'292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See, e.g., '292 Pat. 6:8; block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (3:6–11; 4:15–42; Fig. 2), (4:15–42), (3:6–11; 4:22–27).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

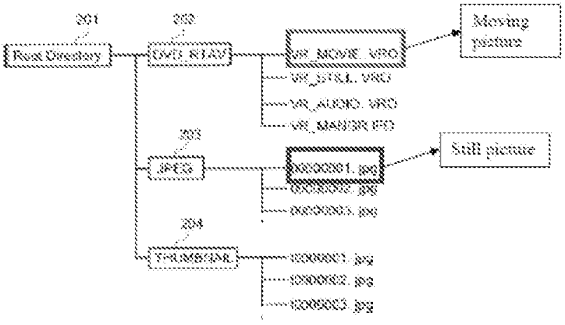
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

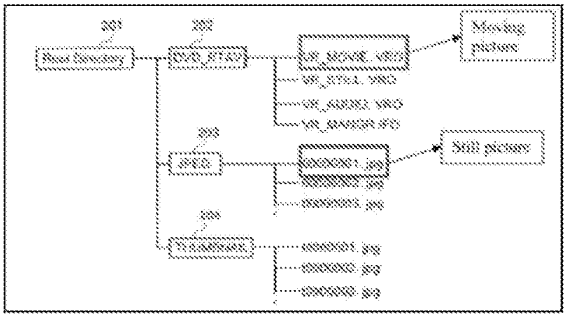
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

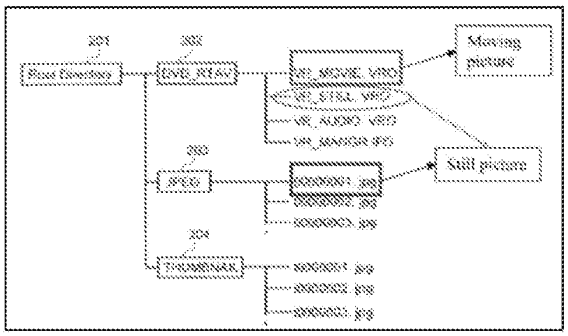
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[3]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., (9:35–39); (3:27–30); (3:39–4:48); (9:30–67); (8:62–9:5); (9:42–10:21); and (3:5–16).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

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Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: determine whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof	This term is written as a means-plus-function element **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "microphone" ('443 "temperature sensor" ('443 "cameras" (Figs. 3A and 3D)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car that is running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an equal number of vertically arranged pixel lines" (claim 59) See also 4:66-5:8, 7:8A, and 7:8B (6, 17–22); 8:15-28, 35)

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

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'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 **Patent claim 1)**

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Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"the amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

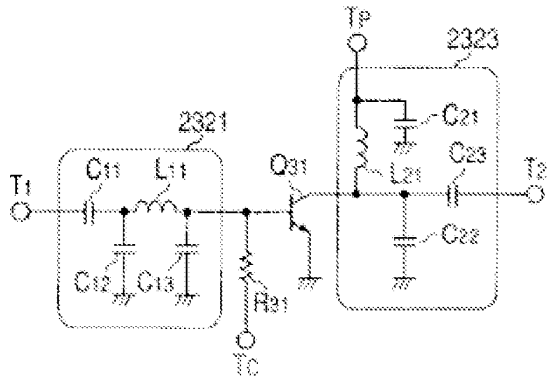
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"hardware, software, or a combination of the two that consumes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read-only memory and the first memory, running the algorithm of Figs. 4 and 5, for [S1–S7] as

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
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Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: as claimed ('695 Pat. col. 33:1) connected to and between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (col. 30:7-51)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

297 F.Supp.3d 668, 2018 Markman 1527870

Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,

v.

HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.

Maxell Ltd., Plaintiff,

v.

ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

*677 On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and its components within a mobile handset that performs processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27), (3:30–31), block 604 in Fig. 2), (4:4–16), (2:66–3:6), (5:3–7).	**Function:** : (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See e.g., 12:66–67; block 602 in fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (See e.g., '292 Patent 3:6–11, 4:15–42, 4:65–67 at Fig. 2), (4:15–42), (3:6–11, 4:2–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, rendering the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

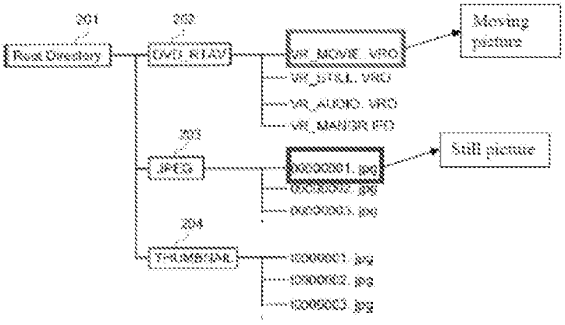
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

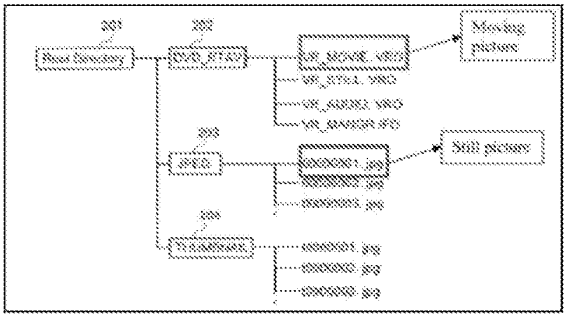
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

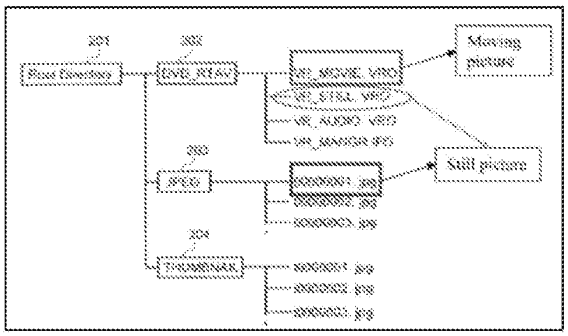
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding text/figures in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:9–58, 8:48–9:19, 9:37–67, 10:52–11:5, 11:42–12:21, and 13:5–14:6.	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 Patent at 11:58); "microphone" ('443 Patent at 12:2); "temperature sensor" ('443 Patent at 12:3); "cameras" (Figs. 3A and 12)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car that is running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

***724**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (claim 59) See also 4:66-5:6, 7:55-8:2, 8:7-22, 8:25-28, 8:51

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

***725**

'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"the amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

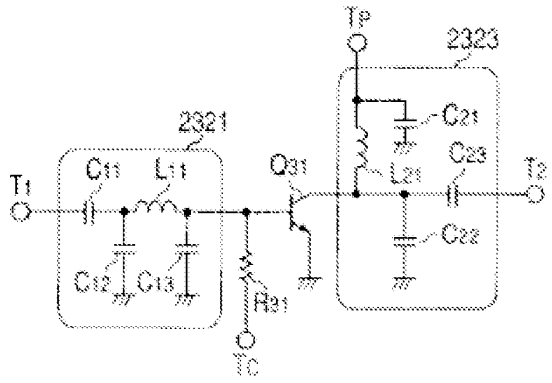
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that sometimes powers and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** "At least one processor – such as a CPU – programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:65–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof"	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as relevant, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read only memory and the first memory, running the algorithm of Figs. 4 and 5, for [S9–S9-2]"

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
>
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: as claimed ('695 Pat. col. 33 l. 1) controller of one is bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (col. 30 l. 7-51).

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

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Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,

v.

HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.

Maxell Ltd., Plaintiff,

v.

ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⇐ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⇐ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⇐ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⇐ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⇐ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⇐ Functions, means, and results of invention

Patents ⇐ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⇐ Functions, means, and results of invention

Patents ⇐ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⇐ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⇐ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

Attorneys and Law Firms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging / merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding sections in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27), (3:30–31), block 604 in Fig. 2), (4:4–16), (2:66–3:6), (5:3–7).	**Function:** : (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing'292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See e.g., '292 Pat. at Block 602 in Fig. 2; 3:58–4:15; 5:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (3:6–11; 4:15–42; Fig. 2), (4:15–42), (3:6–11; 4:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

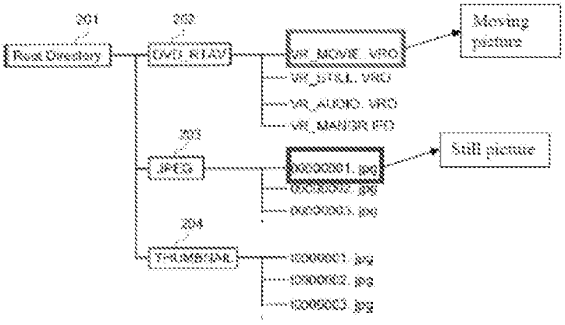
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

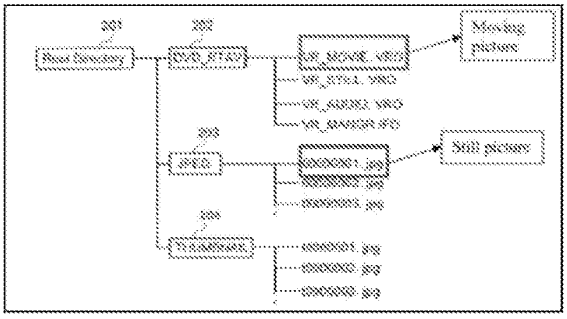
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

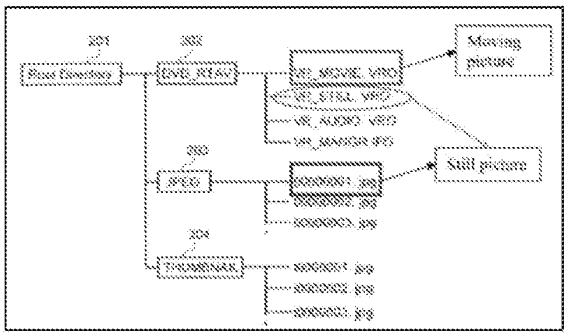
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 108, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:9–58, 8:48–9:19, 9:37–67, 10:52–11:5, 11:42–12:21, and 13:5–14:6.	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" (10:8); "microphone" (10:8); "temperature sensor" (10:23); "cameras" (Figs. 34 and 35)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car that is running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723 Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (claim 59) See also 4:66-5:6, 7:55-8:2, 8:7-22, 8:25-28, 8:51

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

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'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"an amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

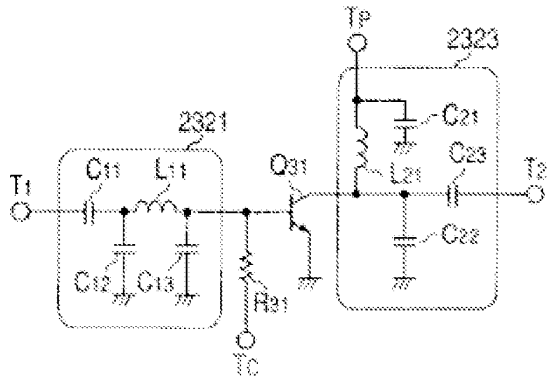
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that consumes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read-only memory and the first memory, running the algorithm of Figs. 4 and 5, (at 3:6–7:54)

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
>
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: an external CPU (FIG. 3) connected via a bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (6:30-7:54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

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Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,
v.
HUAWEI DEVICE USA INC.,
Huawei Device Co., Ltd., Defendants.
Maxell Ltd., Plaintiff,
v.
ZTE Corporation, ZTE
USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ––– U.S. ––––, 135 S.Ct. 831, 840–41, ––– L.Ed.2d ––– (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

*690 Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging / merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27); (3:30–31; block 604 in Fig. 2); (4:4–16); (2:66–3:6); (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 (cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See, e.g., '292 Pat. at Block 602 in Fig. 2; 3:58–4:15; 5:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Board's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (3:6–11; 4:15–42; 4:31–35; Fig. 2), (4:15–42), (3:6–11), (3:7–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, rendering the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

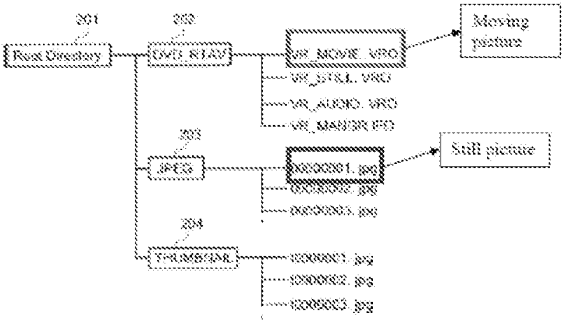
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

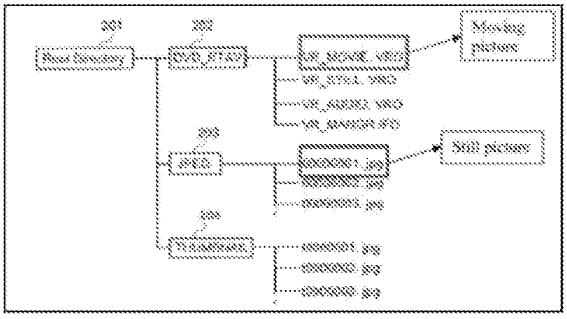
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

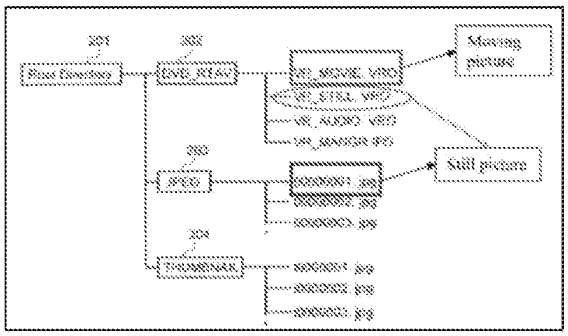
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no dislosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 108, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:9–58, 8:48–9:19, 9:37–67, 10:52–11:5, 11:42–12:21, and 13:5–14:6.	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity to the control using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function e **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 '), "microphone" ('443 '), "temperature sensor" ('443 '), "cameras" (Figs. 3A and 3D)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

***724**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. Also "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" ('729) See also 1006 (0, 138, and 138 (p. 47–228; 155:23, 35)

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

***725**

'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"the amount of instability caused by vertical and/or horizontal movement of the electric camera"	indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

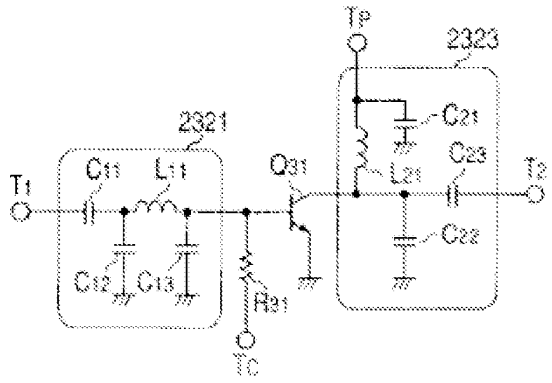
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that sometimes powers and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** "At least one processor, such as a CPU" programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as relevant, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claims 1 & 2: an external CPU (FIG 1) connected via a bus between a read only memory and the first memory, running the algorithm of Figs. 4 and 5, (at 9:7-24)

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
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Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 Patent claims 1 and 4)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: as claimed ('695 Patent at 23:3) connected at one side between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (6:30–7:54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

297 F.Supp.3d 668, 2018 Markman 1527870

Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,

v.

HUAWEI DEVICE USA INC., Huawei Device Co., Ltd., Defendants.

Maxell Ltd., Plaintiff,

v.

ZTE Corporation, ZTE USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

Attorneys and Law Firms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ––– U.S. ––––, 135 S.Ct. 831, 840–41, ––– L.Ed.2d ––– (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (2:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27), (3:30–31), block 604 in Fig. 2), (4:4–16), (2:66–3:6), (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See, e.g., 12:66–67, block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Board's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as: a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (See e.g., '292 Patent 3:6–11, 4:15–42, 4:58–65; id. Fig. 2), (4:10–42), (3:9–11), (5:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

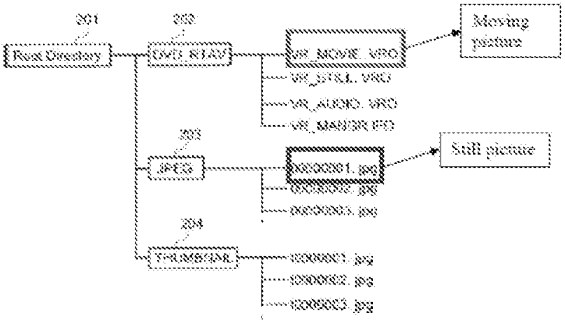
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

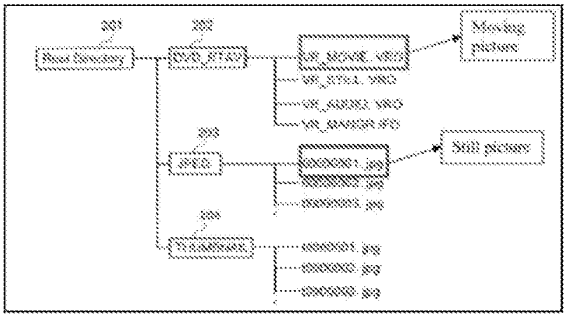
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

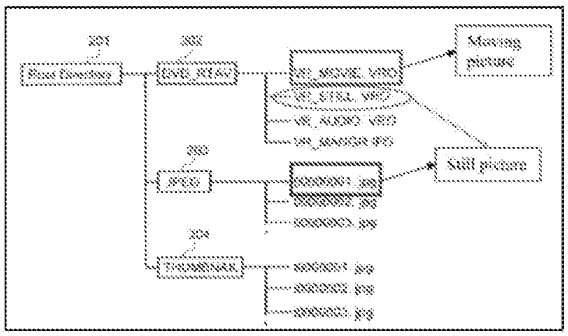
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[3]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:1–8, 6:48–7:32 & 8:7–8:52, 9:5–10:42, 10:21–10:61, and 5:5–.10).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 Patent at 11:58); "microphone" ('443 Patent at 12:23); "temperature sensor" ('443 Patent at 12:23); "cameras" (Figs. 3A and 12A)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (claim 59) See also 4:66-5:6, 7:55-8:2, 8:7-22, 8:25-28, 8:51

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

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'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"an amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

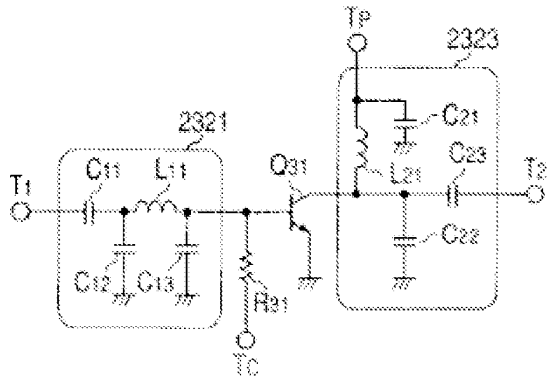
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7)**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that sometimes powers and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read-only memory and the first memory, running the algorithm of Figs. 4 and 5, for [S1–S7]"

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
>
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 Patent claims 1 and 4)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: an external CPU (FIG. 3) connected via a bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (6:30–7:54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

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Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,
v.
HUAWEI DEVICE USA INC.,
Huawei Device Co., Ltd., Defendants.
Maxell Ltd., Plaintiff,
v.
ZTE Corporation, ZTE
USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis
Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general
Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general
Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚙ Functions, means, and results of invention

Patents ⚙ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚙ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚙ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚙ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚙ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚙ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚙ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚙ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] **Patents** ⟹ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] **[2]** **[3]** "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ––– U.S. ––––, 135 S.Ct. 831, 840–41, ––– L.Ed.2d ––– (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and its components within a mobile handset that performs processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27); (3:30–31; block 604 in Fig. 2); (4:4–16); (2:66–3:6); (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 (cellular 301), which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See e.g., 12:66–67; block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Board's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as: a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (3:6–11, 4:15–42, 605 in Fig. 2), (4:15–42), (3:6–11, 4:2–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

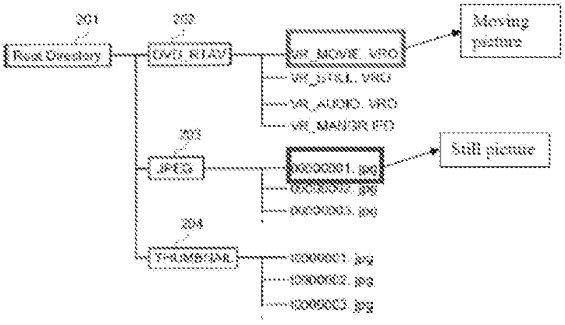
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

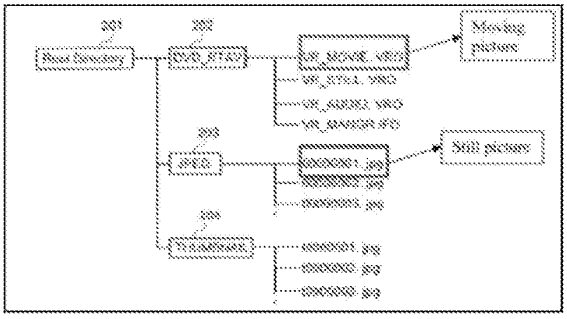
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

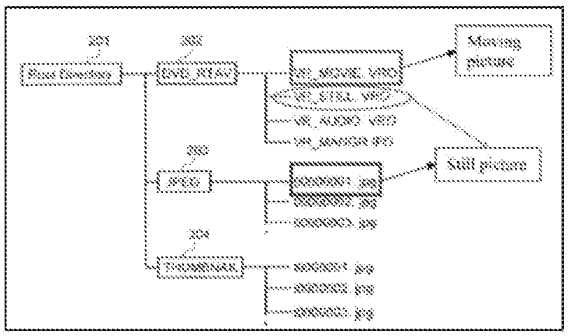
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 108, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:9–58, 8:48–9:19, 9:37–9:52, 10:42–10:51, and 13:5–16).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** an image sensor, a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof	This term is written as a means-plus-function element **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 '443 "camera" (Figs. 3A and 3D)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> [a)] a detecting means for detecting whether [an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user] a user-associated medium at least approaches [or comes in contact with a whole of or] at least a part of a housing of [the] said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723** **Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

***724**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines" (claim 59) See also 4:66–5:9, 13A, and 13B; 6:17–22; 15:28–35

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

***725**

'292 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"the amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television set/set" (3:22–23) or other screen compatible with NTSC or PAL format (1:33–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

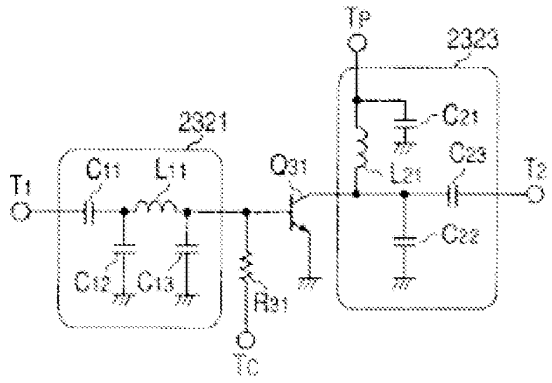
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7)**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"Hardware, software, or a combination of the two that consumes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (1:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1-S3-8), Fig. 5 (including steps S5, S5-1-S5-4) and corresponding citations in the specification at 5:65–6:4, 6:30–7:54, 9:15–18, 9:28–48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read-only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read-only memory and the first memory, running the algorithm of Figs. 4 and 5, (at 5:6–7:54)

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
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Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	Indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: as claimed ('695 Pat. col. 33 l. 1) controller of one bus between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (col. 30 l. 7-51)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

297 F.Supp.3d 668, 2018 Markman 1527870

Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,
v.
HUAWEI DEVICE USA INC.,
Huawei Device Co., Ltd., Defendants.
Maxell Ltd., Plaintiff,
v.
ZTE Corporation, ZTE
USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⚭ Functions, means, and results of invention

Patents ⚭ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⚭ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⚭ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⚭ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⚭ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⚭ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

Attorneys and Law Firms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ––– U.S. ––––, 135 S.Ct. 831, 840–41, ––– L.Ed.2d ––– (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

*690 Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: Combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and its components within a mobile handset that performs processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding text/equations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (3:12–17), (5:3–7).	**Function:** Combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding sections in the specification as provided herein, or equivalents thereof. See, e.g., (1:20–27), (3:30–31), block 604 in Fig. 2), (4:4–16), (2:66–3:6), (5:3–7).	**Function:** (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit 301 cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which render the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See, e.g., '292 Pat. at Block 602 in Fig. 2; 3:58–4:15; 4:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Board's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (See e.g., '292 Patent 3:6–11, 4:15–42, Fig. 2, 4:18–20, 4:31–35, 5:11, 5:23–25)	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, rendering the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

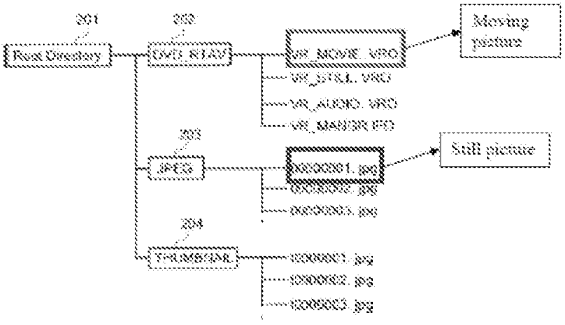
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

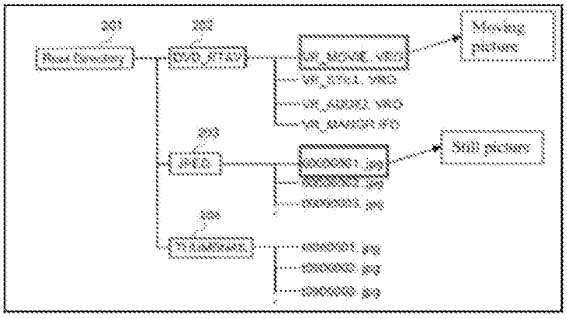
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

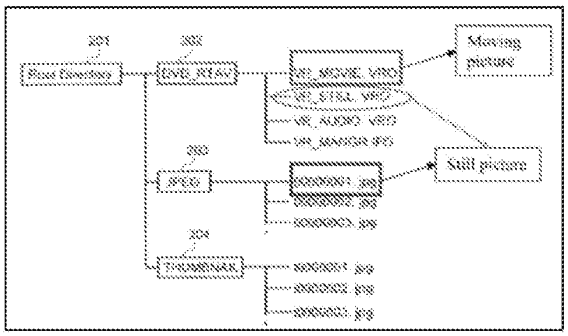
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no disclosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 104, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding text/figures in the specification as provided herein, or equivalents thereof. See e.g., ('517 Patent 3:5–27, 3:50–61, 7:9–58, 8:48–9:19, 9:37–67, 10:52–11:5, 11:42–12:21, and 13:5–14:6.	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability, determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 Patent at 11:58); "microphone" ('443 Patent at 12:23); "temperature sensor" ('443 Patent at 12:23); "cameras" (Figs. 3A and 12)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance

system tablet," "transmission pen type ultrasonic system tablet," and "surface acoustic wave type ultrasonic system tablet." Maxell contends that these other examples are expressly recited in dependent claims 13–19. Maxell also contends that each of these structures also appears in Table 1 of the '443 Patent. Docket No. 95 at 8.

Defendants contend that the patent specification describes "approach detection type" (e.g., proximity) and "contact detection type" detection systems. Docket No. 100 at 4 (citing '443 Patent 9:13–15). Defendants also contend that Table 1 of the patent lists a variety of detector options and expressly describes each as approach type, contact type or both. *Id.* According to Defendants, as originally presented, claim 1 was written so as to capture both approach type and contact type systems. *Id.* (citing Docket No. 100–27 at 49 (Original claim 1, lines 3–7) ("detecting means for detecting whether an operation medium operated by the user ... approaches or comes in contact with ... the apparatus")). Defendants contend that the PTO rejected the claim as indefinite under Section 112(2) as reciting "non-equivalent alternatives." *Id.* (citing Docket No. 100–28 (May 6, 1994 Office Action) at 2). Defendants contend that the PTO found that approach type and contact type systems were non-equivalent.

Defendants argue that the patentee narrowed claim 1 to delete reference to contact detection and required that the detecting means detect whether the user associated medium "at least approaches" the housing. *Id.* (citing Docket No. 100–29 at 2 (August 8, 1994 Amendment)). Defendants contend that any corresponding structure must at least be approach type, although it may also be contact type and that this is consistent with the plain meaning of "at least approaches," which requires, at a minimum, approach type. *Id.* Defendants contend that the plain meaning of the original claim language "approaches or comes in contact with" could be satisfied by either approach type or contact type and that the corresponding structures included in Maxell's construction but not included in Defendants', are described in the patent as contact type only, and thus do not fall within the scope of the claim. *Id.*

Maxell counters that the claim was not amended to exclude "contact type" detecting systems as suggested by Defendants. According to Maxell, Defendants mischaracterized the patentee's August 8, 1994 amendment and the amendment overcame the Examiner's § 112 rejection based on the "such as" language previously found in the claims. Docket No. 106 at 1 (citing ***718** Docket No. 100–28 (May 6, 1994 Office Action) at 2 ("Throughout the claims the 'such as' phrases makes the claims indefinite."). Thus, Maxell contends, the patentee amended the claims to address this issue, not to narrow the scope of the claims to "approach type."

The claim amendment in question is instructive:

> 1. (Amended) An information processing apparatus comprising:
>
> a housing;
>
> {a)} a detecting means for detecting whether {an operation medium operation by the user, such as a pen or finger or a medium accompanying with the user} a user-associated medium at least approaches {or comes in contact with a whole of or} at least a part of a housing of {the} said apparatus; and

Docket No. 100–29at 2. Maxell contends that the "intent" of the amendment was only to remove the "such as" language objected to in the prior Office Action. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1318. What is clear, however, is that the amendment, in addition to removing the "such as" language, also changed the claim language to remove "or comes in contact with a whole of or." It is also clear that, as issued, the claim language requires the detecting means to detect whether "a user-associated medium at least approaches said apparatus." As claimed, approach detection is required of the detecting means. The "at least" language allows for a detecting device that detects both approach and contact, but approach detection must be included.

The corresponding structure must, therefore, be structure that meets this explicitly claimed function of including approach detection. That the dependent claims include the addition of other detection techniques does not change that claim 1 requires "at least approach detection." Maxell's proposed inclusion of various detection schemes listed as "and/or" would allow the claimed structure to include only the contact based systems, which would be inconsistent with the claim language as explained above.

Maxell's argument that the dependent claims mandate Maxell's construction is flawed. First, as noted above, as drafted the claim uses "at least" and thus does not mandate only use of approach detection. Thus, using both approach detection and contact detection, for example, would be encompassed with the claim scope. To the extent the dependent claims add additional detection mechanisms, such claims are not in conflict with the independent claim which recites "at least approaches." Further, even if in conflict, the

doctrine of claim differentiation, at most creates a rebuttable presumption and "cannot broaden claims beyond their correct scope." *See Seachange Int'l, Inc. v. C–COR, Inc.*, 413 F.3d 1361, 1368–69 (Fed. Cir. 2005). Here, the claim language resulting from the amendment is clear.

[56] The Court construes "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" to mean:

Function: detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus

Structure: Electromagnetic induction systems, electrostatic coupling system, and ***719** Optical system, listed in Table 1; "microphone" (18:8); "temperature sensor" (19:12); "cameras" (Figures 14 and 15), or equivalents thereof.

F. The '317 Patent

The '317 Patent relates generally to navigation systems, more specifically to portable terminals suitable for walking navigation. The Abstract of the '317 Patent recites:

> A portable terminal has a function of walking navigation. The direction of a destination is displayed by an indicating arrow that always points in the direction of the destination. In the navigation processing, the user enters data to select a menu and/or set retrieving conditions on the setup screen. At first, the user gets the location information of the portable terminal, represented by a latitude/longitude or coordinates and an altitude, for example. Then, the user gets the direction information of the portable terminal, which is the direction of the tip of the portable terminal as determined by a compass, a gyro, or a clinometer. The location information and the direction information are set as terminal information for the retrieving conditions. The system controls retrieving of the database and retrieves the information corresponding to the selected menu, such as route guidance.

'317 Patent Abstract. More particularly, the '317 Patent describes a portable terminal, which does not require a user to input their current location and which presents navigational information on a narrow screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 2:51–61. The portable terminal includes devices for obtaining a location and direction of the user's present place, so that the user does not have to input such information. '317 Patent 2:62–3:8. In addition, the portable terminal may compress the location and direction information, so as to display a direction of movement from the user's present place with simply an arrow. This enables the navigation information to be displayed on a small-sized screen of the portable terminal in a manner that is easily understood by the user/walker. '317 Patent 3:18–26.

20. "walking navigation" ('317 Patent claims 1, 10, 15, 16, 17, and 20)[5]

Maxell's Proposed Construction	ZTE's Proposed Construction
"information to navigate a user who is walking"	"display of information to assist a user in walking and driving, in a system that is not usable in an object car due to running on a road"

The parties dispute whether the term excludes systems that are usable in a car.

Maxell argues that absent an explicit disavowal, negative limitations are generally disfavored. Docket No. 95 at 41 (citing *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1332–33 (Fed. Cir. 2003)). According to Maxell, ZTE's only intrinsic evidence is a single passage in the background section of the patent that discusses that some prior art car navigation system "cannot be used as a walker's navigation system as is" because it "is too large for a walker to carry" and "because the navigation system premises that the system is used while the object car is running on a road." *Id.* (citing '317 Patent 1:34–37). Maxell contends that the same passage explains ***720** that the bulkiness issue can be resolved by using "a PDA with GPS and a handy GPS" as a location information system for walkers. *Id.* (citing '317 Patent 1:37–39). Maxell also argues that nowhere in this passage from the background section to the described embodiments, does the patent exclude using a portable location information system such as "a PDA with GPS and a handy GPS" in a car. *Id.* Maxell contends that the term "walking navigation" is readily understood and has a common meaning. *Id.* at 42.

Maxell contends that its proposal embraces the term's plain meaning and conforms to the passages in the specification related to providing information to a user that is walking: (1) describing "the function of walking navigation" in the context of a "Neighborhood Guidance Service" example (7:43–8:9), (2) describing "the function of walking navigation" in the context of a "Meeting by Appointment Guidance Service" example (8:10–57), and (3) describing "the function of walking navigation" in the context of a "Present Place Guidance Service" example (8:58–9:39). *Id.* Maxell contends that Figure 3 makes it plain that "walking navigation" means information that navigates a user that is walking by depicting

directional arrows that aids a user in navigating to a particular location. Docket No. 95 at 42.

ZTE counters that in describing the deficiencies of the prior art and touting how the invention allegedly overcomes those deficiencies, a patent may disclaim coverage of the denigrated arrangement. Docket No. 100 at 35 (citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998)). According to ZTE, the specification makes plain that "walking navigation" is mutually exclusive from driving navigation:

> For example, a car navigation system to be mounted on a car is too large for a walker to carry around. In addition, because the navigation system premises that the system is used while the object car is running on a road, it cannot be used as a walker's navigation system as is.

Id. (citing '317 Patent 1:31–38). As to Maxell's argument that the inclusion of the phrase "as is" negates the disclaimer in this case and that the passage was concerned with the fact that such systems were "bulky" or too large to car, ZTE points to the conclusion language "[i]n addition ... it cannot be used as a walker's navigation system as is" and argues that there is no teaching in the '317 Patent of modifying or adjusting a car system to also be a walking navigation system. *Id.*

In its reply, Maxell contends that the '317 Patent describes the problems with "conventional" navigation systems of the time as being too large for a walker to carry. Docket No. 106 (citing '317 Patent 1:19–21, 34–35). Maxell contends that conventional 1990s navigation systems were described as unsuitable for use in walking navigation "as is," but this statement is not an express disclaimer of a system that could be used in cars and just identifies a problem in the prior art. *Id.* (citing '317 Patent 1:36–38; Braasch Decl. at ¶¶ 39–46).

The full claim limitation states "said display changes according to a change of said direction of said portable terminal orientation for walking navigation." Thus, as claimed, the system has to be able to provide navigation for walking. ZTE's limitation, however, would require that the terminal "is not usable" for car navigation. Thus, a terminal that may be used for walking under ZTE's construction would have to have no use in a car. The passage cited by the parties does not disclaim potential car use and—at most—disclaims systems that are too large to be portable for carrying by a walker. '317 Patent 1:31–38. ***721** ZTE has cited no disclaimer for support of the negative limitation to the extent which ZTE seeks.

[57] The Court construes "walking navigation" to mean "information to navigate a user who is walking."

21. "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" ('317 Patent claim 6)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server **Structure:** insufficient corresponding structure is disclosed

[Editor's Note: The preceding image contains the reference for footnote[6]]

The parties dispute whether or not structure is disclosed for the means-plus-function term.

ZTE contends that the functions at issue are clearly software steps (outputting, receiving data) and no corresponding algorithm or corresponding structure is disclosed. Docket No. 100 at 36 (citing Docket No. 100–6 (Andrews Decl.) ¶¶ 49–51).

Maxell contends that the functions of "outputting" and "receiving" do not require algorithms because such functions can be performed by a general purpose computer. Docket No. 106 at 14 (citing *In re Katz*, 639 F.3d at 1316). Specifically, Maxell contends that functions like "processing," "receiving," and "storing" "can be achieved by any general purpose computer without specialized programming" and, in such cases, "it [is] not necessary to disclose more structure than the general purpose processor that performs those functions." *Id.* at 14–15 (quoting *In re Katz*, 639 F.3d at 1316, citing Braasch Decl. at ¶¶ 50–51). Maxell contends that neither ZTE nor its expert conclude otherwise and concede that "the functions at issue" are "outputting, receiving data." *Id.* (citing Docket No. 100 at 36). Maxell contends that the general purpose CPU described in the '317 Patent 9:42–43 is sufficient for performing these functions. *Id.*

The term in question references the earlier recited claim element: "a device connected to the server." The term in question is then recited: "said device connected to said

server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server."

Maxell points to the CPU of Figure 10 as being the corresponding structure. The specification describes the CPU in the passage cited by Maxell: "[t]he portable terminal ***722** 61 is provided with a CPU 71, which is a control unit." '317 Patent 9:42–43. Figure 10 also includes a "device for data communication 76," "device for getting location information 77," and "device for getting direction information 78." It is noted that claim 6 includes the limitations (1) "a device for getting location information," (2) "a device for getting direction information" and (3) "a device connected to a server...wherein...said device connected to said server outputting...and receiving...." The claim limitation in question includes "outputting said location information and said direction information." As shown in the Figure 10, a CPU 71 is connected to the device for data communication 76, device for getting location information 77 and device for getting direction information 78. '317 Patent Figure 10. The CPU 71 is the "control unit" of the portable terminal. *Id.* at 9:40–50. Maxell's expert analyzes the meaning of this passage and figure. Braasch Decl. at ¶¶ 50–54. To the extent the evidence conflicts as to the understanding of one skilled in the art as to the control of the claimed outputting, the Court credits the testimony of Maxell's expert as more persuasive. *See* Braasch Decl. at ¶¶ 50–54; *Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (authorizing courts to make subsidiary factual findings about extrinsic evidence in claim construction).

A close reading of the specification, in context of Figure 10, clarifies that the corresponding structure for the claimed function includes the "CPU 71" and "a device for data communication 76." The device for data communication 76 is then described in the specification as "a device for data communication 76 of an ordinary portable telephone and a PHS [Personal Handyphone System] terminal." Maxell's expert testimony conforms to this disclosure:

> Moreover, the '317 Patent discloses specific structure for a portable terminal to connect to a server and receive retrieved information from the server. For example, the patent discloses that the portable includes data communication 76 (Fig. 10, '317 Patent at 9:47–49), and cellular antenna ('317 Patent at 5:66–67). In addition, the portable terminal includes a CPU (e.g. CPU 71, Fig. 10) for performing processing steps associated with communicating, receiving, and displaying information. '317 Patent at 9:42–43. For example: [quoting a description of the flow chart of Figure 7].

Braasch Decl. at ¶ 54. In light of the specification as interpreted by one skilled in the art, the claimed function involves the use of the CPU 71 and the device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal. *See* '317 Patent 9:40–9:51.

ZTE invokes *WMS Gaming*, contending that no algorithm is disclosed. However, the Court finds that the general functions of "outputting" and "receiving" as recited in the claim are more akin to the "processing," "receiving," and "storing" terms described in *In re Katz*. *See In re Katz*, 639 F.3d at 1316 (finding that it was "not necessary to disclose more structure than a general purpose processor" for functions that "can be achieved by any general purpose computer without special programming" including processing, receiving, and storing).

At the oral hearing, Maxell substantially agreed with the construction proposed below by the Court. H'rg Tr. at 126:13–16.

[58] The Court construes "said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server" to mean:

Function: outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server

***723 Structure**: CPU 71 and device for data communication 76 of a portable telephone and a Personal Handyphone System (PHS) terminal (Figure 10, 9:40–50), or equivalents thereof.

G. The '729 Patent

The '493 Patent and '729 Patent share a substantially similar specification.[7] The '493 Patent and the '729 Patent relate to electric cameras, and more specifically, to an electric camera having an image sensing device having a sufficient number of pixels that is capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry. '493 Patent 3:8–13. The Abstract of the '493 Patent recites:

> An electric camera includes an image sensing device with a light receiving surface having N vertically arranged pixels

and an arbitrary number of pixels arranged horizontally, N being equal to or more than three times the number of effective scanning lines M of a display screen of a television system, a driver to drive the image sensing device to vertically mix or cull signal charges accumulated in individual pixels of K pixels to produce, during a vertical effective scanning period of the television system, a number of lines of output signals which corresponds to 1/K the number of vertically arranged pixels N of the image sensing device, K being an integer equal to or less than an integral part of a quotient of N divided by M, and a signal processing unit having a function of generating image signals by using the output signals of the image sensing device.

'493 Patent Abstract. More particularly, the '493 Patent and the '729 Patent describe an electric camera including an image sensing device (e.g., a CCD) having a number (e.g., 1200) of vertically arranged pixels and a number (e.g., 1600) of horizontally arranged pixels. '493 Patent 4:34–48. When taking still images, all of the effective pixels on the image sensing device are used to produce signals with as high a resolution as possible. '493 Patent 7:31–39. When taking moving video, a number (e.g., 1200/240 = 5) of the vertically arranged pixels are mixed or culled, so that the number of lines of output signals from the image sensing device match or conform to the number of effective scanning lines (e.g., 240) of a television monitor. '493 Patent 4:64–5:6, 7:40–59, 9:30–36. The '729 Patent further describes an image stabilizing operation, which reduces image unstability in the moving video by shifting the effective pixel area of the image sensing device in a direction that cancels the image unstability. '729 Patent 7:11–28.

22. "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" ('729 Patent claim 1)[8]

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Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6 Function: "for image sensing" Structure: a solid state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern and having an equal number of color sensitive filter elements arranged such that each color forms a vertical line. See "a solid-state image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an equal number of vertically arranged pixel lines" (claim 59) See also 4:66-5:8, 7:58-8:22; 8:55-58, 35]

The parties dispute whether or not the term is a means-plus-function term.

Maxell argues against means-plus-function treatment for this term for three reasons. Docket No. 95 at 44. First, Maxell contends that the term "image sensing device" alone denotes a definite structure or class of structures, namely, image sensors. *Id.* Maxell states that a person of ordinary skill in the art would understand that, both from the claim language itself and from the descriptions of an "image sensing device" in the specification, this term refers to a definite class of structures that convert incident light into an electric signal. *Id.* (citing '729 Patent 4:36–39, 10:14–18, and Docket No. 95–4 (Madisetti Decl.) at ¶¶ 35–37). According to Maxell, the claim itself also describes the structure for the "image sensing device" as having "an array of pixels arranged vertically and horizontally in a grid pattern," further supporting that this term has sufficiently definite structure. *Id.*

Second, Maxell argues that the '729 Patent's specification describes in detail exemplary structures for the "image sensing device." *Id.* at 45 (citing '729 Patent 4:36–65, Figure 2). And third, Maxell contends that ZTE's construction improperly narrows the scope of the claims, construing "an image sensing device" as a "solid state image sensing device" with numerous other limitations. *Id.*

ZTE counters that this term should be construed according to 35 U.S.C. § 112, ¶ 6 because the claim doesn't contain sufficient structure to do the function of image sensing. Docket No. 100 at 37. ZTE contends that although this limitation does not include the word "means," the limitation does not recite sufficiently definite structure for performing the claimed function, and thus should be construed as a means-plus-function limitation. *Id.* ZTE contrasts (with emphasis added) claim 1 of the '493 Patent, which ZTE argues includes the requisite structure for image sensing (a light receiving sensor), with claim 1 of the '729 Patent, which

ZTE alleges does not include the requisite structure for image sensing:

***725**

'293 Patent	'729 Patent
an image sensing device with *a light receiving sensor* having an array of pixels arranged vertically and horizontally in a grid pattern	an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern

at 37.

According to ZTE, here, a pixel is a data construct in an image (with data representing color intensities from multiple image filter-sensor elements), not an element on a sensor as Maxell asserts. *Id.* at 38. ZTE then argues that the corresponding structure for imaging sensing must include the color sensitive filters includes color filters arranged in vertical lines. *Id.* For support, ZTE cites to the passage: "On these grid-arrayed pixels three types of color filters that pass yellow (Ye), green (G) and cyan (Cy), respectively, are arranged in such a way that the combination of these three colors is repeated horizontally every three pixels and that the filters of the same colors are lined vertically in so-called vertical stripes." *Id.* (citing '729 Patent 4:41–46). ZTE also points to the passage

> FIGS. 13A and 13B show arrangements of color filters in this embodiment. These color filters in both examples are arranged in vertical stripes and, regardless of the number of pixels to be vertically mixed or culled, the R, G, B primary color signals can be generated from one line of output signals."

at 15:25–30.

In its reply, Maxell argues that ZTE "merely avers that the addition of the words *with a light receiving sensor* transforms an insufficiently structure limitation into one with sufficient structure" but, according to Docket No. Maxell, "a person of skill in the art would associate 'image sensing device' with a class of structures regardless of whether the words *with a light receiving sensor* are part of the claim." Docket No. 106 at 15 (emphasis original). Maxell argues that its expert testimony remains unrebutted and that ZTE also disregards the description of the image sensing device in the patent itself. citing '729 Patent 4:36–65, 12:50–13:15, Figure 2, Figure 10. Maxell contends that the term "image sensing device" describes in the claims how the device operates to achieve the inventions' objectives. *Id.* And, according to Maxell, the '729 Patent's specification describes the "image sensing device" and its operation in detail and the use of additional words (here, *image sensing*) in conjunction with the word *device* places an additional functional constraint on a structure otherwise adequately defined. at 15–16 (citing '729 Patent 4:36–65, Figure. 2, *Free Stream Media Corp. v. Alphonso Inc.*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (emphasis original).

[59] Though a term that does not use "means" is presumed not to be a means-plus-function term, *Williamson* does note that "device" maybe a nonce word "that is tantamount to using the word means." *Williamson*, 792 F.3d at 1350. In this case, however, the full term in question includes "image sensing device." "Image sensing device," as opposed to just "device," imparts a structural significance to the term. In *Williamson*, the word "module" included a prefix of "distributed learning control," which the Federal Circuit determined did not impart structure:

> Although the "distributed learning control module" is described in a certain level of detail in the written description, the written description fails to impart ***726** any structural significance to the term. At bottom, we find nothing in the specification or prosecution history that might lead us to construe that expression as the name of a sufficiently definite structure as to take the overall claim limitation out of the ambit of § 112, para. 6.

Id. at 1351. Here, the intrinsic record is the opposite. The specification is replete with references to "image sensor device" as used in the prior art discussion and in the description of the embodiments. These passages describe, at length, the working detail and structure of both prior art image sensing devices and the disclosed imaging sensing device. '729 Patent 1:25–2:2, 2:20–55, 4:36–65, 10:14–18, 12:50–13:15, Figure 2, Figure 10. In context of the specification as a whole, this term is different than that in *Williamson.*

That ZTE acknowledges that a claim that merely adds a "light sensor" to the term "image sensing device" is sufficient structure further supports this result. ZTE has pointed to no evidence that the disclosure of the image sensor device of the '729 Patent would not include a light sensor. In fact, the specification specifically states light "is focused on a light receiving surface of the image sensing device 3 where it is converted into an electric signal." *Id.* at 4:37–39. The specification further states "FIG. 2 shows the structure of this image sensing device... [where reference number] 30 are ***pixels each formed of a photodiode***, which are arranged horizontally and vertically in a grid pattern." *Id.* at 4:40–43 (emphasis added). In contrast to ZTE's interpretation of a "pixel" ("a pixel is a data construct in an image"), the

specification clearly states that the pixels are photodiodes, which are structures known to be light receiving sensors.

Further, the claim includes additional structural description of the image sensing device: "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern." The additional structural description of the image sensing device ("an array of pixels arranged vertically and horizontally in a grid pattern") further removes the term from means-plus-function usage by showing sufficiently definite structure. *See Free Stream*, 2017 WL 1165578, at *25 (E.D. Tex. Mar. 29, 2017) (declining to construe "client device" as a means-plus-function term because "the claims themselves connote sufficiently definite structure by describing how the 'client device' operates within the claimed invention to achieve its objectives")).

Finally, the extrinsic evidence provides a detailed analysis of the specification and how the disclosure reflects a class of structures that is known to one skilled in the art. Madisetti Decl. at ¶¶ 35–44. ZTE's expert merely makes unsupported allegations that one skilled in the art would not identify structure in the specification, seemingly focusing on an argument that "structure for image sensing must include the color sensitive filters." Docket No. 100–4 (Mansoorian Decl.) at ¶¶ 35–43. However, such testimony does not negate the intrinsic and extrinsic evidence that "image sensing device is a known class of structure." The competing extrinsic evidence more strongly supports Maxell's position that the term is understandable as structure.

Based upon these factors, the presumption that the term is not a means-plus-function term has not been rebutted.

[60] The Court construes the term "an image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern" to have its plain and ordinary meaning.

23. "an image stability detector" ('729 Patent claim 1)

***727**

Maxell's Proposed Construction	ZTE's Proposed Construction
"a device, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electronic camera"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "detecting an image instability of the electronic camera" **Structure:** insufficient corresponding structure disclosed

The parties dispute whether the term is a means-plus-function term.

Maxell contends the claim should not be interpreted as means-plus-function because it does not use the word "means" and lacks a "for" clause with a stated function. Docket No. 95 at 46. Maxell also contends that the Federal Circuit and other post *Williamson* decisions have held that " 'detector' is a sufficiently definite structural term to preclude the application of § 112, P 6." *Id.* (citing *Personalized Media v. Int'l Trade Comm'n*, 161 F.3d at 705; *Raytheon Co. v. Cray, Inc.*, 2017 U.S. Dist. LEXIS 89342, at *69–70 (E.D. Tex. June 9, 2017); *NetFuel, Inc. v. F5 Networks, Inc.*, 2017 WL 2834538, at *19 (N.D. Ill. June 29, 2017) (concluding that "detector" is "more definite than 'means' or 'mechanism' ")). Maxell further contends that the specification expressly describes "gyro sensors 16*a*, 16*b*, that detect vertical and horizontal image-unstabilities." *Id.* (citing '729 Patent 7:12–14). Maxell contends that "Gyro sensors" are exemplary specific, definite, and sufficient structures for detecting image instabilities.

ZTE responds that "image instability" by itself is a term that is not known in the art of image processing. Docket No. 100 at 39 (citing Mansoorian Decl. at ¶¶ 47–48). ZTE contends that images are data that is both fixed in time and in space and there is nothing in an image that could be "unstable" or "instable." *Id.* (citing Mansoorian Decl. at ¶ 49).

ZTE contends that "image instability" is discussed in the specification: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively, and 17 an image-unstability decision circuit to determine the image-instability from signals output from the gyro sensors." *Id.* (citing '729 Patent 4:32–4:35). ZTE contends that cameras detect motion of the imaging platform or camera, not unstability or instability of a resultant image. *Id.* (citing Mansoorian Decl. at ¶¶ 47–49). ZTE also contends that the specification fails to teach any manner to relate vertical or horizontal motion of the camera to a purported "image instability." *Id.* (citing Mansoorian Decl. at ¶ 50). ZTE further argues that it is quite unclear if the patentee equated "instability" with "unstability" or what these terms would even mean with respect to image data. Even if one were to relate the purported "image instability" to motion artifact in a resultant image, ZTE contends that the disclosure of the asserted patents fails to teach how to relate motion of the camera to instability of the image. ZTE contends that since gyroscopic sensors measure rotational velocity, it is

unclear how that measurement would be converted into pixel displacement. *Id.* (citing Mansoorian Decl. at ¶ 55).

***728** In its reply, Maxell contends that ZTE's response largely focuses on whether the patent sufficiently describes how the image instability is calculated and that this inquiry has no bearing on whether the "image instability detector" connotes a sufficiently definite structure or class of structures. Docket No. 106 at 16.

Maxell contends that Dr. Madisetti explained that the skilled artisan "would understand that 'instability'... would refer to the movement of the camera, as measured by a gyro sensor, accelerometer, or similar device." *Id.* (citing Madisetti Decl. at ¶ 48 (describing instability "relating to vertical and horizontal shifts in effective pixel area ... due to vertical and horizontal movement of the camera")). Maxell also argues that "detector" describes a sufficiently definite class of structures, and "image instability" in this context would be readily understood by a person of ordinary skill in the art. *Id.*

ZTE's expert provides a conclusory statement that the term does not connote structure to one skilled in the art, followed by three paragraphs acknowledging that image stabilization techniques and systems were known in the art, including systems that move an image sensor to compensate for unwanted movement. ZTE's expert also states in conclusory fashion that, although the specification teaches using gyro sensors to detect vertical image-unstability and lateral image-unstability, the specification fails to show how the unstability is detected and measured. Mansoorian Decl. at ¶¶ 46–50.

ZTE's evidence fails to meet ZTE's burden to overcome the presumption that the term is not a means-plus-function term. As noted by Maxell, the term "detector" has generally been found to reflect structure. *See Personalized Media*, 161 F.3d at 705; *Raytheon Co.*, 2017 U.S. Dist. LEXIS 89342 at *69–70. Further, the specification provides clear reference to specific structure to detect unstability by disclosing the use of gyro sensors to detect movement: "16a and 16b gyro sensors to detect vertical image-unstability and lateral image-unstability, respectively." '729 Patent 4:31–4:35. As ZTE's expert has agreed that camera stabilization techniques and systems are known and the specification provides discussion of detecting vertical image-unstability and lateral image-unstability with gyro sensors, it is clear that "image instability detector" provides a definite statement of structure. Further, as noted by Maxell's expert, the disclosure of unstability is extensive:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. In light of the disclosure in the specification and the accepted understanding of those in the art, the analysis of the specification by Maxell's expert (and the extrinsic evidence regarding the ***729** understanding of one skilled in the art regarding the use of gyro sensors and "unstability" presented by Maxell's expert) is more reliable compared to the mere conclusions of ZTE's expert. *See* Madisetti Decl. at ¶¶ 47–49.

At the oral hearing, Maxell agreed to the Court's construction presented below.

[61] The Court construes "an image stability detector" to mean "a detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera."

24. "an amount of image-instability of the camera" ('729 Patent claim 1)

Maxell's Proposed Construction	ZTE's Proposed Construction
"the amount of instability caused by vertical and/or horizontal movement of the electric camera"	Indefinite

ZTE contends that it is unclear what the "amount" corresponds to: pixels, quality of portions of the image impacted by motion or quality of the picture as a whole.

Maxell contends that, upon reading the specification of the '729 Patent, a person of ordinary skill in the art would recognize that "an amount of image instability of the camera"

refers to the amount of vertical or horizontal movement of the camera that causes corresponding instability or shifting in a generated image. Docket No. 95 at 47 (citing Madisetti Decl. at ¶¶ 46–47). According to Maxell, the patent describes that the amount of instability can be represented or measured in number of pixels and that the patent discloses that a decision circuit 17 "checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions" *Id.* (citing '729 Patent 7:12–17). Maxell states that the patent also explains that "[b]ased on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability." *Id.* at 7:18–20

Maxell argues that the description of using a gyro sensor to measure image instability would inform a person of ordinary skill that "an amount of image instability" refers to an amount of shift caused by vertical and/or horizontal movement of the electric camera and representable by a number of pixels on the light receiving surface of the image sensor. *Id.* at 47–48 (citing Madisetti Decl. at ¶¶ 49).

In response, ZTE contends that its arguments for indefiniteness of the "image-instability detector" term apply to this term. Docket No. 100 at 40. ZTE further contends that the phrase "an amount of image-instability" is unclear because even assuming that the patentee used this phrase to mean "motion artifact" present in the resultant image, one of ordinary skill would be left guessing whether the claim meant the total number of pixels disturbed in the image, the quality degradation of the sections of the image impacted by motion artifact, or the overall appearance of the image as a whole. *Id.* ZTE contends that the specification is silent on the meaning of "image instability." *Id.* ZTE contends that, as explained by Dr. Mansoorian, gyroscopes measure a rate of rotation (angular velocity or speed) around x, y, and z axis. *Id.* (citing Mansoorian Decl. at ¶ 54). ZTE argues that there is no relationship between the specification's "vertical image-unstability and lateral image-unstability," and the claimed image instability discussed in the specification. *Id.* (citing Mansoorian Decl. at ¶¶ 54–55). ZTE contends that one of ordinary skill is left ***730** wondering, for example, if a lateral speed of 1 inch per second measured by the lateral gyroscope is related to any number pixel offset in the motion artifact of the resultant image. *Id.* ZTE also contends that one would be left wondering how this decision circuit would convert angular velocity of a gyroscope into a number of pixel displacement. Docket No. 100 at 40.

ZTE argues that the "amount" must be limited to some particular amount of instability. However, the term as drafted only requires an image-instability detector, configured to detect "an amount of image-instability of the camera." The explicit claim language is not limited to a particular pixel count, angularly velocity, lateral speed, etc. As discussed above, the patent describes:

> Next, the image stabilizing operation will be explained. Image-unstability information obtained by the gyro sensors 16a, 16b that detect vertical and horizontal image-unstabilities is entered into the image-unstability decision circuit 17, which checks the received information for the amount and direction of the image-unstability and converts them into the number of pixels in vertical and horizontal directions on the light receiving surface of the image sensing device. Based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability. The positional shifting of the extracted area is performed as follows. The shifting in the vertical direction can be made by changing the number of pixel rows transferred during the periods T3 and T4 in FIG. 3 and the shifting in the horizontal direction made by changing the interpolation start position in the horizontal interpolation circuit 9.

'729 Patent 7:11–28. The ability to measure orientation is consistent with this passage cited above, where the information obtained by the gyro sensors is checked for the amount and direction of the image-unstability. The decision circuit 17 then converts the amount and direction detected by the gyro sensors into the number of pixels in the vertical and horizontal directions that the effective pixel area needs to be shifted to cancel the image instability. *See Id.* In context of the specification, the claimed instability of the camera clearly refers to the movement of the camera as sensed by the gyro sensors. Maxell's construction comports with the specification as to what is meant by the amount of instability.

[62] The Court construes "an amount of image-instability of the camera" to mean "an amount of instability caused by vertical and/or horizontal movement of the electric camera"

25. "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" ('729 Patent claim 1)[9]

Maxell's Proposed Construction	ZTE's Proposed Construction
"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in order to correct the image-instability"	"based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-instability."

The parties dispute whether the last portion of the term must be a shift "in a ***731** direction that cancels the image-instability."

Maxell notes that it believes the plain and ordinary meaning is sufficient, but Maxell has agreed to "adopt ZTE's construction so long as the unduly limiting language ('in a direction that cancels the image-instability') is removed." Docket No. 95 at 48. According to Maxell, while the language ZTE adds appears in the specification alongside the other language that forms ZTE's proposed construction, the extra language adds an unnecessary limitation to the claims, importing a particular embodiment. *Id.* Further, Maxell contends that the patent does not equate "correction of image-instability" to "cancellation of image-instability." Maxell notes that an objective of the patent is to "reduce[ ] image quality degradation" but not necessarily cancel image quality degradation. (citing '729 Patent 3:10–15).

ZTE contends that the Court should adopt its construction because, while the specification is silent on exactly how to convert the output of the gyroscopes into a specific pixel count, it does state that in order to correct the purported image instability, the pixels must be shifted in a direction that cancels the image unstability. Docket No. 100 at 41 (citing '729 Patent 7:11–21).

The claim language in question recites "correct the image-instability." ZTE argues for a particular manner of such correction, "shifted in a direction that cancels the image-instability," relying on the following language in the specification:

> the position of an extracted area (effective pixel area) on the light receiving surface is shifted in a direction that cancels the image-unstability. This can correct the image-unstability.

'729 Patent 7:19–22. Though the particular shift technique cancels instability and "can correct the image-unstability," ZTE has pointed only to an embodiment and has not pointed to any language of lexicography, disclaimer or disavowal mandating that the correction must cancel all instability. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329; *Arlington Indus.*, 632 F.3d at 1254 ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). Moreover, at least one passage of the specification references "reduced image quality degradation" as opposed to canceling degradation. '729 Patent 3:10–15. ZTE has not established sufficient grounds in the intrinsic record to import the particular shift technique described in the specification.

[63] The Court construes "to change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability" to mean "based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability."

26. "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" ('729 Patent claim 1)[10]

***732**

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "for displaying an image corresponding to the image signals formed by the signal processing unit" **Structure:** "display screen of a television monitor" (1:32–33) or other screen compatible with NTSC or PAL format (1:35–36; 10:39–41)

The parties dispute whether the term is a means-plus-function term and limited to a television or other screen compatible with NTSC or PAL.

Maxell contends that the mere use of the word "unit" in this term does not, without more, make "display unit" a means-plus-function term. Docket No. 95 at 49. Maxell also contends that the claim language denotes sufficiently definite structure by stating how the "display unit" operates: it displays an image based on corresponding image signals. *Id.* at 49 (citing *Free Stream*, 2017 WL 1165578, at *25).

Maxell also contends that the '729 Patent provides examples of a "display" in the form of a "display screen" (Abstract) and a "television monitor" (1:33–34). Maxell contends that from the claim language and from the description in the specification, one skilled in the art would know that "display unit" refers to a definite class of structures, namely, devices that can display images. *Id.* (citing Madisetti Decl. at ¶¶ 52–54).

ZTE responds that the claim doesn't contain sufficient structure to do the function of displaying the image. Docket No. 100 at 41. ZTE contrasts claim 1 of the '493 Patent, which ZTE alleges includes the requisite structure for displaying the image, with claim 1 of the '729 Patent, which ZTE alleges does not include the requisite structure.

'493 Patent	'729 Patent
"a display unit with the display screen, to display an image corresponding to the image signals"	"a display unit configured to display an image corresponding to the image signals formed by the signal processing unit"

Id. at 41–42.

ZTE contends that Maxell's reliance on *Free Stream* is unavailing because, in contrast to the device construed in *Free Stream*, here, the claim does not include reference to a display screen, structure required for a display unit to work. *Id.* at 42. ZTE contends that the specification discloses that the structure that performs the function of displaying an image must include a display screen of a television system or other screen compatible with NTSC or PAL formats. *Id.* at 42–43 (citing '729 Patent 1:32–44, 10:19–22).

In its reply, Maxell contends that ZTE alleges that the addition of "with a display screen" transforms a limitation into one with sufficient structure. Maxell contends that a person of ordinary skill in the art would associate "display unit" with a class of structures regardless of whether these additional words are part of the claim. Docket No. 106 at 17 (citing Madisetti Decl. at ¶¶ 51–54).

***733** ZTE again argues that *Williamson* would require the claim term to include all the operable components of a display unit. However, as noted above, that is not the standard provided by *Williamson*. Again, the question is whether the term describes sufficiently definite structure to one of ordinary skill in the art to connote structure. ZTE has not shown that one skilled in the art would not understand that the term connotes definite structure. ZTE's acknowledgement that "a display unit with the display screen" is known structure demonstrates as much. The specification clearly teaches that a display unit is a class of structures, providing examples such as "display screen" (Abstract) and a "television monitor" (1:33–34).

Finally, ZTE's expert testimony also indicates that such a term would be known to represent a class of devices that display images such as "anything from a television display, cell phone display, and computer monitor." Mansoorian Decl. at ¶ 57. Thus, the expert recognizes that the term is not unbounded but reflects known structures. In addition to the specification disclosure, the extrinsic evidence about the understanding of those skilled in the art further supports Maxell's position that the term is understandable as structure.

[64] The Court construes the term "a display unit configured to display an image corresponding to the image signals formed by the signal processing unit" to have its plain and ordinary meaning.

H. The '193 Patent

The '193 Patent relates generally to cellular telephones, more specifically to a cellular telephone with improved means for controlling transmitter output power, while reducing current consumption to conserve battery life. '193 Patent 3:12–28. The Abstract of the '193 Patent recites:

> A cellular telephone receives a first communication signal from a cell-site station and transmits a second communication signal to the cell-site station. The cellular telephone includes an antenna, a duplexer, a receiver, an encoder/decoder apparatus, an acoustic transducer, a transmitter and a controller. The receiver is connected to the antenna through the duplexer. The receiver converts the first communication signal into a voice signal code, and outputs a signal indicating an intensity of the first communication signal. The transmitter is connected to the encoder/decoder apparatus and to the antenna through the duplexer. The receiver converts the input voice code signal from the encoder/decoder apparatus into the second communication signal. The controller is connected to the receiver and the transmitter. The controller controls amplitude of the transmitter corresponding to said intensity of the first communication signal. The transmitter includes a variable amplitude amplifier and a power amplifier means, and the controller includes a central processing unit and a memory. The controller controls a gain of the variable amplitude amplifier and a bias condition of the power amplifier means according to a function stored in the memory.

'193 Patent Abstract. More particularly, the '193 Patent describes a cellular telephone (Figure 1) having a transmitter (200), including a variable amplitude amplifier (230) and a power amplifier (250) for amplifying a transmit power to a desired level, and a controller (300) for controlling the transmit power by controlling the gain of the variable amplitude amplifier and the bias condition of the power amplifier. '193 Patent 5:16–6:54, Figures 1 and 2. Instead

of supplying a fixed bias condition (e.g., B_n) to the power amplifier, the '193 Patent defines bias conditions for the power amplifier as a function of predetermined gain values for the variable amplitude amplifier, and stores corresponding sets of gain and ***734** bias values in memory (e.g., G_1B_1, G_2B_2... G_nB_n). '193 Patent 6:6–43, Figure 4. By specifying different bias values for different gain values, the controller can select a bias condition that satisfies a particular transmit power, while reducing current consumption in the power amplifier. '193 Patent 6:43–54.

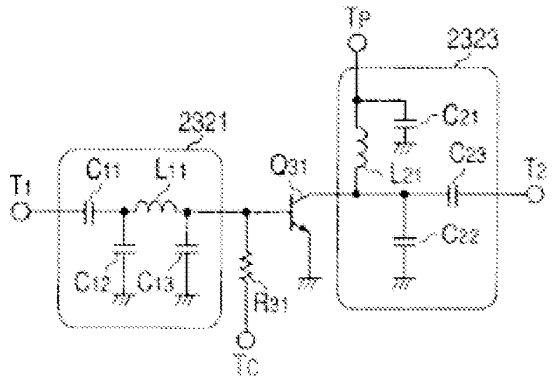
28. "variable amplitude amplifier" ('193 **Patent claims 1 and 7**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Plain and ordinary meaning	"device that includes a first-stage amplifier, two filters, an up-converter, and a second-stage amplifier"

ZTE contends that the claims should be limited to the amplifier design of Figure 1 allegedly because that is the embodiment that fits within the claim limitations.

Maxell contends that ZTE limits the term to the embodiment of amplifier 230 of Figure 1 and excludes the embodiment of Figure 3. Docket No. 95 at 52. Maxell contends that Figure 1 discloses an embodiment of a variable amplitude amplifier 230 that consists of two stages of amplification formed by amplifiers 232 and 234. *Id.* (citing '193 Patent 5:19–21, 5:31–33, 5:40–45). According to Maxell, the embodiment of a variable amplitude amplifier disclosed in Figure 3 consists of a single stage of amplification formed by a single amplifying element, transistor Q31. *Id.* (citing '193 Patent 6:56–57 ("[i]n this embodiment, a transistor is employed as an amplifying element Q31")). Further, Maxell contends that the term "variable amplitude amplifier" would be readily understood by a person of ordinary skill in the art. *Id.* at 53 (citing Docket No. 95–3 (Caloyannides Decl. A) at ¶¶ 48–50).

ZTE contends that its construction should be adopted because the embodiment of Figure 1 is the only embodiment that fits within the scope of the claims. Docket No. 100 at 45. ZTE contends that it is unclear how the amplifier of Figure 3 works or even how it would be connected to the "control signal" required in the claims. *Id.* at 45 46 (citing Docket No. 100–7 (Ding Decl.) at ¶¶ 42).



ZTE's argument focuses on Figure 3, above. According to ZTE, for the circuit in Figure 3, the specification describes T1 and T2 as the input and output terminals respectively and the power source voltage is connected to terminal Tp. *Id.* at 45 (citing '193 Patent 6:58–61, 7:10–12). ZTE ***735** contends that the specification states that "transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 45–46. The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current" but it is silent on how the control signal reaches the Q31 or how it would control the output power if it did reach transistor Q31. *Id.* at 46 (citing '193 Patent 7:15–20, and Ding Decl. at ¶ 44). Specifically, ZTE contends that not only does the specification not disclose how the control signal reaches transistor Q31 it also fails to teach how that signal would vary the gain of the circuit. *Id.*

ZTE further contends that the term "Variable Amplitude Amplifier" has no accepted meaning in the field and would not be known to one of ordinary skill. *Id.* at 47 (citing Ding Decl. at ¶¶ 45–48).

There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech.*, 758 F.3d at 1365 (Fed. Cir. 2014) (quoting *Thorner*, 669 F.3d at 1365); *see also GE Lighting Solutions*, 750 F.3d at 1309 ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309. To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a

"clear and unmistakable" surrender. *Cordis Corp.*, 561 F.3d at 1329; *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.").

[65] ZTE has not pointed to any such clear lexicography, disclaimer or disavowal. "[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction." *Arlington Indus., Inc.*, 632 F.3d at 1254.

As to the meaning of the term, the parties and their experts dispute whether the term has meaning to one skilled in the art. It is noted that the background of the specification references a variable amplitude amplifier in the prior art CDMA standard. '193 Patent 1:23–35, Figure 11. Further, the background of the specification references the use of a variable amplitude amplifier for controlling bias conditions of a FET according to transmission power, as described in a Japanese patent document. '193 Patent 1:60–2:1. Further, Maxell's expert points to two prior art patents which reference the term variable amplitude amplifier. Caloyannides Decl. A at ¶ 42. Further, Maxell's expert identifies three of the cited patents on the face of the '193 Patent as providing example figures of variable amplitude amplifiers. *Id.* at ¶ 48. ZTE's expert's primary challenge to these statements is an assertion that the two prior art patents identified in Caloyannides Decl. A at ¶ 42 do not disclose definite structure for the amplifiers. Ding Decl. at ¶¶ 46, 48. However, that assertion does not rebut the evidence that the term is known in the art. The competing extrinsic evidence of those skilled in the art better supports Maxell's position that the term has meaning to those in the art. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) ***736** (allowing courts to make subsidiary factual findings about the extrinsic evidence).

Moreover, the specification itself provides guidance as to the meaning. The specification provides for two descriptions of the variable amplifier 230. ZTE points to the description of Figure 1 found at 5:16–44. However, the specification provides another description of variable amplitude amplifier 230 in Figure 2 and Figure 3 at 6:1–6, 6:55–7:20. ZTE's expert attempts to discount the disclosure of Figure 3 by stating that the specification is silent on how the control signal reaches the transistor Q31 or how it would control the output power if it did reach transistor Q31. Ding Decl. at ¶ 44. However, the specification is clear: "[a] control terminal Tc is connected to the base of the transistor Q31 through a resistor R31." '193 Patent 7:5–7 (referencing Figure 3). Though ZTE argued at the oral hearing that it was unclear where the signal on Tc is provided from, the specification is clear. Figure 2 clearly illustrates that controller 300 provides an input to the variable amplitude amplifier 230. Further, the specification explains that the CPU 310 (within controller 300) "generates signals for controlling the variable amplitude amplifier 230" (5:53–54 (referencing Figure 1)), "the controller 300 controls a gain of the variable amplitude amplifier 230" (6:1–2 (referencing Figure 2)), "controller 300 controls the variable amplitude amplifier 230 (6:43–44 (referencing Figure 2)), and "the transistor Q31 controls the output power according to the control signal generated by the CPU 310" (7:16–18 (referencing Figure 3)).

The specification also more generally describes the operation of the variable amplitude amplifier 230 as amplifying the input signal for provision to an output. *Id.* at 5:31–40 (referencing Figure 1). This amplification is done by controlling the gain of the amplifier by the control signal from controller 300 as shown in Figure 2: "[t]he controller 300 controls a gain of the variable amplitude amplifier 230...." *Id.* at 6:1–2, 3:17–22, Abstract. The controller 300 controls the variable amplitude amplifier 230 and the power amplifier means 250 based on the conditions stored in MEM 330. *Id.* at 6:43–46. "The transistor Q31 controls the output power according to the control signal generated by the CPU 310. *Id.* at 7:16–18 (referencing Figure 3). "The higher the voltage of the control signal is, the more output power is obtained due to an increase of the collector current." *Id.* at 7:18–20 (referencing Figure 3).

In context of the specification, it clear that the variable amplitude amplifier is not limited to the structure of Figure 1. Moreover, in context of the overall description of the passages discussed above, the variable amplitude amplifier is an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

At the oral hearing Maxell agreed to a construction similar to that adopted by the Court below. H'rg Tr. at 147:8–23.

[66] The Court construes "variable amplitude amplifier" to mean "an amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal."

I. The '794 Patent

The '794 Patent relates generally to power management, more specifically to methods for controlling power consumption in a battery operable information processing device. '794 Patent 1:6–11. The Abstract of the '794 Patent recites:

> A power supply section includes a capacity detector capable of detecting the remaining capacity in a battery and a controller issuing power consumption reduction instructions to independently operable function devices based on usage ***737** priorities thereof. This allows power consumption operations to be performed such as stopping function devices with low priorities first based on the remaining battery capacity. As a result, power to function devices with higher priorities can be maintained. Based on the remaining battery capacity, the controller controls the operations of the function devices and uses a display to show information allowing the operator to identify operable and inoperable function devices as the battery capacity drops.

'794 Patent Abstract. More particularly, the '794 Patent allows priority levels to be set for individual function devices in the information processing device and prioritizes battery time or power consumption for function devices with higher priorities. '794 Patent 2:21–27, 3:57–4:12, Figures 8 and 9. The '794 Patent turns off power to individual function devices based on the priority levels set for the function devices and the remaining battery capacity. In this manner, a lower prioritized function device can be turned off when a first battery capacity is reached, while a higher prioritized function device remains powered. This enables function devices with higher priority to be operated for a longer period of time. '794 Patent 5:17–27.

29. "function devices(s)" ('794 Patent claim 1)

"component device" / "component devices for performing different functions in the device" ('794 Patent claim 9)

Maxell's Proposed Construction	ZTE's Proposed Construction
"hardware, software, or a combination of the two that consumes power and implements one or more functions of the information processing device"	Indefinite This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function:** "modem functions" (3:20); "audio communication function (function device A) and a videophone function (function device B)" (1:31–32); no function otherwise disclosed **Structure:** insufficient corresponding structure disclosed

In the briefing, the parties disputed whether or not the terms are means-plus-function terms. At the oral hearing, Maxell agreed that both terms are means-plus-function terms having the same construction. *See* H'rg Tr. at 159:22–161:12.

Maxell contends that the inventors of the '794 Patent used their own terminology to refer to hardware/software components that perform specific functions in the information processing device: "function device" and "component device." Docket No. 95 at 55. Maxell notes that the patent specifically refers to "an audio communication function" as "function device A" and to "a videophone function" as "function device B." *Id.* (citing '794 Patent 1:31–32). Maxell argues that a person of ordinary skill in the art would recognize the structures that would perform these functions and would understand that these disclosures denote a sufficiently definite class of structures. Docket No. 106 at 20 (citing Docket No. 106–10 (Kiaei Decl.) at ¶¶ 46–49, 56). According to Maxell, the '794 Patent describes "modem functions," and exemplary "common" function devices such as a CPU and memory. Docket No. 95 at 55 (citing '794 Patent 1:19–20, 1:32–33, 6:14–15). ***738** Maxell contends that the modem, CPU, and memory are specific, definite exemplary structures that perform functions in the information processing device. *Id.* Maxell argues that each function device can perform a single function or a function device can perform multiple functions. *Id.* (citing '794 Patent 2:33–35). As to the CPU and memory, Maxell contends that ZTE overlooks that a "common function device" is simply a type of "function device." Docket No. 106 at 20. Maxell further points to claim 8 as making clear that a "common function device" is a type of "function device." *Id.* at 20 n. 24.

At the oral hearing when provided with a structure of "modem devices, audio communication devices and videophone devices," Maxell indicated that it agrees to such structure if CPU and memory are added to the structure. H'rg Tr. at 159:23–160:13. Maxell contends that the CPU and memory are part of the "common function device" and should thus be included in the construction. *Id.*

Maxell also argues that ZTE provides a function, not from the claims, but from exemplary embodiments in the specification. Maxell contends that the function for an MPF claim should come from the claims, not from the specification. Docket No. 95 at 56 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim...") and *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F.Supp.2d 740, 747–48 (E.D. Tex. 2008)

("Defendants insert limitations not cited in the claim, which is improper.")).

ZTE contends that "function device" and "component device" have no recognizable meaning to a person of ordinary skill in the art, instead generically describing literally any device that is capable of performing any function. Docket No. 100 at 48 (citing Docket No. 100–3 (Wolfe Decl.) at ¶¶ 41–42). ZTE also contends the specification does not provide any description of the terms, let alone a level of description that could impart any structural significance. *Id.* (citing Wolfe Decl. at ¶ 43).

ZTE contends that the specification citation for structure provided by Maxell is circular: "[t]he devices specific to the functions 1, 2 are provided through the function devices 1, 2...." Docket No. 100 at 51 (citing '794 Patent 6:15–18). According to ZTE, these portions of the specification describe the "function devices" only in terms of functionality and do not provide any disclosure that one of ordinary skill in the art would recognize as a structure for performing the claimed functions. *Id.* (citing *Williamson*, 792 F.3d at 1352 ("[I]f a person of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim, a means-plus-function clause is indefinite."); *Bosch*, 769 F.3d at 1101 (finding means-plus-function "device" terms indefinite where the specification "offer[ed] no further guidance about their structures.")). ZTE contends that the only actual structure Maxell identifies is CPU and memory and that these are structures of the "common function devices" of Figure 3, not the different "function devices" or "component devices." *Id.* at 50 n. 16 (citing '794 Patent 6:14–15, Figure 3).

In response to Maxell's arguments for inclusion of a CPU in the structure, ZTE argued at the oral hearing that the *Aristocrat Techs* line of cases would require the inclusion of an algorithm in the structure. *See* H'rg Tr. at 162:22–163:20.

To address Maxell's objections to the functions that ZTE identifies from the specification (i.e., "modem functions" (1:20); "audio communication function (function device A) and a videophone function ***739** (function device B)" (1:31–32)), ZTE provides an alternative function directly from the claims: "performing different functions in the device" (for "component devices") and "performing independent functions" (for "function device"). Docket No. 100 at 49, n. 15.

As noted above, the parties are now in agreement that the terms are means-plus-function terms. As to the function, the Court finds that the actual language of each claim is the appropriate language. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332–35 (Fed. Cir. 2006).

As to corresponding structure, the specification describes that the function devices can (1) perform modem functions (1:20), audio communication function (function device A) (1:30–33) and videophone function (function device B). A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic, Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* Based on the specification disclosure, the corresponding structure linked to the claimed function includes modem devices, audio communication devices and videophone devices. The Court also notes that the unrebutted testimony of one skilled in the art is that these classes of devices are well known in the art. Kiaei Decl. at ¶¶ 46–49.

Maxell seeks to include the structure of the common function devices in the construction, but only structure that the specification "clearly links" to the claimed function is appropriate. The functions in question are "performing independent functions" and "performing different functions." In context of the specification, the devices that perform such differing and independent functions are the Function Device 1 (110) and Function Device 2 (111) of Figures 1, 2, 3, 6, 10, and 11. '794 Patent Figures 1, 2, 3, 6, 8, 10, and 11, 1:30–45, 1:55–66, 3:42–43, 3:57–4:12, 4:18–22. The "common function device" of Figure 3 is described differently: "an information process device 301 includes a common function device 302 needed by both the function device 1 (110) and the function device 2 (111)." *Id.* at 6:9–11. Further, the specification explicitly states: "[e]xamples of a common function device 302 include CPU and memory. The devices specific to the functions 1, 2 are provided through the function devices 1, 2, and control of these are provided through the common CPU and memory." *Id.* at 6:14–18. The functions of the common function device 302 are not independent of the Function Device 1 (110) and Function Device 2 (111), but rather tied to the functions of these devices (the common device is "needed by both" function devices and provides "control" of the function devices). In context of the specification as a

whole, it is clear that the functions of the common function device are not the claimed functions.

The claims themselves further provide clear indication that the recited "function devices" and "component devices" of the independent claims are different than the common device. Dependent claim 8 adds to claim 1: "further comprising a function device common to a plurality of independent functions" and dependent claim 14 adds to claim 9: "further comprising a component device common to a plurality of independent functions." In conformance with the specification, these claims make clear that the "common" device is not one of the devices recited in the independent claims. *See Phillips*, 415 F.3d at 1314 (other claims can also aid in determining the claim's meaning, because claim terms are ***740** typically used consistently throughout the patent and differences among the claim terms can also assist in understanding a term's meaning).

In light of the claims and specification, Maxell has not shown the common function device "clearly links or associates" with the claimed independent and differing functions. *See Medtronic, Inc.*, 248 F.3d at 1311. As such structure is not linked to the claimed function, the inclusion of a CPU and memory is inappropriate. Further, ZTE's arguments for inclusion of an algorithm based on the presence of a general purpose processor within Maxell's asserted construction are, thus, not appropriate for the structure adopted below by the Court.

[67] The Court construes "function devices equipped with independent functions" to mean:

Function: equipped with independent functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

[68] The Court construes "component devices for performing different functions" to mean:

Function: performing different functions

Structure: modem devices, audio communication devices and videophone devices, or equivalents thereof.

J. The '491 Patent and '695 Patent

The '491 Patent and '695 Patent share a substantially similar specification. The '695 Patent is a continuation of U.S. Patent No. 7,447,241, which is a continuation of the '491 Patent. The '491 Patent and the '695 Patent relate to audio decoding, and more specifically, to an audio decoder in which a plurality of decoding program codes are stored in an external rather than internal, read only memory (ROM). The Abstract of the '491 Patent recites:

> A multiplexed audio data decoder apparatus is provided in which integration of an audio decoder is easy, and has a high flexibility when the number of the formats to be processed is increased or when the specification is changed. In an external ROM **60** there are accumulated a plurality of decoding program codes corresponding to respective plural methods for compressing and encoding. A controller means **50** transfers the decoding program code corresponding to the method for compressing and encoding after changing thereof, from the external ROM **60** to an internal RAM **25**. A DSP **22** starts decoding processing by using the decoding program code which is transmitted into the internal RAM **25.**

'491 Patent Abstract. More specifically, the '491 Patent and the '695 Patent note that conventional digital signal processor (DSP) based audio decoders store decoding program codes within a built-in ROM, which consume considerable space and could not be easily changed to include new or additional encoding formats. '491 Patent 1:65–2:10. To improve flexibility, the '491 Patent and the '695 Patent store decoding program codes within an external ROM, which can be interchanged or updated with new decoding program codes. '491 Patent 2:11–51, 8:1–15, Figure 1. The '491 Patent and the '695 Patent also provide a controller (*e.g.*, a CPU) that detects a change in the encoding format and transfers appropriate decoding program codes stored within the external ROM to an internal RAM, so that the DSP can start the decoding process using the appropriate decoding program codes stored in the internal RAM. '491 Patent 2:38–45, 5:31–67, 6:66–7:54, Figures 1, 4, and 5. This enables the audio decoder apparatus described in the '491 Patent and the '695 Patent to have the flexibility to process audio signals of numerous formats without requiring a large built-in memory.

***741 18. "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said read-only memory to said second memory in**

advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2)[11]

Maxell's Proposed Construction	ZTE's Proposed Construction
Function: detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory **Structure:** At least one processor, such as a CPU, programmed to execute processing in accordance with the algorithm set forth in flowcharts of Fig. 4 (including steps S3, S3-1, S9), Fig. 5 (including steps S3, S3-1) and corresponding citations in the specification at 3:66–4:4, 6:30–7:54, 9:19–38, 9:58–10:48, and FIGS. 1, 4–6, and 9, as well as equivalents thereof	**Function:** claim 2: "for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" claim 2: "for transferring said plural decoding program codes from said read only memory to said second memory, as reference, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read only memory to said first memory" **Structure:** claim 1: "a control CPU (FIG 1) connected via a bus between a read only memory and the first memory, running the algorithm of Figs. 4 and 5, (at 3b–7:54)

The parties dispute whether the CPU is "external" and "connected via a bus between a read only memory and the first memory." The parties further dispute whether the algorithm of the processor includes all of Figures 4 and 5 or just particular steps of the flow charts of those figures.

Maxell objects to ZTE's construction as limiting the CPU to being "external" and "connected via a bus between a read only memory and the first memory." Docket No. 95 at 36. Maxell contends that ZTE is seeking to limit the scope of the claims to a preferred embodiment and that that ZTE's construction sits in tension with the natural language of the claim itself. *Id.* at 37. Maxell contends that the claims are directed ***742** to a "multiplexed audio data decoder apparatus" that "comprises" the "controller means" but that ZTE would require that the "controller means," which the claim language mandates to be included in the multiplexed audio data decoder apparatus, be a CPU that is external to the multiplexed audio data decoder apparatus. *Id.* at 37.

Maxell contends that the external CPU disclosed in the specification is used in an embodiment in which an exemplary multiplexed audio data decoder apparatus incorporates a DSP that is placed inside an audio decoder 20 that constitutes a self-contained unit which is integrated into the multiplexed audio data decoder. *Id.* (citing '491 Patent 2:4–6 ("integrate the audio decoder including the DSP"); 2:11–13 ("a multiplexed audio data decoder apparatus and a receiver apparatus, in which integration of the audio decoder is easy")). Maxell contends that, accordingly, the term *external* merely describes a location of the CPU (*e.g.*, CPU 50) with respect to such integrated audio decoder. Maxell contends that as shown in Figures 1, 6, and 10–13, the patent describes a CPU 50 that is external to an audio decoder (20) yet still part of a multiplexed audio data decoder apparatus. Docket No. 106 at 13 (citing '491 Patent Figure 1, 4:35–43 ("The multiplexed audio data decoder apparatus according to the present embodiment comprises... an audio decoder 20, [and] an external CPU 50...")).

Maxell contends that the claimed "multiplexed audio data decoder apparatus" does not recite such an audio decoder and does not require the CPU to be external to any specific structure. Docket No. 95 at 38. Maxell further contends that the specification of the '491 Patent does not associate the location (external or otherwise) of the CPU 50 with the performance of the recited function. *Id.*

ZTE contends that even Maxell argues that the corresponding structure is shown in Figures 1, 4–6 and 9. ZTE contends that each of those embodiments uses an "external" CPU. ZTE contends that no embodiment of the patent ever uses an internal CPU for the controller function. Docket No. 100 at 32–33 (citing Figure 1 ("external CPU 50"), Figure 6 ("external CPU 50"); Figure 10 (same); Figure 11 (same); Figure 12 (same); Figure 13 (same)).

ZTE responds that means-plus-function claims are necessarily limited by the corresponding structure in the specification. Docket No. 100 at 32–33. ZTE contends that there is no embodiment, preferred or otherwise, in the patent that does not use an external CPU. *Id.* at 33. ZTE notes that the specification expressly states that the "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* (citing '491 Patent 4:35–39).

ZTE contends that the use of an external CPU for the controller is not unrelated to the recited function but is in fact a primary basis of the alleged invention. *Id.* (citing '491 Patent 1:49–2:10 (described problems with prior art "built-in" ROM)).

ZTE further argues that Maxell's construction ignores the fact that the CPU is connected via a bus between a read only memory [ROM] and the first memory. *Id.* According to ZTE, this is the only corresponding structure disclosed in the patent for performing the "transferring portion" of the "controller means" function. *Id.* (citing '491 Patent Figure 1 (DB, external CPU 50, external ROM 60, Internal RAM 25)).

***743** Additionally, ZTE argues that Maxell seeks to omit certain steps in the disclosed flow charts without providing any reasons for doing so. Docket No. 100 at 34.

Under 35 USC § 112, ¶ 6, means-plus-function terms are limited the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc.*, 248 F.3d at 1311. "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.*

The specification discloses that "FIG. 1 is a block diagram of showing an outlook construction of a **multiplexed audio data decoder apparatus**, according to an embodiment of the present invention." '491 Patent 3:42–44 (emphasis added). This figure and the corresponding disclosure relating to the figure clearly establishes that the "apparatus" is comprised of multiple components, including some that are external to others. For example, the entire "apparatus" includes a digital signal processor 22 and internal RAM 25 (both within audio decoder 20) and a demultiplexer 10, a data bus (DB) and external CPU 50 and external ROM. *Id.* Figure 1, 4:34–43. Similar disclosures are made for Figures 6, 10, 11, 12 and 13. Maxell has not identified any embodiment in which the CPU is not external to at least some of the other components of the audio data decoder apparatus. Further, the patent describes problems that occur when all the components are "built-in: together. *Id.* at 1:26–2:10. The specification describes "multiplexed audio decoder apparatus according to the present invention comprises ... an external CPU 50." *Id.* 4:35–39. The specification refers to the "external CPU" more than 15 additional times and also as mentioned above in the figures.

Maxell argues that the claim is to the "apparatus" and the elements of the apparatus cannot be "external" to the apparatus itself. Maxell reiterates such contentions due to the unnatural reading of "external" asserted by ZTE (discussed below). As shown, the "apparatus" includes multiple components, some external to others, but the "apparatus" is the collection of these components: The CPU is not "external" to the apparatus but, instead, merely external to other components.

At the oral hearing, ZTE seemed to indicate that "external" meant external to the very apparatus that was claimed—specifically, external to the claimed multiplexed audio data decoder apparatus. H'rg Tr. at 119:17–122:23, 170:13–172:8. Such an interpretation would ignore the clear teaching of the specification discussed above. The specification gives the context that makes clear that "external" is not external to the multiplexed audio data decoder apparatus. In context of the specification and the elements recited in the claim, the CPU is external to the digital signal processor and the first memory.

At the oral hearing, Maxell agreed to a construction that makes clear that "external" is not with reference to the apparatus within which the CPU is a claimed element, but rather external to the digital signal processor. H'rg Tr. at 170:17–23.

***744** As to the algorithm, Maxell seeks to pick and choose steps of the algorithms shown in Figures 4 and 9, including the step of determining if there is a format change or not (step S6) and the "transmit decoding process code" step S7 when change is detected in step S6. The specification states:

> The FIG. 4 shows the program switching or changing process focusing mainly on the algorithm thereof, and the FIG. 5 shows it focusing mainly on the transfers of signals between the constructive blocks thereof. Further, in Figures 4 and 5, the same reference numerals indicate the steps in the process, being same to each other

'491 Patent 6:30–35. Further,

> The FIG. 9 shows the program switching process according to the present embodiment, mainly focusing on the algorithm thereof. However, the same reference numerals indicate the same process steps shown in Figures 4 and 5.
>
> z

Id. at 9:28–31. The algorithm that corresponds to the claimed function includes the entire algorithms of Figures 4 and 9. Figure 5 shows these steps in relation to the various system components, however, the algorithm itself is described in Figures 4 and 9.

[69] [70] The Court construes "controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 1) / "controller means for transferring said plural decoding program codes from said

read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory" ('491 Patent claim 2) to mean:

Function Claim 1: for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Function Claim 2: for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory

Structure: a CPU that is within the audio decoder apparatus, the CPU being external to the digital signal processor and the first memory (Figures 1, 6, 10, 11, 12, or 13) and being connected via a bus between a read only memory and the first memory, running the algorithm set forth in the flowcharts of Figure 4 and Figure 9 and the corresponding citations in the specification at 6:30–7:54 and 9:28–44, or equivalents thereof.

19. "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" ('491 Patent claims 7 and 8)[12]

***745**

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term, plain and ordinary meaning	indefinite Alternative if not indefinite: a demultiplexer that outputs one data sequence, which is compressed and encoded to the input of a frame sync. The demultiplexer itself does this inputting and also extracts the method of compression and encoding

The parties dispute whether the term is indefinite because the claim does not recite to what component the demultiplexer inputs the audio data sequence.

Maxell contends that ZTE has conceded that the plain meaning is understandable by agreeing to the plain and ordinary meaning of the term "a demultiplexer for extracting the one audio data sequence ...," as recited by claims 1, 2, and 9. Docket No. 95 at 38. Maxell contends that a "demultiplexer" is a well-known term to those of skill in the art that refers to a particular component. *Id.* at 38–39 (citing Docket No. 95–2 (Maher Decl. A) at ¶¶ 25, 33–34).

Maxell contends that the claim need not specify a precise location for the demultiplexer's output in order for a person of ordinary skill in the art to understand its scope. *Id.* at 39. Maxell contends that the claim specifies the operation of the demultiplexer (sending an audio data sequence to another input) and a person of ordinary skill in the art would understand the scope of this claim with reasonable certainty. Docket No. 106 at 13–14 (citing Docket 106–8 (Maher Decl. B) at ¶¶ 25, 28–32).

Maxell contends that ZTE's alternative construction merely attempts to read into the claim exemplary embodiment without support for such incorporation. Docket No. 95 at 39. Maxell contends that ZTE has not pointed to anything in the intrinsic record that supports an interpretation of "demultiplexer" whereby the "demultiplexer itself... extracts the method of compression and encoding." *Id.*

ZTE responds that the claim does not identify into what this item is inputted. Docket No. 100 at 34. ZTE contends that, thus, the breadth and scope of the claim cannot be determined as the claim does not recite an operable device. *Id.* (citing *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014)). According to ZTE, the only possible language in the claim that could correspond to this input is the last clause which recites "a digital signal processor [DSP] for decoding said one audio data sequence," but this is inconsistent with the specification, as in all disclosed embodiments in the output of the demultiplexer is inputted to a frame sync, not the DSP. *Id.* (citing '491 Patent Figures 1, 6, 10–13). ZTE contends this creates ambiguity that renders the claim invalid under Section 112(2). *Id.*

ZTE contends that, alternatively, the limitation should be construed consistently with the specification such that the demultiplexer is inputting to the Frame Sync. ZTE also contends that, based on the additional requirement in the claim that the demultiplexer is also for "extracting a method of compression and encoding of said one audio data sequence" this must also be part of the claim construction. *Id.* (citing '491 Patent 12:59–63).

As claimed, the claim merely requires the demultiplexer to provide an input, and further requires that input is the "one audio data sequence." ZTE contends that the fact that the demultiplexer provides an input requires the claim to include ***what*** is receiving the input. The claim language ***746** itself does not make such a mandate and the claim language is understandable to just require the demultiplexer to provide an input that is the "one audio data sequence." The competing extrinsic evidence of those skilled in the art also better supports Maxell's position that the term is understandable as drafted. *See Teva Pharm. USA*, 135 S.Ct. at 841 (2015) (allowing courts to make subsidiary factual findings about the extrinsic evidence).

[71] The Court construes the term "a demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed" to have its plain and ordinary meaning.

30. "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" ('695 **Patent claims 1 and 4**)

Maxell's Proposed Construction	ZTE's Proposed Construction
Not a means-plus-function term; plain and ordinary meaning	This is a means-plus-function element to be construed in accordance with 35 U.S.C. § 112, ¶ 6. **Function**: "for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside said memory" **Structure**: as claimed ('695 Pat. col. 33 l. 1) controller 10 as it has between a read only memory and the memory, running the algorithm of Figs. 4 and 5. (col. 10–7, 54)

The parties' dispute centers on whether "controller" connotes structure such that the term is not subject to means-plus-function interpretation.

Maxell contends that "controller" connotes sufficient structure to a person of ordinary skill in the art, noting that the IBM Dictionary of Computing defines "controller" as "[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole." Docket No. 95 at 57–58 (quoting Docket No. 95–5 (IBM Dictionary of Computing) at 145). Maxell also notes that multiple district courts have held that "controller" connotes sufficient structure to avoid a means interpretation. (citing *Sound View Innovations, LLC v. Facebook, Inc.*, 2017 WL 2221177, at *5 (D. Del. May 19, 2017) (" 'Controller' may be a class of structures, rather than one specific structure, and may be defined with functional ***747** terms, but that does not make it means-plus-function."); *Honeywell Int'l Inc. v. Universal Avionics Sys. Corp.*, 264 F.Supp.2d 135 (D. Del. 2003) ("controller" is not an MPF term); *911EP v. Whelen Eng'g Co., Inc.*, 512 F.Supp.2d 713, 727 (E.D. Tex. 2007) ("The claim language does not merely describe a controller, but adds further structure by describing the operation of the controller.... Accordingly, the description of the operation of a controller is sufficient to avoid section 112 P 6."); *SynQor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *23 (E.D. Tex. Jul. 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (finding that "control circuitry determining ..." is not an MPF term)).

Maxell also objects to ZTE's corresponding structure seeking to limit the scope of the claims to a preferred embodiment. Docket No. 95 at 58.

ZTE contends that the parties agreed that the nearly identical term in the '491 Patent ("controller means") was an MPF term governed by Section 112(6). Docket No. 100 at 52. As to the prior cases, ZTE contends that all but one of those cases, were decided prior to the Federal Circuit's *en banc* decision in *Williamson*, which removed the heavy presumption against Section 112(6) application where "means" is not recited. *Id.* ZTE contends that the sole remaining case is *Sound View*, which ZTE submits was decided incorrectly. *Id.* ZTE contends that *Williamson* itself is a close analogue as the term in that case was "distributed learning control module." *Williamson*, 792 F.3d at 1350.

As to the IBM dictionary, ZTE contends that the definition ("[a] device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole") is inconsistent with the recited requirements of the "controller" claim limitation at issue here. *Id.* at 52–53. ZTE states that here the controller must function to (1) detect whether the method of compression and encoding has changed, (2) download particular code from outside the memory to the memory. *Id.* at 53. ZTE contends that these

claim limitation steps are not part of the "ordinary meaning" of controller as defined in the IBM dictionary. *Id.* Thus, ZTE contends that the claim itself recites insufficient structure to meet the claimed function and is thus subject to Section 112(6). *Id.*

ZTE contends that once application of Section 112(6) is established, the claim construction is almost identical to the "controller means" discussed above with respect to the '491 Patent. *Id.* at 53.

In its reply, Maxell contends that as to *Sound View Innovations*, ZTE fails to explain why that case is supposedly "inapplicable" or why it was "wrongly decided." Docket No. 106 at 20.

There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc.*, 800 F.3d at 1372 (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349)); *Robert Bosch, LLC*, 769 F.3d at 1099; *Williamson*, 792 F.3d at 1349 (§ 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); ***748** *Masco Corp.*, 303 F.3d at 1326 (§ 112, ¶ 6 does not apply when the claim includes an "act" corresponding to "how the function is performed"); *Personalized Media Communications, L.L.C.*, 161 F.3d at 704 (§ 112, ¶ 6 does not apply when the claim includes "sufficient structure, material, or acts within the claim itself to perform entirely the recited function ... even if the claim uses the term means." (internal quotation marks and citation omitted)).

The lack of the use of "means" creates a presumption that the term is not a means-plus-function term. ZTE has provided no evidence to support the notion that "controller" is merely a nonce word. ZTE also has not established that in context of the specification, the term does not connote structure. The specification refers to "controller 50" which elsewhere is referred to as "external CPU 50," a clear reference to specific structure. '695 Patent Abstract, 4:41, Figure 1. The patent also references "micro-controller" in the context of a class of structure. *Id.* at 1:38–42. In this context, the specification makes clear that "controller" connotes structure. In light of the teaching of the specification, "controller" connotes sufficiently definite structure to avoid a means-plus-function term. Additionally, as noted by Maxell, the extrinsic evidence indicates that "controller" has a structural meaning. The Court finds this external evidence also supports the Court's conclusion that "controller" connotes a class of structures. Finally, the Court notes that this finding is consistent with multiple courts that have found that "controller" connotes structure that does not fall with the means-plus-function analysis.

[72] The Court finds that the term "a controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory" has its plain and ordinary meaning.

All Citations

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Footnotes

1 The Court consolidated the case against Huawei (Case No. 5:16–cv–178) with the case against ZTE (Case No. 5:16–cv–179) for pretrial purposes.

2 The term numbers used herein are consistent with the term numbers provided in the parties Joint Claim Construction chart and used in the oral hearing. Docket No. 115–1.

3 Maxell changed its proposed construction post-briefing, acknowledging that the term was a means-plus-function term. Docket No. 115–1 at A–6.

4 The Court notes that, even as to rest versus movement, the general concept is merely disclosed without further algorithm support.

5 The parties did not submit oral argument for this term.

6 At the oral hearing, Maxell agreed to a means-plus-function interpretation of the term.

7 The '729 Patent is a continuation of the '493 Patent, which is a continuation of U.S. Patent No. 8,057,177, which is a divisional of U.S. Patent No. 6,765,616.

8 The parties did not provide oral argument for this term.

9 The parties did not provide oral argument for this term.

10 The parties did not provide oral argument for this term.

11 The parties' final Joint Claim Chart did not list claim 2. At the oral hearing the parties agreed that the term in claim 2 was also at issue. *See* H'rg Tr. at 118:23–119:1. Maxell also agreed to a function that matches the explicit claim language. *See Id.* at 113–114.

12 The parties did not provide oral argument for this term.

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297 F.Supp.3d 668
United States District Court,
E.D. Texas, Texarkana Division.

MAXELL LTD., Plaintiff,
v.
HUAWEI DEVICE USA INC.,
Huawei Device Co., Ltd., Defendants.
Maxell Ltd., Plaintiff,
v.
ZTE Corporation, ZTE
USA Inc., Defendants.

CIVIL ACTION NO. 5:16–CV–00178–RWS,
CIVIL ACTION NO. 5:16–CV–00179–RWS
|
Signed 01/31/2018
|
Filed 03/19/2018

Synopsis

Background: Patentee filed suits against alleged infringers of patents related to wireless communication systems, techniques for determining position of device, method for reproducing recorded moving and still pictures, machine-readable recording medium having moving and still pictures recorded thereon, power management, navigation systems, electric cameras, cellular telephones, and audio decoding. Suits were consolidated.

Holdings: The District Court, Robert W. Schroeder III, J., held that:

[1] patent claim terms were construed, and

[2] claim in patent relating to wireless communication systems was not invalid for indefiniteness.

Ordered accordingly.

West Headnotes (75)

[1] **Patents** ⚭ Claims as measure of patentee's rights

The claims of a patent define the invention to which the patentee is entitled the right to exclude.

[2] **Patents** ⚭ Intrinsic evidence in general

Patents ⚭ Multiple sources for construction

District court examines a patent's intrinsic evidence to define the patented invention's scope; "intrinsic evidence" includes the claims, the rest of the specification, and the prosecution history.

[3] **Patents** ⚭ Plain, ordinary, or customary meaning in general

Patents ⚭ State of the art

District court gives patent claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention.

[4] **Patents** ⚭ Language of claims in general

Patent claim language guides the district court's construction of claim terms.

[5] **Patents** ⚭ Context

In construing disputed terms of a patent claim, the context in which a term is used in the asserted claim can be highly instructive; other claims, asserted and unasserted, can provide additional instruction because terms are normally used consistently throughout the patent, and differences among claims, such as additional limitations in dependent claims, can provide further guidance.

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[6] **Patents** ⇐ Specifications and Drawings; Written Description

Patent claims must be read in view of the specification, of which they are a part.

1 Cases that cite this headnote

[7] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent is always highly relevant to the claim construction analysis, and usually, it is dispositive; it is the single best guide to the meaning of a disputed claim term.

[8] **Patents** ⇐ Specification disclaimer

Patents ⇐ Contemporaneous construction

In the specification for a patent, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope.

[9] **Patents** ⇐ Specification disclaimer

Patents ⇐ Prosecution disclaimer

Patents ⇐ Contemporaneous construction

Although the district court generally presumes patent claim terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer; however, the presumption does not arise when the patentee acts as his own lexicographer.

[10] **Patents** ⇐ Specifications and Drawings; Written Description

The specification for a patent may resolve ambiguous patent claim terms where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone.

[11] **Patents** ⇐ Preferred embodiment in general

A patent claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.

[12] **Patents** ⇐ Preferred embodiment

Although the specification for a patent may aid the district court in interpreting the meaning of disputed language in the patent claims, particular embodiments and examples appearing in the specification will not generally be read into the claims.

[13] **Patents** ⇐ Questions of law or fact

A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes.

[14] **Patents** ⇐ Extrinsic Evidence

Patents ⇐ Questions of law or fact

For certain patent claim terms, the district court may need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand the background science or the meaning of a term in the relevant art during the relevant time period; in cases where those subsidiary facts are in dispute, the court will need to make subsidiary factfindings about that extrinsic evidence.

[15] **Patents** ⇐ Extrinsic Evidence

Although extrinsic evidence is useful, it is less significant than the intrinsic record in determining the legally operative meaning of patent claim language.

[16] **Patents** ⇐ State of the art

Patents ⇐ Dictionaries, encyclopedias, treatises, and other reference works

Technical dictionaries and treatises may help district court understand the underlying technology and the manner in which one skilled in the art might use patent claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent.

[17] **Patents** ⟜ Expert and inventor testimony

Expert testimony may aid district court in understanding the underlying technology and determining the particular meaning of a patent claim term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful in construing the claims.

[18] **Patents** ⟜ Extrinsic Evidence

Generally, extrinsic evidence is less reliable than the patent and its prosecution history in determining how to read patent claim terms.

[19] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

There are only two exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning: (1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution.

[20] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

Patents ⟜ Contemporaneous construction

To fall within the exceptions to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the standards for finding lexicography or disavowal that trigger the exceptions are exacting.

[21] **Patents** ⟜ Contemporaneous construction

To act as his own lexicographer, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee must clearly set forth a definition of the disputed claim term and clearly express an intent to define the term.

[22] **Patents** ⟜ Contemporaneous construction

In acting as his own lexicographer, as required to fall within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's lexicography must appear with reasonable clarity, deliberateness, and precision.

[23] **Patents** ⟜ Specification disclaimer

Patents ⟜ Prosecution disclaimer

To disavow or disclaim the full scope of a claim term, thereby falling within the exception to the general rule that patent claim terms are construed according to their plain and ordinary meaning, the patentee's statements in the specification or prosecution history must amount to a clear and unmistakable surrender; however, where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable.

[24] **Patents** ⟜ Functions, means, and results of invention

A patent claim may be expressed using functional language. 35 U.S.C.A. § 112.

[25] **Patents** ⟜ Functions, means, and results of invention

Patents ⟜ Step-plus-function claims

For a patent claim expressed using functional language, a structure may be claimed as a means for performing a specified function, and an act

may be claimed as a step for performing a specified function. 35 U.S.C.A. § 112.

[26] **Patents** ⇐ Functions, means, and results of invention

Patents ⇐ Step-plus-function claims

There is a rebuttable presumption that the statutory provision, stating that a structure may be claimed as a means for performing a specified function and that an act may be claimed as a step for performing a specified function, applies when the patent claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms; the presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. 35 U.S.C.A. § 112.

[27] **Patents** ⇐ Functions, means, and results of invention

When it applies, the statutory provision governing means-plus-function limitations for a patent claim, limits the scope of the functional term to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof. 35 U.S.C.A. § 112.

[28] **Patents** ⇐ Functions, means, and results of invention

Construing a means-plus-function limitation for a patent claim involves multiple steps: the first step is a determination of the function of the means-plus-function limitation, and the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof. 35 U.S.C.A. § 112.

[29] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, a structure disclosed in the patent's specification is "corresponding structure" only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. 35 U.S.C.A. § 112.

1 Cases that cite this headnote

[30] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the focus of the corresponding structure inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is clearly linked or associated with the recited function. 35 U.S.C.A. § 112.

[31] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation for a patent claim, the corresponding structure must include all structure that actually performs the recited function; however, incorporation of structure from the written description is not permitted beyond that necessary to perform the claimed function. 35 U.S.C.A. § 112.

[32] **Patents** ⇐ Functions, means, and results of invention

In construing a means-plus-function limitation in a patent claim, for limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function; the corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. 35 U.S.C.A. § 112.

[33] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. 35 U.S.C.A. § 112.

[34] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Whether a patent claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application for the patent was filed. 35 U.S.C.A. § 112.

[35] **Patents** ⇐ Weight and sufficiency

As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with the definiteness requirement must be shown by clear and convincing evidence. 35 U.S.C.A. § 112.

[36] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

Patents ⇐ Questions of law or fact

Indefiniteness is a question of law and in effect part of patent claim construction.

[37] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In analyzing definiteness of patent claims, when a term of degree is used in a claim, district court must determine whether the patent provides some standard for measuring that degree; likewise, when a subjective term is used in a claim, the court must determine whether the patent's specification supplies some standard for measuring the scope of the limitation. 35 U.S.C.A. § 112.

[38] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

In the context of a patent claim governed by the statutory requirements for means-plus-function limitations, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions; the disclosure is inadequate when one of ordinary skill in the art would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim. 35 U.S.C.A. § 112.

[39] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

The definiteness standard requires that a patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty; the definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable. 35 U.S.C.A. § 112.

[40] **Patents** ⇐ Correction or amendment in general

A district court can act to correct an error in a patent by interpretation of a patent where no certification of correction has been issued only if: (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification, and (2) the prosecution history does not suggest a different interpretation of the claims.

[41] **Patents** ⇐ Ambiguity, Uncertainty, or Indefiniteness

If the patent claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. 35 U.S.C.A. § 112.

[42] **Patents** ⇐ Radio and telecommunications equipment

"A storage unit in which group information generated by classifying the plurality of base stations into groups," in patent relating to

methods for selecting, from multiple base stations within wireless system, one base station for communication with terminal, meant a storage unit in which group information generated by classifying the plurality of base stations into groups is stored.

[43] **Patents** ⚙ Particular products or processes

In patent relating to wireless communication systems, claim describing "storage unit in which group information generated by classifying the plurality of base stations into groups" was not invalid for indefiniteness, although claim as drafted contained error that patentee sought to have corrected at United States Patent and Trademark Office (USPTO) via certificate of correction by adding "is stored" at end of claim term, since correction adding "is stored" at end of claim term was not subject to reasonable debate based on claim language and specification, and prosecution history did not suggest different interpretation of claim. 35 U.S.C.A. § 112.

[44] **Patents** ⚙ Radio and telecommunications equipment

"Combining," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merging.

[45] **Patents** ⚙ Radio and telecommunications equipment

"Combined," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant merged.

[46] **Patents** ⚙ Radio and telecommunications equipment

"GPS or cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability.

[47] **Patents** ⚙ Radio and telecommunications equipment

"Cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result.

[48] **Patents** ⚙ Radio and telecommunications equipment

"GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating GPS positioning reliability based on the GPS-based position result.

[49] **Patents** ⚙ Radio and telecommunications equipment

"Cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result," in patent relating to method for determining position of mobile handset using both GPS and cellular signals, meant calculating cellular positioning reliability based on the cellular-based position result.

[50] **Patents** ⚙ Specification as limiting or enlarging claims in general

Even if a patent claim limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification.

[51] **Patents** ⇐ Data processing

"Still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded," in patent relating to method for reproducing recorded moving and still pictures, had its plain and ordinary meaning.

[52] **Patents** ⇐ Rejection and Amendment of Claims; Prosecution History

The prosecution history for a patent often lacks the clarity of the specification and thus is less useful for claim construction purposes.

[53] **Patents** ⇐ Data processing

"First encoding method," in patent related to machine-readable recording medium having moving and still pictures recorded thereon, had its plain and ordinary meaning.

[54] **Patents** ⇐ Radio and telecommunications equipment

"Selection switching determination unit for," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, meant selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster.

[55] **Patents** ⇐ Radio and telecommunications equipment

"Waits a longer time until switching," in patent related to mobile device capable of automatically selecting physical interface for communication based on communication availability of physical interface, device moving speed, and position of mobile device, had its plain and ordinary meaning.

[56] **Patents** ⇐ Electricity and Electronics

"Detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus," in patent related to techniques for conserving battery power by providing for power-saving state, meant detecting whether a user associated medium at least approaches at least a part of a housing of said apparatus.

[57] **Patents** ⇐ Data processing

"Walking navigation," in patent related to portable terminals suitable for walking navigation, meant information to navigate a user who is walking.

[58] **Patents** ⇐ Data processing

"Said device connected to said server outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server," in patent related to portable terminals suitable for walking navigation, meant outputting said location information and said direction information and receiving retrieved information based on said outputted information at said server.

[59] **Patents** ⇐ Functions, means, and results of invention

Though a patent claim term that does not use "means" is presumed not to be a means-plus-function term, the term "device" may be a nonce word that is tantamount to using the word "means." 35 U.S.C.A. § 112.

[60] **Patents** ⚭ Photography; imaging and graphic arts

"Image sensing device having an array of pixels arranged vertically and horizontally in a grid pattern," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[61] **Patents** ⚭ Photography; imaging and graphic arts

"Image stability detector," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant detector, such as a gyroscopic sensor or the like, capable of detecting an image instability of the electric camera.

[62] **Patents** ⚭ Photography; imaging and graphic arts

"Amount of image-instability of the camera," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant amount of instability caused by vertical and/or horizontal movement of the electric camera.

[63] **Patents** ⚭ Photography; imaging and graphic arts

"To change a position of the second effective set of pixels according to the amount of image-instability detected by the image-instability detector, in order to correct the image-instability," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, meant based on the converted pixel numbers, the position of an extracted area (effective pixel area) on the light receiving surface is shifted, in order to correct the image-instability.

[64] **Patents** ⚭ Photography; imaging and graphic arts

"Display unit configured to display an image corresponding to the image signals formed by the signal processing unit," in patent related to electric camera having image sensing device with sufficient number of pixels capable of taking highly detailed still images and moving video with reduced image quality without increasing circuitry, had its plain and ordinary meaning.

[65] **Patents** ⚭ Preferred embodiment in general

Even where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction.

[66] **Patents** ⚭ Radio and telecommunications equipment

"Variable amplitude amplifier," in patent related to cellular telephone with improved means for controlling transmitter output power while reducing current consumption to conserve battery life, meant amplifier whose output amplitude may be varied and that provides a variable gain in response to a control signal.

[67] **Patents** ⚭ Electricity and Electronics

"Function devices equipped with independent functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant equipped with independent functions.

[68] Patents ⇐ Electricity and Electronics

"Component devices for performing different functions," in patent related to methods for controlling power consumption in battery operable information processing device, meant performing different functions.

[69] Patents ⇐ Data processing

"Controller means for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[70] Patents ⇐ Data processing

"Controller means for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), meant for transferring said plural decoding program codes from said read-only memory to said second memory in advance, as well as for detecting change in said method of compression and encoding, and for transferring the decoding program code corresponding to the method of the compression and encoding after being changed, from said read-only memory to said first memory.

[71] Patents ⇐ Data processing

"Demultiplexer for inputting one audio data sequence which is compressed and encoded, being selected from a plurality of audio data sequences which are multiplexed," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[72] Patents ⇐ Data processing

"Controller for receiving a method of compression and encoding from said demultiplexer, for detecting whether said method of compression and encoding changes to another method of compression and encoding or not, and if said method of compression and encoding changes, for downloading the decoding program code corresponding to said another method of compression and encoding, to said memory from outside of said memory," in patent related to audio decoder in which plurality of decoding program codes were stored in external rather than internal, read only memory (ROM), had its plain and ordinary meaning.

[73] Patents ⇐ In general; utility

US Patent 5,396,443, US Patent 6,329,794, US Patent 6,408,193, US Patent 6,748,317, US Patent 6,754,440, US Patent 6,816,491, US Patent 6,856,760, US Patent 6,928,292, US Patent 7,116,438, US Patent 7,203,517, US Patent 7,671,901, US Patent 8,098,695, US Patent 8,339,493, US Patent 8,736,729. Construed.

[74] Patents ⇐ In general; utility

US Patent 6,424,795, US Patent 6,765,616, US Patent 7,295,767, US Patent 7,447,241, US Patent 7,457,529, US Patent 7,995,897, US Patent 8,057,177, US Patent 8,417,088. Cited.

[75] Patents ⇔ In general; utility

US Patent 7,509,139. Construed and Valid.

Go to Markman Construed Terms

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CLAIM CONSTRUCTION MEMORANDUM AND ORDER

ROBERT W. SCHROEDER III, UNITED STATES DISTRICT JUDGE

***677** On November 29, 2017, the Court held an oral hearing to determine the proper construction of the disputed claim terms of the patents-in-suit. Having considered the parties claim-construction briefing and based on the intrinsic and extrinsic evidence, the Court construes the disputed terms in this Memorandum and Order as detailed below. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, ——— L.Ed.2d ——— (2015).

BACKGROUND

On November 18, 2016, Plaintiff Maxell, Ltd. ("Maxell") filed suit against Defendants Huawei Device USA Inc., Huawei Device Co., Ltd. (collectively "Huawei") and ZTE USA Inc. ("ZTE"). Plaintiff Maxell, Ltd. ("Maxell") has asserted fifteen patents in this consolidated action:[1]

- U.S. Patent No. 5,396,443 ("'443 Patent"), which is asserted against both Huawei and ZTE USA;
- U.S. Patent Nos. 7,509,139 ("'139 Patent"); 6,754,440 ("'440 Patent"); 6,928,292 ("'292 Patent"); 7,203,517 ("'517 Patent"); 7,671,901 ("'901 Patent"); 6,856,760 ("'760 Patent"); and 7,116,438 ("'438 Patent"), which are asserted against Huawei; and
- U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent"), which are asserted against ZTE USA.

On November 29, 2017, the Court held a *Markman* hearing on the disputed claim terms of the patents-in-suit. Docket Nos. 118, 138. At the hearing, Maxell and Huawei agreed to the construction of the sole disputed terms in the '901 Patent and '438 Patent. Docket No. 138 (H'rg Tr.) at 101:8–10.

APPLICABLE LAW

[1] [2] [3] "It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.' " *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)

(quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The Court examines a patent's intrinsic evidence to define the patented invention's scope. *Id.* at 1313–14; *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). Intrinsic evidence includes the claims, the rest of the specification and the prosecution history. *Phillips*, 415 F.3d at 1312–13; *Bell Atl. Network Servs.*, 262 F.3d at 1267. The Court gives claim terms their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

***678** [4] [5] Claim language guides the Court's construction of claim terms. *Phillips*, 415 F.3d at 1314. "[T]he context in which a term is used in the asserted claim can be highly instructive." *Id.* Other claims, asserted and unasserted, can provide additional instruction because "terms are normally used consistently throughout the patent." *Id.* Differences among claims, such as additional limitations in dependent claims, can provide further guidance. *Id.*

[6] [7] [8] [9] "[C]laims 'must be read in view of the specification, of which they are a part.' " *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.' " *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). In the specification, a patentee may define his own terms, give a claim term a different meaning that it would otherwise possess, or disclaim or disavow some claim scope. *Phillips*, 415 F.3d at 1316. Although the Court generally presumes terms possess their ordinary meaning, this presumption can be overcome by statements of clear disclaimer. *See SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001). This presumption does not arise when the patentee acts as his own lexicographer. *See Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1301 (Fed. Cir. 2004).

[10] [11] [12] The specification may also resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. For example, "[a] claim interpretation that excludes a preferred embodiment from the scope of the claim 'is rarely, if ever, correct.' " *Globetrotter Software, Inc. v. Elan Computer Group Inc.*, 362 F.3d 1367, 1381 (Fed. Cir. 2004) (quoting *Vitronics Corp.*, 90 F.3d at 1583). But, "[a]lthough the specification may aid the court in interpreting the meaning of disputed language in the claims, particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro–Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988); *see also Phillips*, 415 F.3d at 1323.

[13] [14] "A district court's construction of a patent claim, like a district court's interpretation of a written instrument, often requires the judge only to examine and to construe the document's words without requiring the judge to resolve any underlying factual disputes." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, ——— U.S. ———, 135 S.Ct. 831, 840–41, ——— L.Ed.2d ——— (2015). For certain terms, however, the Court may "need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Id.* at 841. In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factfindings about that extrinsic evidence." *Id.*

[15] [16] [17] [18] Although extrinsic evidence is useful, it is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862) (internal quotation marks omitted). Technical dictionaries and treatises may help a court understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions ***679** that are too broad or may not be indicative of how the term is used in the patent. *Id.* at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition are not useful. *Id.* Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.*

A. Departing from the Ordinary Meaning of a Claim Term

[19] [20] There are "only two exceptions to [the] general rule" that claim terms are construed according to their plain

and ordinary meaning: "(1) when a patentee sets out a definition and acts as his own lexicographer, or (2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Golden Bridge Tech., Inc. v. Apple Inc.*, 758 F.3d 1362, 1365 (Fed. Cir. 2014) (quoting *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)); *see also GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("[T]he specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."). The standards for finding lexicography or disavowal are "exacting." *GE Lighting Solutions*, 750 F.3d at 1309.

[21] **[22]** To act as his own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "clearly express an intent to define the term." *Id.* (quoting *Thorner*, 669 F.3d at 1365); *see also Renishaw*, 158 F.3d at 1249. The patentee's lexicography must appear "with reasonable clarity, deliberateness, and precision." *Renishaw*, 158 F.3d at 1249.

[23] To disavow or disclaim the full scope of a claim term, the patentee's statements in the specification or prosecution history must amount to a "clear and unmistakable" surrender. *Cordis Corp. v. Boston Sci. Corp.*, 561 F.3d 1319, 1329 (Fed. Cir. 2009); *see also Thorner*, 669 F.3d at 1366 ("The patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "Where an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

B. Functional Claiming and 35 U.S.C. § 112, ¶ 6 (pre-AIA) / § 112(f) (AIA)

[24] **[25]** A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 & n.3 (Fed. Cir. 2015) (en banc in relevant portion). Section 112, Paragraph 6, provides that a structure may be claimed as a "means ... for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

[26] But § 112, ¶ 6 does not apply to all functional claim language. There is a rebuttable presumption that § 112, ¶ 6 applies when the claim language includes "means" or "step for" terms, and that it does not apply in the absence of those terms. *Masco Corp.*, 303 F.3d at 1326; *Williamson*, 792 F.3d at 1348. The presumption stands or falls according to whether one of ordinary skill in the art would understand the claim with the functional ***680** language, in the context of the entire specification, to denote sufficiently definite structure or acts for performing the function. *See Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) (§ 112, ¶ 6 does not apply when "the claim language, read in light of the specification, recites sufficiently definite structure" (internal quotation marks omitted) (citing *Williamson*, 792 F.3d at 1349; *Robert Bosch, LLC v. Snap–On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014))); *Williamson*, 792 F.3d at 1349 ("Section 112, ¶ 6 does not apply when "the words of the claim are understood by persons of ordinary skill in the art to have sufficiently definite meaning as the name for structure"); *Personalized Media Communications, L.L.C. v. Int'l Trade Com'n*, 161 F.3d 696, 704 (Fed. Cir. 1998) (" '[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format' even if the claim uses the term 'means' ")

[27] **[28]** **[29]** **[30]** **[31]** When it applies, § 112, ¶ 6 limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step ... is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291,

1298 (Fed. Cir. 2005). However, § 112 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

[32] For § 112, ¶ 6 limitations implemented by a programmed general purpose computer or microprocessor, the corresponding structure described in the patent specification must include an algorithm for performing the function. *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The corresponding structure is not a general purpose computer but rather the special purpose computer programmed to perform the disclosed algorithm. *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008).

C. Definiteness Under 35 U.S.C. § 112, ¶ 2 (pre-AIA) / § 112(b) (AIA)

[33] **[34]** **[35]** **[36]** Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2. "A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, 'fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.' " *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1377 (Fed. Cir. 2015) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, ------ U.S. ------, 134 S.Ct. 2120, 2124, 189 L.Ed.2d 37 (2014)). Whether a claim is indefinite is determined from the perspective ***681** of one of ordinary skill in the art as of the time the application for the patent was filed. *Nautilus*, 134 S.Ct. at 2130. As it is a challenge to the validity of a patent, the failure of any claim in suit to comply with § 112 must be shown by clear and convincing evidence. *Id.* at 2130 n.10. "[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012).

[37] When a term of degree is used in a claim, "the court must determine whether the patent provides some standard for measuring that degree." *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d at 1378 (internal quotation marks omitted). Likewise, when a subjective term is used in a claim, "the court must determine whether the patent's specification supplies some standard for measuring the scope of the [limitation]." *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005); *accord Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Datamize*, 417 F.3d at 1351).

[38] In the context of a claim governed by 35 U.S.C. § 112, ¶ 6, the claim is invalid as indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352.

AGREED TERMS

Before the *Markman* hearing, the parties agreed to construction the following terms:

Term	Agreed Construction
"at least approaches" ('443 Patent claim 1)	Plain and ordinary meaning
"simultaneously" ('292 Patent claims 1 and 2)	Plain and ordinary meaning
"A mobile communication terminal device having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising" / "A mobile communication terminal device	The preambles of claims 1 and 9 of the '517 patent are limiting.

having a first physical interface for making a communication to the outside, a second physical interface different in scheme from said first physical interface, and a selection switching determination unit ... , said mobile communication terminal device comprising"	
***682** ('517 Patent claims 1 and 9)	
"A connection control method for selecting one base station, to which a terminal is to connect, from a plurality of base stations in a wireless communication system" / "A wireless terminal for selecting a connection destination base station from a plurality of base stations in a wireless communication system"	The preambles of claims 1 and 11 of the '139 patent are limiting.
('139 Patent claims 1 and 11)	
Preambles	The preambles of claims 1 and 2 are limiting.
('491 Patent claims 1 and 2)	
"voice signal code"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"an input portion to which video signals are inputted"	Plain and ordinary meaning
('901 Patent claim 1)	
"black side"	Plain and ordinary meaning
('901 Patent claim 2)	
"video signal[s]"	Plain and ordinary meaning
('901 Patent claims 1 and 2)	
"obtaining an index of communication quality between the terminal and the base stations"	"obtaining an indication of communication quality between the terminal and the base stations"
('139 Patent claims 1 and 11)	
"using said input"	Plain and ordinary meaning
('438 Patent claim 1)	
"an authentication process for allowance to use said display apparatus"	"a process that authorizes the user to use the display apparatus"
('438 Patent claim 1)	
"a predetermined constant period of time"	Plain and ordinary meaning
('443 Patent claim 1)	

"means for selecting an object displayed on said display apparatus" ('438 Patent claim 3)	**Function**: selecting an object displayed on said display apparatus **Structure**: Input/output unit 103 and associated software that allows for the claimed selection function. *See, e.g.,* 8:57–9:13, 7:52–8:6, Fig. 2 (106).
"operate to the end" ('794 Patent claims 8 and 14)	Plain and ordinary meaning
***683** "a receiving means for receiving a plurality of compressed and encoded audio data sequences which are multiplexed" ('491 Patent claim 9)	**Function**: receiving a plurality of compressed and encoded audio data sequences which are multiplexed **Structure**: An antenna and equivalents
Preambles ('491 Patent claims 7–9)	The preambles of claims 7–9 are not limiting.
"packetizing audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences" ('491 Patent claims 1 and 2)	"digitized audio data in packet form for transmission is compressed and encoded and by combining a plurality of the data"
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information which each packet has, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information which said each audio data sequence has" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a first memory" ('491 Patent claims 1, 2, and 7)	Plain and ordinary meaning
"a digital signal processor for decoding the compressed audio data sequences in accordance with said decoding program codes, sequentially" ('491 Patent claims 1, 2, and 9)	Plain and ordinary meaning
"a second memory which said digital signal processor and said video decoder use as work area for the decoding processing thereof"	Plain and ordinary meaning

('491 Patent claim 2)	
"from an outside"	Plain and ordinary meaning
('491 Patent claim 7)	
"an input device for inputting a destination"	Plain and ordinary meaning
('317 Patent claim 1)	
"a device for getting a location information of another portable terminal from said another terminal via connected network"	Plain and ordinary meaning
('317 Patent claim 10)	
***684** "a device for retrieving a route from said present place to said destination"	Plain and ordinary meaning
('317 Patent claim 15)	
"an image sensing device with a light receiving sensor having an array of pixels arranged vertically and horizontally in a grid pattern, in an N number of vertically arranged pixel lines"	Plain and ordinary meaning
('493 Patent claim 5)	
"a display unit with a display screen, that displays an image corresponding to the image signals"	Plain and ordinary meaning
('493 Patent claim 5)	
"an image-instability detector"	Plain and ordinary meaning
('493 Patent claim 6)	
"an image-instability of the electric camera"	Plain and ordinary meaning
('493 Patent claim 6)	
"an encoder/decoder apparatus"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"open-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"closed-loop power control"	Plain and ordinary meaning
('193 Patent claims 1 and 7)	
"bias condition"	"the bias voltage and/or current setting of the amplifier"

('193 Patent claims 1 and 7)	
"a function defining a relation between bias data and gain data stored in said memory"	"a relationship between bias data and gain data such that each gain data value has a corresponding bias data value"
('193 Patent claim 7)	
"capacity detector for detecting a remaining capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 1)	
"controller for controlling operation of said function devices based on said remaining capacity"	Plain and ordinary meaning
('794 Patent claim 1)	
"a capacity detector detecting a remaining battery capacity of said battery"	Plain and ordinary meaning
('794 Patent claim 9)	
Preambles	Preambles are limiting
***685** ('695 Patent, all asserted claims)	
"packetized audio data sequences which are compressed and encoded and by multiplexing a plurality of those sequences"	"digitized audio data in packet form is compressed and encoded and by combining a plurality of the data"
('695 Patent claims 1 and 4)	
"a demultiplexer for extracting the one audio data sequence which is designated by the user from said group of packets depending upon a property or attribute information of each packet, and further for extracting a method of compression and encoding which is applied for compressing the audio data sequence from a header information of each audio data sequence"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a memory"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"begins decoding processing"	Plain and ordinary meaning
('695 Patent claims 1 and 4)	
"a state display means including a display means and for displaying on said display means that said apparatus is in one of a standby state and an active state in response	**Function**: displaying on said display means that said apparatus is in one of a standby state and an active state in response to said

to said power saving state and said non-power saving state, respectively" ('443 Patent claim 2)	power saving state and said non- power saving state, respectively **Structure**: State display unit 103 including a display device such as a liquid crystal display (LCD), a flat display panel, a light emitting diode (LED) panel, an electroluminescence (EL) panel, a plasma display panel, a cathode ray tube (CRT), and equivalents, together with a processor (e.g. CPU 501) programmed to display state information on the display device in accordance with the procedures set forth e.g. in the specification at 4:6– 9; 4:49–55; 5:30–37; 7:7–60; 8:64– 68; Figs. 2–4 and 11–13 as well as equivalents thereof
"displaying means for displaying at least one of the moving pictures, the still pictures, and the first and second pictures; wherein the displaying means displays a plurality of reproduced ones of the first pictures, and wherein the displaying means displays ones ***686** of the moving pictures corresponding to any selected first pictures" ('440 Patent claim 7)	**Function**: displaying at least one of the moving pictures, the still pictures, and the first and second pictures **Structure**: display medium 130, such as a liquid crystal panel. *See, e.g.*, Figure 6 (130); 13:45–47; 13:49–51; 13:54–57; 13:62–63.
"displaying means for displaying at least one of said first still picture, said second still picture and said first picture, wherein said displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture" ('760 Patent claim 13)	**Function**: displaying at least one of said first still picture, said second still picture and said first picture such that the displaying means displays a plurality of reproduced pictures from the reproducing means, and wherein said displaying means displays said first still picture corresponding to a selected picture **Structure**: display medium 130, such as a liquid crystal panel. See, e.g., Figure 6 (130); 13:43–46; 13:47–49; 13:52–55; 13:60–61.
"a relation of said direction and a direction from said present place to said destination" ('317 Patent claims 1 and 10)	Plain and ordinary meaning
"a signal processing unit configured to form image signals" ('729 Patent claim 1)	Plain and ordinary meaning
"characterizing quantities of the communication quality for each of the groups" ('139 Patent claims 1 and 11)	"group scores derived from the indication of communication quality for each base station in a group"

Docket No. 115–2at B–1–B–14.

At the oral hearing the parties also agreed to the constructions of the following terms:

***687** "GPS receiver means for receiving GPS oriented signals and generating received GPS signals" ('292 Patent claim 1)	**Function**: receiving GPS oriented signals and generating received GPS signals **Structure**: GPS receiver 200 of a mobile handset, the GPS receiver 200 performing block 600 in Figure 2, as disclosed at 3:24–32, 2:53–57, or equivalents thereof
"cellular receiver means for receiving cellular-oriented signals and generating received cellular signals" ('292 Patent claim 1)	**Function**: receiving cellular-oriented signals and generating received cellular signals **Structure**: cellular receiver 300 of a mobile handset, the cellular receiver performing block 603 in Figure 2, as disclosed at 2:66–3:4, 4:4–9, or equivalents thereof
"GPS position calculation means for calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result" ('292 Patent claim 1)	**Function**: calculating the mobile handset's position from the received GPS signals and outputting a GPS-based position result **Structure**: position calculation unit for GPS 201 of a mobile handset, the position calculation unit for GPS 201 performing block 601 in Figure 2 and utilizing synchronization acquisition and reception timing measurements for position determination, as disclosed at 2:54–57, 2:57– 60, 3:24–32, 3:33–43, or equivalents thereof
"when any change occurs in the video signal inputted to the input portion" / "when the change of the video signal does not occur and when the illumination detected by the illumination sensor is above a predetermined value" ('901 Patent claim 1)	"in response to any change occurring in the video signal inputted to the input portion" "in response to the change of the video signal not occurring and the illumination detected by the illumination sensor being above a predetermined value"
"an input entered by the user" ('438 Patent claim 1)	Plain and ordinary meaning
"a cellular telephone adapted to be used in a CDMA system, comprising" ('193 Patent, all asserted claims)	The preambles are limiting

H'rg Tr. at 6:7–10, 111:19–112:6.

DISPUTED TERMS

A. The '139 Patent

The '139 Patent relates generally to wireless communication systems, more specifically to methods for selecting, from multiple base stations within a wireless system, one base station for communication with a terminal. The Abstract of the '139 Patent recites:

> When one base station to which a terminal is to connect is determined from a plurality of base stations in a wireless communication system, the best base station is selected according to the communication quality or the content of communication services. In the wireless communication system, the plurality of base stations are classified into a plurality of groups. Indexes of communication quality between the base stations and the terminal are obtained and, for each group, the characterizing quantities of ***688** the indexes of communication quality are calculated. The base station group with which the terminal is to communicate is specified based on the characterizing quantities. One of the base stations in the specified group is determined as a communication destination base station.

'139 Patent Abstract. More particularly, the '139 Patent describes a wireless communication system in which a plurality of base stations are classified into a plurality of groups, and a method for selecting one of the plurality of base stations to connect to a terminal based on calculated characterized quantities of communication quality for each group. As shown in Figure 1, the method described in the '139 Patent obtains an index of communication quality (e.g., a received power, bit rate or signal-to-noise ratio) for each base station (step 102), calculates a group score (e.g., a total power or average power) for each group of base stations (step 103), specifies one of the groups based on the group score (step 104), and selects one of base stations in the specified group to establish a connection (step 105). In one example, the group with the largest total power is specified and a base station within that group is selected to connect to a wireless terminal. *See*, '139 Patent 2:37–64, 4:45–5:12, Figure 1.

2. "a storage unit in which group information generated by classifying the plurality of base stations into groups" ('139 Patent claim 11)[2]

Maxell's Proposed Construction	Huawei's Proposed Construction
"Not indefinite; plain and ordinary meaning"	"Indefinite: because the claim term does not inform those skilled in the art about the claim's scope with reasonable certainty"

Huawei contends that the claim language contains "an obvious grammatical error that renders the term indefinite because one of skill in the art would be unable to determine with reasonable certainty which of (at least) two possible corrections to make." Docket No. 100 at 9. Huawei advances two possible corrections: adding to the end of the claim (1) the phrase "is stored" or (2) the phrase "is stored in RAM." *Id.* Adding "is stored" to the end of the claim would "mean that the storage unit could be, for example, RAM (Random Access Memory; memory that can be rewritten) or ROM (Read Only Memory; memory that cannot be rewritten)." *Id.* (citing Docket No. 100–1 (Akl. Decl.) at ¶¶ 173–75, 186–188. Alternatively, according to Huawei, adding "is stored in RAM" is another reasonable correction, as it would "correct the claim to cover the preferred, indeed the only disclosed, embodiment." *Id.* (citing Akl. Decl. at ¶ 187–90).

In response, Maxell agrees that the claim language contains a "clear typographical error" and requests that the Court correct the error in this claim by adding "is stored" at the end of the claim term. H'rg Tr. at 9:3–11; Docket No. 106 at 11. Maxell notes that it has sought this correction at the USPTO via a Certificate of Correction. *Id.* Maxell identifies two reasons that it believes defeat Huawei's argument that two corrections are possible.

First, according to Maxell, adding "is stored" would encompass the embodiment in the specification that discloses RAM and Huawei or Dr. Akl have not provided any evidence that the claim should be limited ***689** to the RAM embodiment. *Id.* (citing Docket No. 106–7 (Vojcic Decl.) at ¶ 34).

Second, Maxell contends that "claim 11 is an apparatus claim and [the] applicant indicated its intent to broadly encompass different types of memory by using 'storage unit.' " *Id.* (citing '139 Patent 11:6). Maxell contends that if the applicant wanted to limit the claim to RAM, it would have recited a RAM storage unit instead of broadly reciting "storage unit." *Id.* (citing Vojcic Decl. at ¶ 36). Maxell argues that "[t]he correction is being made to the functional recitation of the claim, and a person of ordinary skill in the art would not consider adding 'in RAM' to the functional part of the claim because it is clear that the structure is already defined by 'storage unit,' and the latter part of the claim term is simply describing information that ***is stored*** in the already claimed storage unit." *Id.* at 11–12 (citing Vojcic Decl. at ¶ 36) (emphasis original).

[39] **[40]** **[41]** The definiteness standard of 35 U.S.C. § 112, ¶ 2 requires that:

> [A] patent's claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty. The definiteness requirement, so understood, mandates clarity, while recognizing that absolute precision is unattainable.

Nautilus, 134 S.Ct. at 2129–30. The parties both agree that as drafted the claim contains an error. The Federal Circuit has held that a district court can "act to correct an error in

a patent by interpretation of a patent where no certification of correction has been issued ... only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite. *See Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus, Inc.*, 134 S.Ct. at 2130, n.8 (2014)).

[42] [43] The Court construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored." The correction of "is stored" is not subject to reasonable debate based on the claim language and the specification. In effect, Huawei seeks to limit "a storage unit" to "a RAM storage unit" but has pointed to no lexicography, disclaimer or disavowal in the intrinsic record indicating that the term "storage unit" should be so limited. Even Huawei's own expert states that one skilled in the art would recognize that "storage unit" is a term that is not limited to RAM but inclusive of multiple types of memory. *See* Akl Decl. at ¶¶ 173–79. And Maxell's expert agrees. *See* Vojcic Decl. at ¶ 32 ("One of ordinary skill in the art would understand that the function of the "storage unit" is to store and therefore this correction would be the only logical correction to make."). Given that one skilled in the art would recognize that the "a storage unit" for storing "group information generated by classifying the plurality of base stations into groups" would not be limited to RAM, the Court finds it unreasonable to read in a limitation at the end of the claim term that would be in opposition of the broad usage of "a storage unit." Maxell's proposed correction of "is stored" is not subject to reasonable debate based on the claim language and specification and the prosecution history does not suggest a different interpretation of the claims.

***690** Accordingly, the Court finds that the claim is not indefinite and construes "a storage unit in which group information generated by classifying the plurality of base stations into groups" to mean "a storage unit in which group information generated by classifying the plurality of base stations into groups is stored."

B. The '292 Patent

The '292 Patent relates generally to techniques for determining the position of a device, more specifically to a method for determining a position of a mobile handset using both GPS and cellular signals. The Abstract of the '292 Patent recites:

> To extend the areas where a mobile handset can determine its position using radio waves, the present invention provides a mobile handset that is equipped with both position calculation means using radio waves from GPS satellites and position calculation means using RF carriers from cellular base stations. Positioning results obtained from both of these position calculation means are combined and weighted with GPS positioning reliability and cellular positioning reliability, respectively. A weighted mean of these results is then output as a final position calculation result.

'292 Patent Abstract. More particularly, the '292 Patent describes a mobile handset that receives transmissions from GPS satellites, determines a position of the mobile handset using GPS signals and calculates the reliability of the GPS position. '292 Patent 3:24–4:3, Figure 1. The mobile handset also receives transmissions from cellular base stations, determines the position of the mobile handset using the cellular signals, and calculates the reliability of the cellular position. '292 Patent 4:4–34, Figure 1. The mobile handset then combines the GPS position, the cellular position, the GPS reliability calculation and the cellular reliability calculation to determine an accurate position of the mobile handset in diverse ambient conditions and environments. '292 Patent 4:43–56, Figure 1.

3. "combining" / "combined" ('292 Patent claims 1 and 2)

Maxell's Proposed Construction	Huawei's Proposed Construction
"a determination based on one or more inputs"	"merging" / "merged"

Maxell contends that its proposed construction "accounts for the embodiments where the 'GPS-based position calculation result 202' or the 'cellular based position calculation result 302' will have 'no effect on further processing' because they assigned a reliability value of 0." Docket No. 95 at 24–25 (citing '292 Patent 3:64–4:3, 4:36–42). Maxell contends that its proposed construction for combining "is consistent with the embodiments disclosed in the specification—*i.e.*, 'a determination based on one or more inputs' because, in the scenario where the reliability value of one of the positions is 0, the combining means will make a determination based on one input." *Id.* at 25 (citing '292 Patent 3:64–4:3, 4:36–42; Docket

No. 95–1 at ¶ 5). Maxell contends that Huawei's proposed construction excludes this disclosed embodiment. *Id.*

According to Huawei, the '292 Patent explains that the GPS and cellular positioning results are "weighted with the reliability 205 and the reliability 305, respectively" and then input to "combination unit 410" which "calculates a weighted mean." Docket No. 100 at 17 (citing '292 Patent 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2 (606) and 3). Thus, Huawei contends, the data are merged.

***691** Huawei argues that merging "is not merely a preferred embodiment; it is the only embodiment." *Id.* Huawei contends that the inventors "believes that the 'accuracy of the position determination may be enhanced' by 'using **both** GPS and cellular signals' 'compared to ... using either ... alone.' " *Id.* (citing '292 Patent 4:1–3) (emphasis original). According to Huawei, when one estimate is unreliable, its reliability value is preferably set to zero and the estimate has no net effect in the merge. *Id.* at 17–18. Huawei further asserts that, even though the estimate has no net effect on the merge, it still "enters the combiner to be merged. Combining unit 400 does not make any decisions based on the inputs; it simply merges them." *Id.* at 18.

Huawei contends that its construction is also consistent with the extrinsic evidence and constructions of "combine" from other patents. *Id.* at 18 n. 11, 12.

Huawei particularly objects to Maxell's proposed construction as expanding "combining" into "selecting." *Id.* According to Huawei, Maxell's construction would allow for an output based on merely one input—so "if the GPS and cellular positions are equally reliable, a device can just use one and throw the other away." *Id.* at 18–19. But, Huawei contends, "that is *selecting*, not combining." *Id.* at 19 (emphasis original). Moreover, Huawei argues, the present invention uses both GPS and cellular signals, an enhancement compared to using only one of the two, and allowing a device to select between the two would "eviscerate[e] the patent's fundamental feature." *Id.* (citing *On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344 (Fed. Cir. 2006)). As an example, Huawei proposes that Maxell's construction would allow for ignoring cellular results completely in a situation where GPS results had 75% reliability and cellular results had 50% reliability, which would be direct opposition to the claimed "combining." *See* H'rg Tr. at 25:1–27:21, 29:6–30:14.

The specification is clear that both cellular and GPS data are calculated. Further, a reliability factor is output from each of the cellular and GPS calculation units even when it is determined that a position calculation is impossible for the particular unit. '292 Patent 3:64–4:3, 4:36–42. The specification describes and shows the position being output to the combiner in all cases. *Id.* at Figures 1–3, 3:33–59, 3:64–4:3, 4:10–35, 4:36–42. Maxell's construction would encompass a system that merely selected one or the other of GPS and cellular—for example switching between the two. Construing "combining" / "combined" to mean a determination based on one or more inputs would allow for selection and, thus, ignore the language of the claim and the clear corresponding scope of the specification. *Id.* at 4:49–56, Abstract, 2:13–18, 3:12–17, 4:43–49, 5:7–12, Figures 2–3.

Maxell contends that Huawei's construction excludes the "value of 0" embodiment in which one of the GPS position or cellular position will have "no effect on further processing." In that embodiment, however, the data from both the GPS and cellular units is still provided to the combiner. The specification and the claims do not state that in such a situation the data is not combined; instead, the specification explains that the reliability weighting is adjusted to achieve the "no effect." That one value may have a corresponding reliability set at zero to have no effect does not mean that the data from the two units is not provided to the combining unit for combining. As described, both values are still output to the combiner.

Thus, as noted in the specification, the "mobile handset of the present invention preferably combines the positioning results obtained by both of [the GPS and cellular] ***692** positioning means [with] the reliability of the positioning... [so that] the mobile handset can accurately determine its position in diverse ambient conditions and environments." '292 Patent 2:13–18. The specification describes a mathematical function (shown in Figure 3) for combining the four inputs supplied to the combining unit 400/410. Although combining all four inputs is preferable, the specification notes that the GPS position results (or the cellular position results) supplied to the combining unit may not be accurate. '292 Patent 3:64–4:3, 4:36–42. When this occurs, the reliability value corresponding to the inaccurate GPS or cellular position is set to 0, so that when the GPS/cellular position and reliability values are combined in the mathematical function, the inaccurate GPS or cellular position has no effect on the position calculation result. '292 Patent 4:43–56.

Maxell's construction would enable the combining unit to determine a position calculation result based on only one, two, three or four of the inputs being supplied to the combining unit. For example, Maxell's construction could enable the combining unit to determine the position of the mobile device based on GPS position alone without ever receiving the other values. This is in direct contrast to the scope of the invention and the claims themselves. '292 Patent 2:13–18.

At the oral hearing, it became clear that Maxell intended to include providing only one factor to the combining unit in the ordinary meaning of "combining." The Court does not agree that such a meaning falls within the ordinary meaning of "combining" or within the meaning of "combining" as used in the specification. In light of Maxell's unsupported view of "combining" and to clearly address that dispute between the parties, the Court makes clear the usage of all of the factors (though a factor could be set to "0" to provide "no effect" for certain factors) as described in the specification by construing the term to require "merging." *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (requiring claim construction disputes to be resolved).

[44] [45] Accordingly, the Court construes "combining" / "combined" to mean "merging" / "merged."

4. "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS/cellular positioning results combining unit 400 and its components within a mobile handset that performs processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that combines GPS/cellular position as described in Fig. 2 (block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. See e.g., (4:42–56), (Fig. 3 at 400); (2:12–17), (5:3–7).	**Function:** combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability **Structure:** GPS / Cellular Positioning Results Combining Unit 400 performing the weighted mean disclosed in Figure 3 and at col. 4:49–56, block 606 in Fig. 2

***693** The parties agree that this term is a means-plus-function term and generally agree on the function but disagree as to the structure of the means term.

Maxell argues that, while the structure includes block 400 in Figure 3 includes part of the structure that corresponds to the GPS/cellular positioning results combining means, it is "not the only disclosed structure or processing step." Docket No. 95 at 23 (emphasis original). Maxell contends that the '292 Patent provides other examples of processing steps that are to be performed by the claimed combining means in addition to performing the weighted mean disclosed in Figure 3. *Id.* Specifically, Maxell points to the example when the reliability value is 0:

> In some cases, the GPS reliability calculation unit 204 may determine that positioning by GPS is impossible. (For example, if the number of GPS satellites used is found to be two or less). In that event, the GPS reliability calculation unit 204 preferably outputs a value of 0 as the reliability 205 so that the GPS based position calculation result 202 has no effect on further processing.

Id. at 23–24 (citing '292 Patent 3:64–4:3). Maxell also cites to its expert to contend that, in the case where reliability of the cellular or GPS based position is zero, the combining means will not necessarily need to perform a weighted mean because the other non-zero position will be selected. *Id.* at 24 (citing Docket 95–1 (Braasch Decl.) ¶¶ 50–51). Maxell contends that Huawei dismisses the embodiments where the "GPS/cellular positioning results combining means" will ignore the "GPS-based position calculation result 202" or the cellular based position calculation result 302 because they were unreliable. *Id.* (citing '292 Patent at 3:64–4:3, 4:36–42).

Maxell also contends that the '292 Patent can be performed by "a single mobile handset," thus a processor that can perform the claimed function is necessarily included. *Id.* at 24 (citing Braasch Decl. at ¶¶ 50–51 (contending that it is known in the art that a mobile handset may include a processor)). At the oral hearing, Maxell conceded that the term "processor" was not found in the specification. H'rg Tr. at 36:16–21.

Huawei contends that the only structure clearly linked to the function of the combining means is the weighted average disclosed in Figure 3, described at 4:49–56, and identified as block **606** in Figure 2. Docket No. 100 at 23 (citing Akl Decl. at ¶ 156). Huawei contends that the additional disclosure that Maxell points to is not structure and is not clearly linked to the combining function. *Id.* (stating that lines 36–41 of 4:36–56 is not structure for the combiner; 4:42–56 is subsumed by Figure 3; 3:64–4:3 (same); 3:12–17 (inputs and outputs, not structure); 5:3–7 (same)); and citing Akl Decl. at ¶¶ 157–68).

Because the specification describes the use of a mobile handset, Maxell would have the structure of every means term merely being a processor of a mobile handset. A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history

clearly links or associates that structure to the function recited in the claim." *Medtronic Inc.*, 248 F.3d at 1311. The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function but, rather, whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The specification does not clearly link a generic processor of a mobile handset to the claimed function. In fact, the specification does not recite the processor of a mobile handset. The specification does, however, clearly describe the GPS / Cellular Positioning Results Combining Unit 400 as performing the claimed ***694** function. '292 Patent 4:43–56, Figures 1 and 3.

Maxell contends that Huawei ignores the example wherein the reliability 205 value or the reliability 305 value are 0. As discussed above for the "combining" term, the specification does not describe the weighted mean approach as not being used in such situations. Rather, it is noted that the reliability outputs are set to zero so that the GPS or cellular position has no result, as can be seen from the disclosure. The weighted mean approach is still described as being used, though one of the weightings may be 0. *See* '292 Patent 3:64–4:3, 4:36–42, 4:49–56, block 606 in Figure 2, block 410 in Figure 3.

It is noted that "FIG. 3 represents an *exemplary embodiment* of the GPS/cellular positioning results combining unit 400." '292 Patent 4:49–50 (emphasis added). However, the corresponding structure of a means-plus-function term is limited to the structure disclosed in the specification. *See Medtronic, Inc.*, 248 F.3d at 1311. The structure adopted below is the corresponding disclosed structure.

[46] The Court construes "GPS/cellular positioning results combining means for combining the GPS-based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability" to mean:

Function: combining the GPS based position result and the cellular-based position result with the GPS positioning reliability and the cellular positioning reliability

Structure: GPS / Cellular Positioning Results Combining Unit 400 of a mobile handset performing the weighted mean algorithm disclosed in Figure 3 block 400, Figure 2 block 606, and at cols. 3:12–17, 3:64–4:3, 4:36–56, or equivalents thereof.

8. "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" ('292 Patent claim 1)

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result. **Structure:** A position calculation unit 301 and/or components within a mobile handset that perform processing functions, such as, a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, or a processor that performs cellular position calculation processes as described in Fig. 2 (block 604) and corresponding recitations in the specification as provided herein, or equivalents thereof. See, e.g., 1:20–27; 3:10–31; block 604 in Fig. 2; 3:64–4:3; 4:36–3:6; 5:3–7).	**Function:** : (1) calculating the mobile handset's position from the received cellular signals and (2) outputting a cellular-based position result. **Structure:** position calculation unit for cellular 301, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute, however, whether the specification recites sufficient structure and/or algorithms for calculating the mobile handset's position from the received cellular signals to render the means term definite.

***695** As with the other terms, Maxell objects to construing the position calculation unit for cellular 301 as the only structure. Docket No. 95 at 21. Maxell points to the '292 Patent specification:

> In much the same way, a cellular receiver 300 executes the receive operations required for position determination which preferably include: receiving the cellular signals of high/medium frequencies out of the signals received by the antenna 100; baseband signal modulation; synchronization acquisition; and reception timing calculation.

Id. (citing '292 Patent 4:4–16; *see also* '292 Patent 2:66–3:6 (describing receiver operations); '292 Patent 1:23–23 (disclosing calculating a position using cellular signals based on "propagation delay time of RF carriers.")). Maxell further argues that the disclosure of the '292 Patent makes clear that the claimed cellular position calculation means makes a "position determination" based on execution of receive operations, including "baseband signal modulation; synchronization acquisition; and reception timing calculation" as part of the reception. *Id.* at 21–22. Maxell points to the statement in the specification that "the handset calculates its current location using the propagation delay time of the RF carriers." *Id.* at 22 (citing '292 Patent 1:26–28). According to Maxell, one of ordinary skill in the art would understand that a processor would be a basic component of the disclosed "mobile handset" that will be required to "execute[ ] the receive operations" of baseband signal modulation, synchronization acquisition, and reception

timing calculation and, as disclosed by the '292 Patent, these operations are "required for position determination." *Id.* (citing Braasch Decl. at ¶¶ 46–48, '292 Patent 3:24–32). As with other terms, Maxell argues that the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor for executing the disclosed operations. *Id.*

Huawei contends that "[a]ll that the patent shows is inputs ('GPS signals'), an output ('positioning result L_{cell}'), a black box ('Position calculation unit for cellular 301'), and a non-structural, purely functional block ('Calculate positioning result L_{cell}'). Docket No. 100 at 22 (citing '292 Patent Figures 1–2, 3:4–11, 4:10–15; Akl Decl. at ¶¶ 131–35). Huawei contends that the patent does not describe either hardware or an algorithm that connects the inputs to the output. *Id.* According to Huawei, the '292 Patent "offers 'no instruction for using a particular piece of hardware, employing a specific source code, or following a particular algorithm' for the function." *Id.* (quoting *ePlus*, 700 F.3d at 519–20). Huawei contends that Maxell identifies only a desired output, a black box, and unrelated-or non-structure. *Id.* (citing Docket No. 95 at 21).

Huawei contends that, although Maxell references an algorithm in the specification, Maxell does not *identify* an algorithm. According to Huawei, even though cellular positioning techniques were known before the filing date of the '292 Patent, " 'position calculation unit for cellular 301' is not a term of art, and the mere invocation of this phrase, even in light of the other disclosure that Maxell cites, does not connote structure to a skilled person: these techniques were (and still are) usually implemented as particular algorithms in hardware or a general-purpose processor." *Id.* (citing Akl Decl. at ¶¶ 132–37). Huawei contends that merely because one *could* devise a way to calculate cellular-based positions does not save this claim because the inventors were required to identify the structure they wanted to claim and did not do so. *Id.*

In its reply, Maxell contends that Huawei contradicts its positions in Huawei's ***696** briefing on a motion to dismiss under section 101. Maxell contends that in its 101 briefing, Huawei stated that the '292 Patent utilizes "off-the-shelf generic GPS and cellular hardware" that "can be implemented in generic hardware" and that "the '292 Patent employs conventional GPS and cellular components for their routine functions ... [such that] obtaining position estimates and the reliability of these estimates was background technology." Docket No. 106 at 3–4 (citing Docket No. 26 at 1, 12 and Docket No. 31 at 3).

Maxell also responds that the '292 Patent discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal." *Id.* at 5 (citing '292 Patent 4:4–16, 2:66–3:6, 1:24–29, Braasch Decl. at ¶¶ 46–48).

As with the "GPS position calculation means" term discussed above, Maxell contends that one skilled in the art would understand that the mobile handset would include a processor (such as a CPU) that performs cellular position calculation processes as described in Figure 2 (block 604). Maxell also contends that the specification discloses specific algorithms for "calculating the mobile handset's position from the received cellular signal" in '292 Patent 4:4–16, 2:66–3:6, 1:24–29. As explained above, the '292 Patent specification fails to recite a processor, much less clearly link or associate a processor with the claimed function of "calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result."

The '292 Patent specification discloses "position calculation unit for cellular 301 calculates the position of the mobile handset using the cellular signals." '292 Patent 4:11–13. Huawei contends that the '292 Patent specification fails to recite *specific algorithms* for "calculating the mobile handset's position from the received cellular signal" in 4:4–16 and 2:66–3:6. However, the specification does disclose in the passage at 1:24–29 that cellular position can be calculated, i.e., by "using the propagation delay time of the RF carriers." The specification describes this technique in a manner such that it is clear that this basic cellular-position technique for determining location has deficiencies. These deficiencies, however, are addressed by using both GPS and RF carrier cellular information, as disclosed in the '292 Patent. '292 Patent 1:48–2:19. At the oral hearing, Maxell agreed to the construction adopted below. H'rg Tr. at 44:14–17, 46:18–23.

[47] Accordingly, the Court construes "cellular position calculation means for calculating the mobile handset's position from the received cellular signals and outputting a cellular-based position result" to mean:

Function: calculating the mobile handset's position from the received cellular signals and outputting a cellular based position result

Structure: position calculation unit for cellular 301 of a mobile handset, the position calculation unit for cellular 301 performing block 604 in Figure 2 and utilizing propagation delay of RF carriers for position determination, as disclosed at 1:23–27, 4:4–16, 2:66–3:6, or equivalents thereof.

9. "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" ('292 Patent claim 1)

***697**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating GPS positioning reliability based on the GPS-based position result **Structure:** A GPS reliability calculation unit 204 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithms set forth in the specification, a processor that performs GPS reliability calculation processes described in Fig. 2 (block 602) and corresponding sections in the specification as provided herein, or equivalents thereof. (See e.g., 12:66–67; block 602 in Fig. 2; 5:58–6:15; 6:3–7).	**Function:** calculating GPS positioning reliability based on the GPS-based position result **Structure:** GPS reliability calculation unit 204, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties agree that this term is a means-plus-function term and agree on the function corresponding to the term. The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating GPS positioning reliability based on the GPS-based position result to render the means term definite.

As with other terms, Maxell objects to identifying one block from the figures. Maxell contends that the specification of the '292 Patent discloses exemplary techniques for determining the reliability of the GPS-based position result:

> The GPS reliability calculation unit 204 calculates the reliability in a manner in which, for example, the number of GPS satellites used when the position calculation unit for GPS 201 calculated the handset position is used as the reliability 205. Alternatively, the quality of the signals received from the GPS satellites used when the position calculation unit for GPS 201 calculated the handset position might be used....
>
> By way of illustration, if the received signal quality (for example, the signal-to-noise ratio (SNR) in decibels) is used, the lowest SNR among the SNRs of the signals received from the GPS satellites may be used as the reliability 205....

Docket No. 95 at 18 (citing '292 Patent 3:44–4:3). Maxell contends that "[t]hese sections of the '292 Patent explain that the GPS reliability calculation unit 204 can perform several alternative processing steps to calculate the reliability of the GPS position," including "making a determination on whether the result is reliable based on the number of GPS satellites that have provided the signal." *Id.*

As an example, Maxell contends that if the GPS-based position was calculated based on signals received from four GPS satellites, the reliability of the result will be high because signals from multiple sources provided the same result. *Id.* at 19. As an alternative example, Maxell provides that the reliability of the GPS position can be calculated using the quality of the signals that have been received from the GPS satellites and/or the signal-to-noise ratio of the various signals. *Id.* Maxell contends that if the position was calculated based on a signal that was very noisy, the reliability of the result would be low. *Id.* Maxell again repeats that because the '292 Patent also makes clear that the disclosed invention can be performed by "a single mobile handset," which will necessarily include a processor, one of ordinary skill in the art will recognize that these processing steps will be executed by a processor. *Id.* Maxell ***698** contends that Huawei's proposal ignores these processing steps provided in the '292 Patent for performing the recited function. *Id.*

Huawei contends that the '292 patent does not disclose sufficient structures for the two reliability means terms. Huawei contends that the fundamental feature of this patent is to merge GPS-and cellular-position estimates depending on the reliability for each position estimate. Docket No. 100 at 19 (citing'292 Patent 3:12–17). Huawei contends that, "[t]o do this, the 'mobile handset calculates the reliability (W_{gps})' for the GPS position using 'the number of GPS satellites ... and the received signal quality' of the GPS signals. *Id.* (citing '292 Patent 2:60–65, 3:44–4:3). According to Huawei, the disclosure is nearly identical for calculating "the reliability (W_{cell})" for the cellular-based estimate, essentially replacing "satellite" with "base station." *Id.* (citing'292 Patent 4:22–34). Huawei further contends that the patent also includes black boxes marked "GPS Reliability Calculation Unit 205" and "Cellular Reliability Calculation Unit 304" in Figure 1 and purely functional steps in Figure 2 (e.g., "Calculate the reliability (W_{gps}) for L_{gps}" 602). *Id.* at 19–20. Huawei contends that, for the reliability functions, the patent insufficiently just lists (1) desired outputs—W_{gps} and W_{cell}; (2) potential inputs—the number of satellites (GPS), base stations (cellular), and received signal qualities; and (3) figures with purely functional, or black boxes. *Id.* at 20 (citing *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1317 (Fed. Cir. 2012); *ePlus*, 700 F.3d at 519–20; Akl Dec. ¶¶ 102–10).

According to Huawei, the '292 Patent "does not provide structure that converts these inputs into the desired outputs," by failing to offer, for example, "an algorithm for converting the 'number of satellites,' the 'number of base stations,' or the 'received signal quality' into reliability values for position estimates." *Id.* Huawei contends that drawing boxes for "GPS reliability calculation unit" and "Cellular reliability calculation unit," listing potential inputs to these boxes, and labeling the outputs of these boxes, does not denote structure and that the number of satellites and base stations are neither reliability values in themselves nor structure. *Id.*

As to Maxell's claim that a person of ordinary skill can calculate "high" or "low" reliability values based on the disclosed inputs (e.g., number of GPS satellites), Huawei contends that there is no support in the specification, and "high"/"low" does not fit the preferred embodiment. *Id.* at 21. (citing Akl Decl. at ¶¶ 112–13). According to Huawei, the "inventors were required to, but did not, disclose structures (e.g., algorithms) to convert data—like the number of satellites, number of base stations, or signal quality—into reliability values." *Id.* (citing *ePlus*, 700 F.3d at 518).

In its reply, Maxell contends that the '292 Patent explicitly discloses specific algorithms to be followed by a processor to determine the reliability of the GPS-based position based on the number of GPS satellites that provide a signal and/or based on the Signal-to-Noise Ratio ("SNR") of the received signals. Docket No. 106 at 4 (citing '292, 3:44–4:3, Braasch Decl. at ¶ 42). Maxell also contends that the '292 Patent explicitly discloses specific algorithms for determining the reliability of the cellular-based positions or for converting "number of satellites," "number of base stations," or "received signal quality" into reliability values. *Id.* (citing'292 Patent 3:6–11, Braasch Decl. at ¶ 49). Maxell contends that these specific algorithms include using the number of GPS satellites or cellular base stations ***as*** the GPS/cellular reliability value, and using the signal-to-noise ratio in decibels for signals received from the GPS satellites or cellular base stations ***699** ***as*** the GPS/cellular reliability value. *Id.* (citing '292 Patent 3:49–53, 3:60–63, 4:27–34).

As to the use of a processor, the rationale provided above for other terms is equally applicable here for not including "processor" within the recited structure.

Huawei contends that merely a black box is disclosed because an algorithm for converting the "number of satellites" or the "received signal quality" into reliability values for position estimates is not provided. Huawei further contends that the number of satellites and base stations are not "reliability values." Huawei is correct that, in general, a detailed and specific exact algorithm for calculating the reliability of the GPS/cellular positions is not disclosed in the '292 Patent. However, an algorithm and technique for operation of the disclosed structure is described that provides context to the structure. The '292 Patent states that:

> The mobile handset also calculates the reliability (W_{gps}) for L_{gps} 602 using the number of GPS satellites used in calculating L_{gps} and the received signal quality (such as a signal-to-noise ratio in decibels) for the signals from each GPS satellite.

'292 Patent 2:60–65, and

> GPS reliability calculation unit 204 calculates the reliability of the GPS-based position calculation result 205 based on the information about the reliability input from the position calculation unit for GPS 201....

'292 Patent 3:44–47. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of GPS satellites... and the received signal quality of the signals from the GPS satellites." '292 Patent 3:38–42. In illustrative examples, the '292 Patent also suggests that the "number of satellites," or the "received signal quality" "is used as the reliability 205" or "might be used." '292 Patent 3:50–59. Therefore, as disclosed, GPS reliability calculation unit 204 utilizes an algorithm in which reliability of the GPS positions involves using the information regarding the number of GPS satellites or the received signal quality to calculate the GPS positioning reliability.

[48] Thus, the Court construes "GPS reliability calculation means for calculating GPS positioning reliability based on the GPS-based position result" to mean:

Function: calculating GPS positioning reliability based on the GPS-based position result

Structure: GPS reliability calculation unit 204 of a mobile handset, the GPS reliability calculation unit 204 performing block 602 in Figure 2 and utilizing the number of satellites or the received signal quality to calculate GPS positioning reliability, as disclosed at 2:60–65, 3:38–4:3, or equivalents thereof.

10. "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" ('292 Patent claim 1)

***700**

Maxell's Proposed Construction	Huawei's Proposed Construction
Function: calculating cellular positioning reliability based on the cellular-based position result **Structure:** A cellular reliability calculation unit 304 and/or components within a mobile handset that perform processing functions, such as a CPU programmed to execute processing in accordance with the algorithm set forth in the specification, a processor that performs cellular reliability calculation processes as described in Fig. 2 (Block 605) and corresponding recitations in the specification as provided herein, or equivalents thereof. (See e.g., '292 Patent 3:6–11, 4:15–42, 605 in Fig. 2, 4:43–45, 4:9–11, 4:3–7).	**Function:** calculating cellular positioning reliability based on the cellular-based position result **Structure:** cellular reliability calculation unit 304, which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

The parties dispute whether the specification recites sufficient structure and/or algorithms for calculating cellular positioning reliability based on the cellular-based position result to render the means term definite.

The parties present the same arguments for this term as presented for the "GPS reliability calculation means" term. Maxell further states that the '292 Patent explains that cellular positioning reliability is calculated in the same way, i.e., "using the number of cellular base stations used in calculating Lcell and the received signal quality for the signals from each cellular base station." Docket No. 95 at 22–23 (quoting '292 Patent 3:6–11).

The same analysis applied to the "GPS reliability calculation means" applies to the "cellular reliability calculation means." It is noted that with regard to the cellular calculations, the specification similarly states:

> The mobile handset also calculates the reliability (W_{cell}) for L_{cell} 605 using the number of cellular base stations used in calculating L_{cell} and the received signal quality for the signals from each cellular base station.

'292 Patent 3:6–10, and

> The cellular reliability calculation unit 304 calculates the reliability of the cellular-based position calculation result 305 based on the information about the reliability input from the position calculation unit for cellular 301, and the unit 304 outputs the reliability 305 to the GPS/cellular positioning results combining unit 400.

'292 Patent 4:22–27. Further, the '292 Patent describes the "information about the reliability" as, "for example, the number of cellular base stations ... and the received signal quality of the signals from the cellular base stations." '292 Patent 4:18–20. In illustrative examples, the '292 Patent also suggests that the "number of base stations," or the "received signal quality" "may be used as reliability 305." '292 Patent 4:31–35. Therefore, as disclosed, cellular reliability calculation unit 304 uses an algorithm in which reliability of the cellular positions involves using the information regarding the number of cellular base stations or the received signal quality to calculate the cellular positioning reliability.

[49] The Court construes "cellular reliability calculation means for calculating cellular positioning reliability based on the cellular-based position result" to mean:

Function: calculating cellular positioning reliability based on the cellular-based position result

***701 Structure**: cellular reliability calculation unit 304 of a mobile handset, the cellular reliability calculation unit 304 performing block 605 in Figure 2 and utilizing the number of base stations or the received signal quality to calculate cellular positioning reliability, as disclosed at 3:6–10, 4:15–42, or equivalents thereof.

C. The '440 Patent and '760 Patent

The '440 Patent and '760 Patent share a substantially similar specification, both patents being continuations of a common parent, U.S. Patent No. 6,424,795. The '440 Patent relates to a method for reproducing recorded moving and still pictures and the '760 Patent relates to a machine-readable recording medium having moving and still pictures recorded thereon. The Abstract of the '440 Patent recites:

> A video reproducing method and apparatus includes reproducing at least still pictures encoded by a first encoding method and first pictures that have pixels smaller than the still pictures from a recording medium. The recording medium has the still pictures, the first pictures, moving pictures encoded by a second encoding method, and second pictures corresponding to the moving pictures that have pixels smaller than the moving pictures recorded thereon. A plurality of the reproduced first pictures are outputted and the still pictures corresponding to selected first pictures are outputted.

'440 Patent Abstract. The Abstract of the '760 Patent recites:

> A recording medium which records thereon moving pictures encoded by a first encoding method, first pictures corresponding to the moving pictures and which have

pixels smaller than the moving pictures, still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and which have pixels smaller than the still pictures.

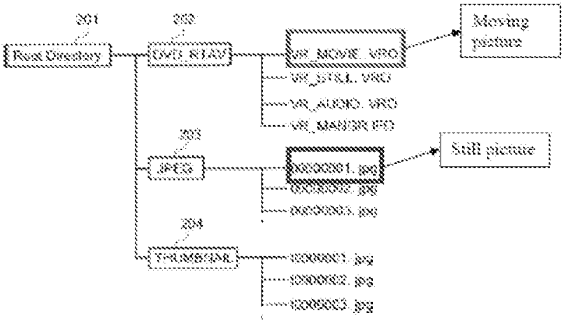
'760 Patent Abstract. More particularly, the '440 Patent and the '760 Patent describe a recording medium and video reproducing apparatus/method, which reproduces from the recording medium moving pictures and still pictures encoded by a first encoding method (e.g., an MPEG encoding standard) and still pictures encoded by a second encoding method (e.g., a JPEG encoding standard). To facilitate easier searching of both types of pictures, thumbnail pictures (i.e., compressed data having a smaller number of pixels) corresponding to the moving pictures and the still pictures encoded by the first and second encoding methods are recorded, and a plurality of the thumbnail pictures are output or displayed. In the '440 Patent, a moving picture corresponding to a selected one of the thumbnail images is output or displayed. *See* '440 Patent 10:41–11:14, 11:31–12:50, Figures 4 and 5.

11. "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" ('440 Patent claims 1, 3, 5, and 7)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"still pictures encoded by the first encoding method and by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded"

***702** Maxell contends that the fact that this term does not require any construction is apparent from Huawei's proposed construction, which parrots the claim language with the exception that Huawei adds the underlined phrase: "still pictures encoded by the first encoding method and by a second encoding method...." Docket No. 95 at 9. Maxell contends that the claim language makes clear that: "moving pictures [are] encoded by a first encoding method" and "still pictures encoded by a second encoding method." *Id.* Maxell contends that Huawei imports a limitation by imposing the claimed first encoding method for moving pictures on the claimed second encoding method for still pictures. *Id.* at 10.

According to Maxell, Huawei's proposed construction improperly excludes a preferred embodiment disclosed in the '440 Patent. *Id.* at 10–11. Maxell points to Figure 2 and Figure 4 as showing that a moving picture is recorded with a ".VRO" extension (e.g., first encoding method) and still pictures are recorded with a ".jpg" extension (e.g., second encoding method). *Id.* at 11.



Id.(citing '440 Patent Figure 4 (emphasis added), 10:49–51 ("Numeral 203 is a directory for recording JPEG data files for storing compressed still pictures")). Maxell contends that Huawei's construction would exclude this embodiment because it would require the still picture to be encoded in both the first (".VRO") and second (".jpg") encoding methods. *Id.* While Maxell acknowledges that what Huawei's construction requires is described in the specification in other embodiments, it contends that it is not a requirement, or even a part of, other embodiments. *Id.* Maxell argues that the specification discloses embodiments in which the reproducing apparatus includes the capability to reproduce one but not both still picture encoding formats. *Id.* (citing '440 Patent 12:61–63 ("if no fine still picture signal is output ... the fine still picture expanding circuit can also be omitted")). Maxell further states that the specification does not limit still pictures to a specific format, pointing to the passage: "Although both fine still pictures and thumb nail pictures are recorded in a JPEG data file respectively in this embodiment, both fine still and thumb nail pictures may be recorded in any file format and in any different file formats." H'rg Tr. at 72:2–8 (citing '440 Patent 11:15–18). Maxell contends that there is no requirement for the reproducing apparatus to be able to handle pictures that have been recorded under the moving picture format. Docket No. 95 at 11.

***703** In response, Huawei states that the parties agree that the "first encoding method" is a moving picture encoding method (e.g., MPEG) and that the "second encoding method" is a still picture encoding method (e.g., JPEG). Docket No. 100 at 11. Huawei contends that the dispute is whether the claims require a still picture to also be encoded by the first encoding method (i.e., a moving picture encoding method). *Id.* at 11–12.

According to Huawei, "[t]hey do because 'the very character of the invention' requires a still picture to be encoded using a moving picture encoding method (as a single-frame moving

picture) so that a device that only reproduces moving pictures can now reproduce a still picture." *Id.* at 12 (citing *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1370 (Fed. Cir. 2003)). Huawei contends that the '440 Patent describes the "present invention" as encoding a still picture using both the first and the second encoding methods. *Id.* at 13 (citing '440 Patent 2:50–59, 2:59–3:20, 4:52–60). Huawei also argues that encoding a still picture using a moving picture encoding method is implicated in every embodiment. *Id.* (citing '440 Patent 7:3–8 (first embodiment), 9:36–42 (second embodiment), 12:38–41 (third embodiment), 13:58–62 (fourth embodiment)).

Huawei also points to the prosecution of U.S. Patent No. 7,295,767, which shares the specification with the '440 Patent, in which the inventors overcame an obviousness rejection by arguing that "[o]ne characteristic point of the present invention" is that still pictures are "still pictures encoded by **the first** encoding method **by which moving pictures are encoded**." *Id.* (citing Docket No. 100–19 at 12 (emphasis original)). Huawei also identifies another statement in the prosecution history as relevant:

> According to the present invention, you can get an excellent merit like following. For example, applicant's invention is advantageous in a moving-picture-only player which implements the first encoding method by which moving pictures are encoded (for example, MPEG), but which does not implement the second encoding method by which still pictures are encoded (for example, JPEG). In fact, there are many DVD players like this. Traditionally, you cannot play still pictures on this player. But, according to applicant's disclosed and claimed Invention, there is recorded the still pictures encoded by the first encoding method by which moving pictures are encoded, so you can play still pictures on such a moving-picture-only player as above.

Id. According to Huawei, the applicants "reinforced this by arguing that their "invention [of] having moving/first-encoding-method (e.g., MPEG), and still/first-encoding-method (e.g., MPEG) recording was [the] key in being able to reproduce still pictures within a device having **MPEG-only** capabilities." *Id.* at 13 (citing Docket No. 100–19 at 13) (emphasis original). Huawei contends that above-cited prosecution history of a patent having the same specification as the '440 Patent underscores that encoding a still picture using the first encoding method (i.e., the moving picture method) is the key feature of the invention. *Id.* at 13–14. Huawei further notes that the patent emphasizes the benefit of being able to omit reproduction circuitry for still pictures encoded with JPEG. *Id.* at 14 (citing '440 Patent 12:61–63).

At the oral hearing, Huawei further pointed to the file history of the '440 Patent where the applicant distinguished the Anderson reference. Specifically, Huawei contends that the applicants distinguished claims 1–8 as:

***704**

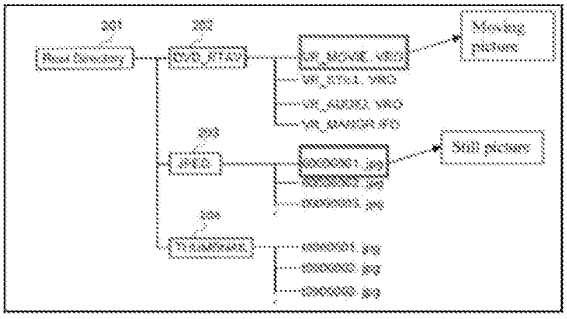
Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares clarified Claims 1-8, and Anderson, as follows.

Claims 1-8	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
First picture	X (no disclosure)
Second picture	Thumbnail and Screennail

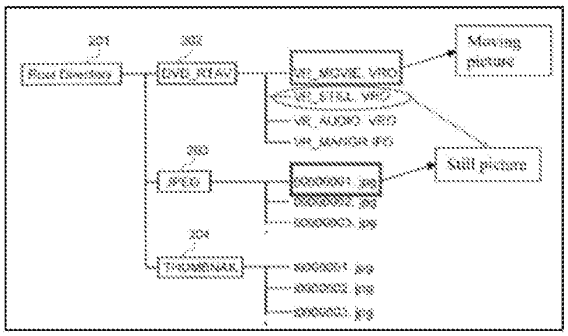
It is clear that Anderson doesn't disclose Applicant's "outputting a moving picture corresponding to any selected first picture." Therefore, clarified Claims 1-8 are clearly different from Anderson.

Docket No. 119–3at 9. Huawei contends that the reference to "First still picture (MPEG)" limits the claimed first still picture to a picture encoded by a moving picturing format, the first encoding method. *See* H'rg Tr. at 73:2–74:16.

Huawei also objects to Maxell's characterization of Figures 2 and 4, arguing that Maxell incorrectly asserts that Huawei's construction excludes Figure 4. Docket No. 100 at 14. Specifically, Huawei compares Maxell's annotation of Figure 4 with Huawei's own annotation of Figure 4.



***705** Maxell's annotation of Figure 4 (Docket No. 95 at 11).



Huawei's annotation of Figure 4 (Docket No. 100 at 14).

Huawei contends that "Figure 4 discloses recording a still picture as both (1) a JPEG still picture (.jpg file: blue box) and (2) an MPEG still picture (a .VRO file: green oval): 'In the still picture photographing mode, MPEG I-picture still pictures are recorded in the VR_STILL.VRO file ... as well as a fine still picture data file containing JPEG-compressed data is recorded with a file name of 00000001.jpg under the JPEG directory 203 ....' " *Id.* (quoting '440 Patent 11:2–8). Huawei states that Maxell ignores that the purpose of the invention is to record a still picture as a single-frame moving picture so that a device that only has a moving picture encoding method can reproduce both a moving and a still picture. *Id.* at 14–15. Huawei contends that by ignoring this feature of the invention, Maxell seeks to reduce the '440 Patent claims to the prior art apparatus disclosed in the "Background Art" section, merely embellished with a thumbnail. *Id.* at 15.

In its reply, Maxell contends that Huawei's proposal improperly limits the claims to the proposed solution of a problem in the prior art and that "statements about the difficulties and failures in the prior art, without more, do not act to disclaim claim scope." Docket No. 106 at 2 (citing *Spine Sols., Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1315 (Fed. Cir. 2010)). According to Maxell, other problems with the prior art were also disclosed, and the specification did not limit the disclosed techniques to just addressing one problem. H'rg Tr. at 70:12–71:3 (citing '440 Patent 2:5–11, 2:12–17).

As to the file history of U.S. Patent No. 7,295,767, Maxell notes that this related patent explicitly claims "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 106 at 2 (citing Docket No. 106–1 at 15:12–13). Maxell further notes that four other patents that share the same specification as the '440 Patent also include claims that explicitly require encoding still pictures with the "first encoding method" and encoding additional still pictures with "the second encoding method." *Id.* (citing claim 20 of U.S. Patent No. 7,457,529 (Docket No. 106–2); claim 1 of U.S. Patent No 7,995,897 (Docket No. 106–3); claim 1 of U.S. Patent No 6,424,795 (Docket No. 106–4); and claim 1 of U.S. Patent No 8,417,088 (Docket No. 106–5)). Maxell contends that this shows that when the applicant intended to claim multiple types of encoded still pictures, it included such recitations ***706** in the claim, but it did not do so in the '440 Patent. *Id.*

On its face, the claim language is clear: The language of the claim clearly reflects that still pictures are encoded by the second encoding method. Huawei seeks not to interpret any word or phrase in the claim, but, rather, seeks to add a whole limitation missing from the claim language. As noted by Maxell, the specification does disclose an embodiment that includes still pictures encoded by the second encoding method (pointing to Figures 2 and 4). Though Huawei may be correct that this embodiment also teaches still pictures produced by the first encoding method (moving picture encoding method), Huawei has not identified intrinsic evidence mandating this additional limitation to be added to the clear claim language. Huawei has not pointed to clear language in the intrinsic record of lexicography, disavowal or disclaimer mandating that the still pictures must also be ones produced by the first encoding method. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[50] Huawei does point to the embodiments of the specification. However, even if a limitation is in all embodiments, that is not necessarily enough to read a limitation into the claim from the specification. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254 (Fed. Cir. 2011) ("[E]ven where a patent describes only a single embodiment, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words of expressions of manifest exclusion or restriction."). As noted by Maxell, the specification does support an interpretation that still pictures are encoded by a second encoding method (the JPEG encoding format). '440 Patent Figure 4. That the figure also shows pictures encoded by a first encoding method (the moving picture encoding format) does not mandate, however, that the claimed still pictures must be encoded by two different encoding formats. As noted by Maxell, for example, the specification does describe embodiments in which one may omit "converting the format of the fine still picture signals to the same signal format as that of the single frame moving picture signals" and "no fine still picture signal

is output." *Id.* at 12:51–64. Thus, the specification indicates that using two different encoding formats for generating still pictures is not a requirement.

The Court is not persuaded that prosecution history of the related U.S. 7,295,767 mandates a different result. The prosecution history speaks to a claim in which the claim language at issue included "still pictures encoded by the first encoding method by which moving pictures are encoded." Docket No. 100–19 at 2. Further, the fact that the claim language of that patent explicitly includes such language further emphasizes that the term "still pictures" itself does not mandate still pictures are encoded by the moving picture encoding method. *See Phillips*, 415 F.3d at 1314 ("To take a simple example, the claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.").

Finally, the '440 Patent file history is—at most—ambiguous and does not make an affirmative statement regarding the "still pictures encoded by a first encoding method." The '440 Patent claims do recite "moving pictures encoded by a first encoding method and *first pictures* having a smaller number of pixels than the moving pictures" (emphasis added). Separately, the '440 Patent claims recite that what is recorded is "the moving pictures, the first pictures, as well as still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures ***707** and having a smaller number of pixels than the still pictures."

The chart cited by Huawei from the '440 Patent file history does not represent to the '440 Patent claims in multiple respects. For example, the claims do not recite "first still picture" and "second still picture," as identified in the chart but instead call out first pictures, second pictures and still pictures which have the corresponding second pictures. In relation to the claim language, the chart does not indicate that the "still pictures encoded by a second encoding method" and which have "second pictures corresponding to the still pictures" are still pictures encoded by both MPEG and JPEG standards. Further, the chart purports to relate to claims 1–8, yet it is only claims 2, 4, 6, and 8 which incorporate MPEG for the first encoding method and JPEG for the second encoding method. Finally, it is noted that the use of the chart was explicitly presented during prosecution to argue that Anderson "doesn't disclose applicant's 'outputting a moving picture corresponding to any selected first picture.' " Docket No. 119–3 at 10. It is clear that the applicant distinguished Anderson based on the last limitation of the claim, which calls out "outputting a moving picture corresponding to any selected first picture," not based on an alleged statement that the claimed "still pictures" were encoded by both the first and second encoding methods. Ultimately, the prosecution history does not reflect a disavowal of clear claim language as Huawei argues. *See Phillips*, 415 F.3d at 1318 ("because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes"); *see also Athletic Alternatives, Inc.*, 73 F.3d at 1580 (ambiguous prosecution history may be "unhelpful as an interpretive resource").

[51] The Court construes the term "still pictures encoded by a second encoding method, and second pictures corresponding to the still pictures and having a smaller number of pixels than the still pictures are recorded" to have its plain and ordinary meaning.

12. "first encoding method" ('760 **Patent claims 1, 3, 4, 6, 7, 9, 10, 12, 13, and 15**)

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	"moving picture encoding method"

The parties dispute whether the "first encoding method" is limited to moving picture encoding methods.

The term first appears in the claims in the phrase "a first still picture recorded thereon by a first encoding methods." Maxell contends that it is clear that the first encoding method is one of potentially several encoding methods that may be used for encoding still pictures, including JPEG, MPEG, or others, without any preferential order. Docket No. 95 at 32 (citing '760 Patent 8:5–7, 8:9–11). Maxell further states that the patent discloses that still pictures "may be recorded in any file format and in any different file formats." *Id.* (citing '760 Patent 11:14–15). Maxell contends that there is no ambiguity in the claim that would limit the first encoding method to be a moving picture encoding method. *Id.*

Huawei contends that, consistent with the specification, a still picture should be encoded in a moving picture encoding method *and* a still picture encoding method. Docket No. 100 at 15. According to ***708** Huawei, Maxell incorrectly argues that a still picture could be encoded in two types of still picture encoding methods, without a moving picture encoding method. *Id.* Huawei repeats the arguments presented above with regard to the "still pictures encoded by..." term to assert that encoding a still picture using both a still picture encoding

method ***and*** a moving picture encoding method is "one of the primary inventive contributions of the patent." *Id.* (emphasis original). Huawei contends that the '760 Patent consistently refers to the "first encoding method" as a moving picture encoding method that is used to encode a moving picture ***and*** a still picture (as a single-frame moving picture):

> [T]he present invention used for a video recording apparatus that can record both moving and still pictures on a recording medium includes steps for recording moving pictures encoded with the use of the first encoding method when in recording moving pictures; and for recording still pictures encoded with the use of the second encoding method and other still pictures encoded by the first encoding method from single frame signals ...

Id. at 16 (citing '760 Patent 2:50–57; 2:58–3:19 (referring to the "first encoding method" as a moving picture encoding method that is used to encode a still picture as a single-frame moving picture), 4:5–12 (same), 4:51–59 (same), 4:60–67 (same), 5:4–13 (same), 5:14–20 (same), 5:24–30 (same)).

According to Huawei, the prosecution history of the '760 Patent family confirms its understanding. *Id.* Huawei contends that to overcome a rejection, the applicant distinguished the Anderson reference by providing the following table, and arguing that Anderson did not disclose the claimed "first still picture" in MPEG:

Furthermore, Anderson solely teaches recording still images, and two kinds of pictures, such as screennails and thumbnails. Applicant respectfully compares claimed Claims 1 and 2, and Anderson, as follows.

Claims 1 and 2	Anderson (see Fig. 5)
First still picture (MPEG)	X (no disclosure)
Second still picture (JPEG)	Compressed image data
A picture	Thumbnail
X (no dislosure)	Screennail

It is clear that Anderson doesn't disclose Applicant's "first still picture"

Id.(citing Docket No. 100–23 at 12). Huawei contends that if the applicant had not limited the "first still picture" to a moving picture encoding method (e.g. MPEG), Anderson would have clearly disclosed this limitation because it discloses two still pictures: (1) a compressed image data in one encoding method, and (2) a screennail in another encoding method. *Id.* at 16, n.8. Huawei contends that Anderson's screennail would thus have been a "first still picture" and the applicant had already admitted that Anderson's compressed image data met the claimed "second still picture." *Id.*

Huawei contends that Maxell now seeks to broaden the "first encoding method" to include still picture encoding methods, and Maxell's construction would expand the scope of the claims far beyond anything described in the specification. *Id.* at 17 (citing *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing "wound" to mean "skin wound")).

In its reply, Maxell argues that the prosecution history Huawei cites supports ***709** Huawei's position, as the applicant "clarified Claims 1 and 2 don't have a 'moving image' capability." Docket No. 106 at 12 (citing Docket No. 100–23 at 12). Maxell also notes that the chart from the file history references claims 1 and 2, and that dependent claim 2 is the claim that explicitly recites "MPEG standard." *Id.* According to Maxell, Huawei's proposed constructions would "render dependent claims 2, 5, 8, 11, and 14 superfluous because the dependent claims already recite MPEG." *Id.* at 12 n.16.

As drafted, the claims merely characterize the two encoding methods as a first encoding method and a second encoding method. Huawei's proposal would limit the two different methods to one being a moving picture method and one being a still picture method, but the claim language as explicitly drafted is not so limited. Similarly to as noted above with the prior term, Huawei has not identified language of lexicography, disavowal, or disclaimer. *See GE Lighting Solutions*, 750 F.3d at 1309; *Cordis Corp.*, 561 F.3d at 1329.

[52] As to the file history, as Maxell points out, the file history emphasizes the more generalized meaning of "first" and "second." The applicant explicitly stated that "Anderson doesn't disclose Applicant's first still picture" in reference to a chart which shows Anderson as having "no disclosure" of a first still picture. Docket No. 100–23 at 12. At most, it is this aspect which the applicant emphasized as a distinction from Anderson with relation to claim 1, not MPEG. Moreover, in the section of the file history immediately before to the chart comparing the claims to Anderson, the applicant stated that claims 1 and 2 "don't have a 'moving image' capability." *Id.* at 11. Further, similar to the prior "still pictures" term, the table in question also references claim 2, which explicitly references MPEG. *Phillips*, 415 F.3d at 1317. The prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." *Phillips*, 415 F.3d at 1317. Such is the case here, with statements that do not overcome the claim's clear reference to merely "first" and "second" encoding methods.

[53] Accordingly, the Court construes the term "first encoding method" to have its plain and ordinary meaning.

D. The '517 Patent

The '517 Patent relates generally to wireless communications, more specifically to a mobile device capable of automatically selecting a physical interface for communication based on (1) communication availability of the physical interface, (2) device moving speed and (3) position of the mobile device. '517 Patent 1:58–2:6. The Abstract of the '517 Patent recites:

> A mobile communication terminal device which includes a plurality of different communication interfaces that are automatically switched for making a communication. The stable connection is ensured whether the terminal device remains at rest or is moving by monitoring positional information on the terminal device for a moving situation thereof to control a selection from a plurality of physical interfaces. This selection control involves selecting a connection to a narrow range communication such as wireless LAN which is inexpensive and stable when the terminal device remains at rest, and selecting a connection for a communication through a portable telephone which provides a connection over a wider range when the terminal device is moving. Also, a connection for a communication is automatically selected from the positional information, thereby permitting an automatic selection of a connection intended by the user.

***710** '517 Patent Abstract. More particularly, the '517 Patent describes a mobile device (100) having a plurality of physical interfaces (e.g., 120, 130 and/or 140) for communicating with external networks. '517 Patent Figures 1, 2, and 5. The mobile device monitors communications between the physical interfaces and the external networks to determine communication availability, detects the position (e.g., a GPS position) of the mobile device, and determines if the mobile device is at rest or moving. The mobile device then determines a physical interface to use for communication based on (1) communication availability of the physical interface, (2) device moving speed, and (3) position of the mobile device. *See*, '517 Patent 3:5–61, 7:1–8, Figures 1, 2 and 5.

13. "selection switching determination unit for selecting one from said first and second physical interfaces to switch to a selected physical interface"

"wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit"

"wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the movement speed being faster"

('517 Patent claim 1)

Maxell's Proposed Construction[1]	Huawei's Proposed Construction
Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Physical interface selection unit 108, switching determination unit 108, and/or components within one or more of a mobile communication terminal device, a notebook type personal computer, a portable telephone, a PDA (Personal Digital Assistance), a car navigation that perform processing functions, such as, a processor programmed to execute processing in accordance with the algorithm set forth in the specification in, for example, Figs. 4, 6, 9, and 10 and corresponding explanations in the specification as provided herein, or equivalents thereof. See e.g., (9:35-39); (3:27-30); (3:35-45); (9:30-67); (8:62-9:5); (9:42-10:2); and (3:5-16).	**Function:** selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit **waits a longer time** until switching of said physical interface when said movement determination unit determines the moving speed being faster **Structure:** Switching determination unit 108 and the algorithms in Figs. 4, 6, and 9 which is insufficient structure because the specification does not disclose the necessary algorithm or flowchart, which renders the term indefinite

[**Editor's Note:** The preceding image ***711** contains the reference for footnote[3]]

The parties agree that this term is a means-plus-function term but dispute whether a sufficient algorithm is disclosed for the means-plus-function term.

Huawei contends that the '517 Patent fails to disclose structure corresponding to the claimed function of the "selection switching determination unit," because the patent describes a "switching determination unit 108" but does not identify physical structure for this unit. Docket No. 100 at 27. Huawei contends that it is merely a black box described by the function it performs, which is insufficient. *Id.* (citing '517 Patent 3:33–39, 3:50–61, 4:41–50 and Docket No. 100–2 (Wells Decl.) ¶ 43, *Noah Systems*, 675 F.3d at 1317 and *ePlus*, 700 F.3d at 519–20).

According to Huawei, the specification fails to disclose an algorithm to perform the claimed functions, instead only providing flow charts that partially describe how the switching determination unit 108 selects a physical interface, but do not address the key function: waiting a longer time until switching. *Id.* (citing '517 Patent Figure 4, 6, & 9). Huawei states that Figures 4 and 9 do not consider moving

speed at all in determining how long to wait before switching even though claim 1 requires "wait[ing] a longer time until switching" interfaces when the device is moving "faster." *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, instead, the figures focus on whether the device is in a rest-state or a moving-state to determine which interface to use. *Id.* (citing Wells Decl. at ¶ 45). Huawei contends that, based on the claim language, the patent must disclose structure that (1) considers moving speed when making the switching decision and (2) varies the wait time based on the moving speed, but that Figures 4 and 9 insufficiently only consider whether the device is moving or not, and even then not for the purpose of adjusting a wait time. *Id.* (citing Wells Decl. at ¶ 45).

According to Huawei, Figure 6 does consider whether the moving speed is "high" or "low" (step S407–1) but does not vary the wait time before switching. *Id.* at 27–28 (citing Wells Decl. at ¶ 46. Huawei contends that Figure 6 and its disclosure do not depict or explain how to vary the wait time wait based on moving speed. *Id.* at 28 (citing Wells Decl. at ¶ 46).

Huawei argues that the patent's sole passage about waiting a period of time before switching relates to switching away from the current physical interface when it becomes unavailable. *Id.* (citing '517 Patent 6:62–7:9). Huawei contends that the related flow charts only explain how a device selects a network address when first selecting a physical interface and that the disclosure about waiting a period of time before switching only turns on whether the device is moving or not without (1) considering the moving speed or (2) or requiring waiting a longer time depending on the moving speed. *Id.* (citing '517 Patent 6:62–7:9, Figure 6 (S401)).

In its reply, Maxell contends that there is sufficient structure disclosed in the '517 Patent for this term. Docket No. 106 at 7. Maxell argues that the '517 Patent explicitly discloses that the claimed invention can be implemented in a "notebook type personal computer, a portable telephone, a PDA, [and/or] a car navigation device." *Id.* (citing '517 Patent 3:5–10). Maxell also contends that the '517 Patent indicates that a "terminal data control processing unit 103, which may be based on a CPU, a microcomputer IC or the like, is responsible for the processing associated." *Id.* (citing ***712** '517 Patent 3:23–31). According to Maxell, "by repeatedly referring to the processing unit 103, the '517 Patent makes clear that all of the operations, including switching interfaces, in this terminal are being implemented under the control of unit 103, *i.e.*, CPU or microcomputer." *Id.* (citing '517 Patent 3:3–60, 5:25–46, 8:1–9, 8:53–67, Docket No. 106–6 (Caloyannides Decl. B) ¶¶ 27–28). Maxell contends that a person of ordinary skill in the art would understand that one or more processors will be used to implement the structure of the claimed "selection switching determination unit." *Id.* (citing Caloyannides Decl. B ¶¶ 25–28).

As to algorithms, Maxell contends that when considered as a whole, the '517 Patent provides sufficient descriptions of one or more algorithms. *Id.* (citing '517 Patent Figures 4, 6, 9, & 10; Caloyannides Decl. B at ¶ 29). Maxell contends that Huawei's sole argument is predicated on the fact that the '517 Patent does not disclose "the key function: waiting a longer time until switching." *Id.* (citing Docket No. 100 at 27). Maxell contends this concept is disclosed:

> On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time may be set to be long. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Id. (citing '517 Patent 6:62–7:8). Maxell contends that this section of the '517 Patent explicitly discloses that when a particular physical interface becomes unavailable, the terminal device 100 should wait for a period of time to see if the physical interface becomes available. *Id.* (citing Caloyannides Decl. B at ¶ 31). Maxell contends that this passage also explains that this time period of waiting depends on the movement of the device, such that if the device is moving, the physical interface should wait longer. *Id.* at 8.

Maxell also argues that the '517 Patent explains with respect to Figure 4 that, if the mobile device is moving at a slow speed (e.g., at rest) and using the portable telephone interface it will switch to LAN, but if the device is moving at a higher speed than at rest and if it is on the portable telephone interface, it will wait a longer time to switch, i.e., stay on the portable telephone interface instead of switching to LAN. *Id.* (citing '517 Patent 6:32–68). Maxell contends this is because of different "Rest–State" and "Moving–State" priorities identified in Figure 4(b). *Id.* Maxell contends similar examples are also provided with respect to Figures 8, 9, and 10. *Id.* at 8 n. 9 (citing '517 Patent 8:58–9:18, 9:54–10:9).

Maxell contends that the specification provides for a structure that includes a central processing unit programmed to execute the algorithms disclosed in the specification. Even accepting Maxell's structure, the Court finds that algorithms for all the

claimed function are not disclosed. Thus, sufficient structure to satisfy the requirements of 35 U.S.C. § 112 ¶ 6 is not disclosed. *See WMS Gaming Inc.*, 184 F.3d at 1349; *Aristocrat Techs.*, 521 F.3d at 1333.

Specifically, the claim language includes: "said selection switching determination unit waits a longer time until switching of said physical interface *when said movement determination unit determines the movement speed being faster.*" '517 Patent claim 1 (emphasis added). As noted by Huawei, such language does not just require identification of movement or rest, but rather some level of the relative speed: "the movement being faster." As noted by Huawei, the disclosures related to the "switching determination unit" generally provide for only a determination based on rest versus movement. *See* '517 Patent Figure 4 (block S407), Figure 6 (block ***713** S407), Figure 9 (block S910), 5:3–14; 6:28–35, 6:45–52, 6:53–62, 9:5–18, 9:54–10:9. At the oral hearing, Maxell acknowledged that the language "determines the movement speed being faster" does not relate to rest versus movement, but rather high speed versus low speed movement. H'rg Tr. at 96:2–14.

Speed is discussed with regard to the switching priorities. Specifically, Figure 6 section (b) and the passage at 7:45–67 discloses three states: "rest state priorities," "high speed moving state priorities" and "low speed moving state priorities." However, these relate to what interface is chosen based on the determination of the moving speed being faster or slower, not changing the waiting time until switching based on the high speed versus low speed. At the oral hearing, Maxell emphasized the passages at 5:3–14 and 9:5–18. *Id.* at 92:12–94:21. However, the first passage relates again to the different priorities given, specifically a higher priority given to a portable telephone during movement. '517 Patent 4:64–5:14. The second passage also relates to determining which physical interface to select. *Id.* at 9:2–18. Neither passage references changing the wait time "when said movement determination unit determines the movement speed being faster."

As discussed in more detail below, with regard to the "wait" term, the "waits a longer time" concept is disclosed at '517 Patent 6:62–7:8. This disclosure does not describe different wait times based on determining the moving speed being faster or slower. Rather, the wait time just changes based on resting versus movement.[4] Again however, as the parties agree, the claimed function is not a rest versus movement determination. Rather, the claimed function relates to changing the wait time based on the determination of the movement speed being faster (low speed versus high speed). Maxell has not identified, and the specification provides no disclosure of, any algorithms for performing this claimed function. The lack of an algorithm corresponding to the claimed function renders the term indefinite. *See WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d at 1349.

[54] Accordingly, the Court construes the "selection switching determination unit for ..." term to mean:

Function: selecting one from said first and second physical interfaces to switch to a selected physical interface, wherein said selection switching determination unit makes a selection switching based on the communication availability determined by said communication determination unit, the moving speed determined by said movement determination unit, and the position detected by said position detection unit and wherein said selection switching determination unit waits a longer time until switching of said physical interface when said movement determination unit determines the moving speed being faster

Structure: insufficient corresponding structure is disclosed for the claimed function.

14. "waits a longer time until switching" ('517 Patent claim 1)

***714**

Maxell's Proposed Construction	Huawei's Proposed Construction
Plain and ordinary meaning	sets a longer period of time to wait before determining whether to switch

The parties dispute whether the time period of the wait must be a period that is "set" and whether it must be set "before" the determination.

Maxell objects to Huawei's construction as importing into the claim from the specification the scenario where the period of time is "set." Docket No. 95 at 26. Maxell notes that '517 Patent discloses that, when device 100 remains at rest, the switching wait time "may be set to short" and that when device 100 is moving, the switching wait time "may be set to be long." *Id.* (citing '517 Patent 6:66–7:8). According to Maxell, Huawei's proposal improperly imports "set" into the claim language when the patent makes clear that a wait time "may be set," which implies that a time period is not always necessarily set. *Id.* at 26–27. Maxell also relies on the "may be set" language to counter Huawei's argument that the time is always set in advance. Docket No. 106 at 6. As to the

reference to "fixed time" in the passage, Maxell contends that there is no indication in the '517 Patent that "fixed time" means a time period that is always set in advance of switching and that a fixed time can simply mean a fixed period of time. *Id.* at 6 n. 8.

Huawei counters that the patent only offers a single passage about intentionally waiting to switch interfaces, which states that, when the current physical interface is unavailable, the device "waits for a fixed time" before deciding whether to switch interfaces to "prevent useless switching":

> If a physical interface in use becomes unavailable during a communication, the mobile communication terminal device 100 waits for a fixed time for the physical interface to recover. If the physical interface does not recover even after the fixed time, the connection is switched. Since the mobile communication terminal device 100 is relatively stable in communication when it remains at rest, a physical interface switching wait time **may be set to be short**. On the other hand, when the mobile communication device 100 is relatively instable in communication when it is moving, the physical interface switching wait time **may be set to be long**. In this way, it is possible to prevent useless switching from one physical interface to another and to switch to an appropriate physical interface.

Docket No. 100 at 24 (citing '517 Patent 6:62–7:8). Huawei contends that this "fundamental feature of the alleged invention" is reflected in its proposed construction. *Id.* According to Huawei, the claim is not about incidental delays in switching due to the inherent time it takes to analyze wireless signals received by a moving device, as those delays occur whether or not the switching mechanism accounts for moving speed. *Id.* at 24–25. Instead, Huawei contends, this incidental instability is the alleged problem in the prior art that the patent wants to solve. *Id.* at 25. Huawei contends that the invention attempts to solve the problem by expressly using the device's moving speed as a factor in the interface selection, by waiting longer intentionally before attempting to switch interfaces when the device is moving faster. *Id.* (citing '517 Patent 1:58–64).

In response to Maxell's contention that construction is unnecessary, Huawei counters that Maxell's infringement contentions reveal a fundamental dispute over claim scope. *Id.* Huawei contends that Maxell alleges infringement of claim 1 by devices that ignore moving speed in their switching decisions, but that may coincidentally ***715** take longer to establish a connection because of inherent instability in the connection or temporary reductions in signal strength that occur when moving. *Id.* (citing Docket No. 100–24 at 59). Huawei contends that if devices ever (incidentally) take longer to switch, it is due to inherent aspects of wireless communication in a moving device, which the '517 Patent sought to ameliorate by expressly using moving speed in the switching decision. *Id.* Huawei contends that unlike a passive word like "takes" (i.e., "takes a longer time"), "wait" implies an intentional delay. *Id.* Huawei further states that the specification likewise speaks of "setting" the delay. *Id.* (citing '517 Patent 6:66–7:5).

As to use of "may" in the cited specification passages, Huawei contends that this ignores the text immediately before Maxell's cite noting that the device "waits for a fixed time for the physical interface to recover" and only switches "[i]f the physical interface does not recover even after the fixed time." *Id.* at 26 (citing '517 Patent 6:62–7:8). Huawei contends that "may" only means that the fixed time can be set to different intervals; it does not mean that waiting a longer time is optional. Huawei contends that some "fixed time" is defined (i.e., "set") as the wait time before deciding whether to switch. *Id.*

Huawei has not pointed to any language of lexicography, disclaimer or disavowal in the specification that requires the waiting time to be predetermined in advance. Further, even the passage at 6:62–7:8 merely states that wait times may be set, without requiring setting the time prior to the determination. Accordingly, the claim does not require that the period of time is "set" "before" the determination.

Huawei's primary argument is that Maxell's construction is intended to cover incidental waiting that may occur when moving, such incidental waiting that may be irrespective of the determination of the movement determination unit. The surrounding claim language, however, is instructive. The "waits a long time" is not just any wait but rather as claimed: "said selection switching determination unit waits a longer time until switching of said physical interface ***when said movement determination unit determines*** the moving speed being faster." '517 Patent claim 1 (emphasis added). The interaction of the different portions of this phrase requires the longer wait to be based on the determination. Thus, the claim itself requires the longer time to be based on the determination of the movement determination unit. This corresponds also to the specification passage cited by the parties in which the waiting time is dependent upon movement or non-movement. Some incidental change unrelated to the determination is not claimed nor described in the specification.

At the oral hearing, the Court proposed a construction with a note that stated that the phrase "when said movement determination unit determines" requires the longer wait to be based on the determination. Maxell agreed to such an interpretation. H'rg Tr. at 83:23–84:6. Such an interpretation conforms to the plain and ordinary meaning of the term in context of the surrounding claim limitations.

[55] The Court construes the term "waits a longer time until switching" to have its plain and ordinary meaning.

E. The '443 Patent

The '443 Patent relates generally to power management, more specifically to techniques for conserving battery power by providing for a power saving state. The Abstract of the '443 Patent recites:

> An information processing apparatus can save an electric power when it is not in use and can be made active immediately after an operation medium such as a pen and a finger or the user approaches ***716** or comes in contact with the apparatus, the arrangement being such that a housing portion of the apparatus includes therein a sensor for detecting the approach or contact of a user operation medium or user and a state display unit for informing the user that the apparatus is in the active state or in the standby state, a power saving control unit controls a controlled object concerning a power consumption in response to the approach, contact or separation of the operation medium or user, and a timer included in the electric power saving control unit determines whether or not the operation medium or user is separate from the apparatus.

'443 Patent Abstract. More particularly, the '443 Patent describes an information processing apparatus having detecting means (e.g., a sensor) for detecting the approach or contact of an operation medium (e.g., a pen, or a user's finger, voice, etc.), and control means (e.g., a power saving control unit) for controlling power consumption of the information processing apparatus in response to the detected approach or contact, or the lack thereof for a predetermined time period. In the '443 Patent, the information processing apparatus is set in a non-power saving state if the user approaches or comes in contact with the information processing apparatus. On the other hand, the information processing apparatus is set in a power saving state, if the user has been away from the apparatus (or has not touched the apparatus) for a predetermined time or more. *See*, '443 Patent 2:1–24, 3:58–4:35, Figure 1.

17. "a detecting means for detecting whether a user associated medium at least approaches at least part of a housing of said apparatus" ('443 Patent claim 1)

Maxell's Proposed Construction	Defendants' Proposed Construction
Function: detecting whether a user-associated medium at least approaches at least part of a housing of said apparatus **Structure:** "a sensor," a touch-sensitive surface, or a tablet configured to detect proximity and/or contact using one or more of an electromagnetic induction system, a capacitance system, a capacitive coupling system, a pressure-sensitive resistance system, a transmission pen type ultrasonic system, a surface acoustic wave type ultrasonic system, an optical system, an image sensor, a camera, a microphone, or a temperature sensor, as well as equivalents thereof.	This term is written as a means-plus-function element. **Function:** for detecting whether a user-associated medium at least approaches at least a part of a housing of said apparatus **Structure:** Electromagnetic induction systems, electrostatic coupling systems, and Optical systems, listed in Table 1; "image sensor" ('443 Patent at 11:58); "microphone" ('443 Patent at 12:2); "temperature sensor" ('443 Patent at 12:3); "cameras" (Figs. 3A and 12)

The parties dispute the corresponding structure for the means term, specifically whether approach detection techniques are required.

Maxell contends that the '443 Patent associates a sensor with the function of "detecting" and lists several examples of structures for the sensor, including "an image sensor, a microphone or a temperature sensor etc." Docket No. 95 at 7 (citing '443 Patent 4:2–6; 4:19–23 (describing the role of the sensor in the overall power-saving scheme)). Maxell also contends that the patent discloses that a touch-sensitive surface can be provided on a tablet to detect the approach of a pen or finger. *Id.* (citing '443 Patent 11:42–46). Maxell further ***717** points to Table 1 of the '443 Patent as disclosing multiple kinds of tablets that can operate as sensors for detecting approach and/or contact, including a "capacitance system tablet" ('443 Patent 11:26–27), "pressure sensitive resistance system tablet" ('443 Patent at 11:27–28), "transmission pen type ultrasonic system tablet" ('443 Patent at 11:28–29), and several others. Docket No. 95 at 7–8.

Maxell contends that the patent also describes the capabilities of these sensors: (1) "the capacitive coupling system tablet can also detect the approach of the pen/finger input medium" ('443 Patent at 11:34–36) and (2) "the optical system tablet can detect both the contact and approach of the pen/finger input medium depending on the distance in the height direction from a touch-sensitive surface of an array of sensing and emitting devices ..." ('443 Patent at 11:36–40).Docket No. 95 at 8.

Maxell contends that Defendants' construction includes some of these examples while excluding others, specifically the "capacitance system tablet," "pressure-sensitive resistance