

EXHIBIT 1007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCL Electronics Holdings Ltd. (f/k/a TCL Multimedia Technology Holdings, Ltd.)
TCL Industries Holdings Co., Ltd.
TCL Industries Holdings (H.K.) Limited
TTE Technology, Inc. (d/b/a TCL North America)
TTE Corporation
TCL Moka International Limited
TCL Moka Manufacturing S.A. de C.V.
TCL King Electrical Appliances (Huizhou) Co. Ltd.
Manufacturas Avanzadas S.A. de C.V.
TCL Smart Device (Vietnam) Co., Ltd.
Shenzhen TCL New Technology Co., Ltd.
TCL Optoelectronics Technology (Huizhou) Co., Ltd.
TCL Overseas Marketing Ltd.
TCL Technology Group Corporation (f/k/a TCL Corp.),
Petitioners

v.

LG Electronics Inc.,
Patent Owner.

Case No. IPR2023-00461

U.S. Patent No. 7,839,452

DECLARATION OF JOSEPH P. HAVLICEK, PH.D. IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,839,452

Ex. 1007 - TCL Indus Holdings Co., Ltd.
TCL Indus Holdings Co., Ltd. v. LGE – IPR2023-00461

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EXHIBITS CONSIDERED

Exhibit	Description
1001	U.S. Patent No. 7,839,452 (the “452 patent”); Applicant Admitted Prior Art (“AAPA”)
1002	File History for U.S. Patent No. 7,839,452
1003	European Patent Application Pub. No. EP 0700211 (“Mitani”)
1004	Japanese Patent Publication JP-9-275563 (“Oku”) (Certified translation)
1005	U.S. Patent No. 5,734,436 (“Abe”)
1006	Reserved
1007	Joseph P. Havlicek declaration
1008	Joseph P. Havlicek CV
1009	Reserved
1010	In the Matter of Reallocation of Television Channels 60-69, the 46-806 MHz Band, ET Docket No. 97-157, FCC (January 6, 1998)
1011	Telecommunications Act of 1996, Public Law 104-104, February 8, 1996
1012	ANSI ISO-IR-006 ASCII Graphic character set (1975)
1013	U.S. Pat. No., 5,109,279
1014	Updated Guidance on the Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews under 35 U.S.C. §311, June 9, 2022.
1015	Plaintiff’s Preliminary Claim Constructions and Extrinsic Evidence [N.D.Cal. Patent L.R. 4-2]
1016	Docket Control Order
1017	Average Time to Trial
1018	Foley et al., <i>Computer Graphics</i> (2 ed. 1997) [LG-HISENSE00050051-85]
1019	D. Hearn and M.P. Baker, <i>Computer Graphics</i> (2 ed. 1996)
1020	A. Bouridane, et al., “A parallel implementation of a novel cubic interpolation technique for visual analysis,” IEEE ISIE, 1993, pp. 565-570, doi: 10.1109/ISIE.1993.268743

Exhibit	Description
1021	W.K. Carey, D.B. Chuang, and S.S. Hemami, “Regularity-preserving image interpolation,” IEEE ICIP, 1997, pp. 901-904, doi: 10.1109/ICIP.1997.648112
1022	T. Nakayama, “Content-oriented categorization of document images,” <i>16th Conference on Computational Linguistics</i> , ACM, 1996, pp. 818-823.
1023	G.-H. Cha and C.-W. Chung, “Object-oriented retrieval mechanism for semistructured image collections,” <i>6th ACM International Conference on Multimedia</i> , ACM, 1998, pp. 323-332.
1024	L.J. Guibas and J. Stolfi, “A language for bitmap manipulation,” <i>ACM Trans. Graph.</i> , vol. 1, no. 3, July 1982, pp. 191-214.
1025	F. Rabitti and P. Stanchev, “An approach to image retrieval from large image databases,” <i>10th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval</i> , ACM, 1987, pp. 284-295.
1026	R. Pike, “Graphics in overlapping bitmap layers,” <i>ACM Trans. Graph.</i> , vol. 2, no. 2, April 1983, pp. 135–160.
1027	FINTIV Stipulation

I, Joseph P. Havlicek, Ph.D., hereby declare under penalty of perjury:

I. BACKGROUND AND QUALIFICATIONS

1. I have been retained by Petitioners, TCL Electronics Holdings Ltd. (f/k/a TCL Multimedia Technology Holdings, Ltd.), TCL Industries Holdings Co., Ltd., TCL Industries Holdings (H.K.) Limited, TTE Technology, Inc. (d/b/a TCL North America), TTE Corporation, TCL Moka International Limited, TCL Moka Manufacturing S.A. de C.V., TCL King Electrical Appliances (Huizhou) Co. Ltd., Manufacturas Avanzadas S.A. de C.V., TCL Smart Device (Vietnam) Co., Ltd., Shenzhen TCL New Technology Co., Ltd., TCL Optoelectronics Technology (Huizhou) Co., Ltd., TCL Overseas Marketing Ltd., TCL Technology Group Corporation (f/k/a TCL Corp.), (hereinafter “TCL” or “Petitioners”) to provide my opinions regarding claims 1-3, 5-17, 19-21, and 23 of U.S. Patent No. 7,839,452 (Ex. 1001, “the ’452 patent”).

2. I am currently the Gerald Tuma Presidential Professor of Electrical and Computer Engineering at the University of Oklahoma.

3. Ex. 1008 is a copy of my current curriculum vitae, which provides further details about my academic and professional background and qualifications.

4. I am being compensated for my services and reimbursed for reasonable expenses that I may incur while working on this matter. I have no financial interest in the outcome of this matter or any other matter that may exist between Petitioners and LG Electronics. This compensation does not depend in any way on the conclusions I reach.

A. Educational Background

5. I received a Bachelor of Science Degree in electrical engineering with minors in mathematics and computer science from Virginia Tech in 1986. I also received a Master of Science degree in electrical engineering from Virginia Tech in 1988. I received a Ph.D. degree in Electrical and Computer Engineering from the University of Texas at Austin in 1996. My Ph.D. research was in the field of image processing.

B. Professional Experience

6. From December 1984 to May 1987, I was a software engineer at Management Systems Laboratories, Blacksburg, VA. My main job responsibilities included developing software for nuclear materials management under contract with the United States Department of Energy.

7. From June 1987 to January 1997, I was an electrical engineer at the United States Naval Research Laboratory. For the period of June 1987 through

August 1989, I was an on-site contractor affiliated with SFA, Inc, Landover, Maryland. From August 1989 through January 1997, I was a regular government employee. I was on leave without pay from August 1987 through July 1988 while completing my Master of Science Degree. I was also on leave without pay for much of the period from August 1990 through January 1997 while I completed my Ph.D. degree. My main job responsibilities at the United States Naval Research Laboratory included designing digital and analog circuits to process real-time video signals and designing and implementing target detection, tracking, and identification algorithms. I developed missile warning receivers for Navy aircraft including the Navy's first two-color infrared system. I was a recipient of the 1990 Department of the Navy Award of Merit for Group Achievement for this work. The production version of this system was deployed on Navy helicopters and saw combat in Afghanistan and Iraq. One component of this work involved developing and implementing systems to display experimental sensor data (such as time codes and telemetry) as text overlaid on digital video signals.

8. From January 1993 through December 1993, I was an on-site contractor at International Business Machines (IBM) Corporation, Austin, TX. My

main job responsibilities included designing and implementing image compression and decompression algorithms (CODECs) for IBM products.

9. Since January 1997, I have been a regular faculty member in the School of Electrical and Computer Engineering at the University of Oklahoma, Norman, OK. I was an Assistant Professor from January 1997 through June 2002. I was promoted to the rank of Associate Professor and granted tenure in July 2002. I was promoted to the rank of Professor in July 2007. I was appointed to the Williams Companies Foundation Presidential Professorship from April 2009 through April 2017. In April 2017 I was appointed to the Gerald Tuma Presidential Professorship. My main job responsibilities at the University of Oklahoma include conducting academic research in electrical and computer engineering, teaching graduate and undergraduate courses in electrical and computer engineering, and performing professional and institutional service.

10. I am a member of several professional societies and organizations, including the Institute of Electrical and Electronics Engineers (IEEE), the IEEE Signal Processing Society, the IEEE Computer Society, and the IEEE Intelligent Transportation Society. I am a Senior Member of the IEEE. From November 2015 through February 2018, I served as a Senior Area Editor for the IEEE Transactions

on Image Processing. I was formerly an Associate Editor for the IEEE Transactions on Image Processing from December 2010 through October 2015. I served as a Technical Area Chair for the IEEE International Conference on Image Processing in the area of Image & Video Analysis, Synthesis, and Retrieval (2012, 2013) and have served on the organizing committee of that conference (2007). I have also served as a Technical Area Chair for the IEEE International Conference on Acoustics, Speech, and Signal Processing in the area of Image, Video, and Multidimensional Signal Processing (2012-2014).

11. For over 30 years, I have conducted research and taught classes in the field of image processing and image analysis. My main scholarly contributions have been in the areas of modulation domain image models and image processing (AM-FM image models), video target tracking, and distributed control of video networks for intelligent transportation systems. I have supervised or co-supervised 11 Ph.D. students to completion and 27 M.S. students to completion. I have served as a committee member on 64 additional doctoral committees and 67 additional M.S. committees.

12. I teach a variety of courses at the University of Oklahoma, including the required junior-level Signals and Systems course ECE 3793 (taught 21 times),

the graduate level Digital Image Processing course ECE 5273 (taught 23 times), and the graduate level Digital Signal Processing course ECE 5213 (taught 17 times). I have received a number of teaching awards, including the University of Oklahoma College of Engineering Outstanding Faculty Advisor Award (2005-2006) and the University of Texas Engineering Foundation Award for Exemplary Engineering Teaching while Pursuing a Graduate Degree (1992).

13. Since joining the University of Oklahoma in January 1997, I have been Principal Investigator or Co-Principal Investigator on over 100 externally funded grants and contracts with a total value of \$25,225,718. My main research contributions have been in the areas of signal, image, and video processing, video target tracking, and intelligent transportation systems. I have been author or coauthor on over 130 scholarly publications in these areas. I was a recipient of the 1990 Department of the Navy Award of Merit for Group Achievement for my work in video target tracking. My research group at the University of Oklahoma originated the Virtual Traffic Management Center concept featured in a December 2014 FHWA technical report (Guidelines for Virtual Transportation Management Center Development) and a November 2014 FHWA national webinar with the same title. I am co-founder and director of the University of Oklahoma Center for

Intelligent Transportation Systems. One aspect of this work has involved supervising engineers and programmers in the development of systems to overlay text and graphics information on digital video signals acquired from, e.g., highway overhead cameras and snow plow cameras.

C. Publications

14. A complete listing of my publications is found in my curriculum vitae (Ex. 1008). I highlight some of the publications relevant to the subject matter of the '452 patent below.

15. I have published numerous peer reviewed scholarly journal articles, book chapters, and conference papers, including 24 journal articles, 9 book chapters, and 99 conference papers; the following are representative:

- J.P. Havlicek, T.N. Arian, H. Soltani, T. Przebinda, and M. Özaydın, “A preliminary case for Hirschman transform video coding,” in *Proc. IEEE Southwest Symp. Image Anal. & Interp.*, Santa Fe, NM, Mar. 29-31, 2020, pp. 104-107.
- E. Vorakitolan, J.P. Havlicek, R.D. Barnes, and A.R. Stevenson, “Simple, Effective Rate Control for Video Distribution in Heterogeneous

- Intelligent Transportation System Networks,” in *Proc. IEEE Southwest Symp. Image Anal. & Interp.*, San Diego, CA, Apr. 6-8, 2014, pp. 37-40
- P.A. Campbell, J.P. Havlicek, A.R. Stevenson, and R.D. Barnes, “Realization of ITS applications through mapping technologies: a survey of advanced traveler information systems,” in *Proc. 15th Int’l. IEEE Conf. Intel. Transportation Syst.*, Anchorage, AK, Sep. 16-19, 2012, pp. 788-795.
 - S. Peddireddy, N. Mould, and J.P. Havlicek, “AM-FM picture carrier beat type noise filters,” in *Proc. IEEE Southwest Symp. Image Anal. & Interp.*, Santa Fe, NM, Apr. 22-24, 2012, pp. 209-212.
 - P.A. Campbell, J.R. Junger, J.P. Havlicek, A.R. Stevenson, and R.D. Barnes, “Pathfinder: Oklahoma’s advanced traveler information system,” in *Proc. 14th Int’l. IEEE Conf. Intel. Transportation Syst.*, Washington, DC, Oct. 5-7, 2011, pp. 402-407.
 - B.H. Kilani, P.A. Campbell, J.P. Havlicek, M.P. Tull, A.R. Stevenson, and R.D. Barnes, “Peer-based communication for a distributed, virtual Traffic Management Center,” in *Proc. 14th Int’l. IEEE Conf. Intel. Transportation Syst.*, Washington, DC, Oct. 5-7, 2011, pp. 2068-2073.

- B.H. Kilani, E. Vorakitolan, J.P. Havlicek, M.P. Tull, and A.R. Stevenson, “Distributed ITS control and the Oklahoma virtual TMC,” in *Proc. 12th Int’l. IEEE Conf. Intel. Transportation Syst.*, St. Louis, MO, Oct. 4-7, 2009, pp. 785-790.
- R.C. Huck, J.P. Havlicek, J.J. Sluss, Jr., and A.R. Stevenson, “A low-cost distributed control architecture for intelligent transportation systems deployment in the State of Oklahoma,” in *Proc. 12th Int’l. IEEE Conf. Intel. Transportation Syst.*, Vienna, Austria, Sep. 13-16, 2005, pp. 919-924.

II. MATERIALS CONSIDERED

16. In developing my opinions below relating to the ’452 patent, I have considered the materials cited herein, including those itemized in the table of “Exhibits Considered” preceding this declaration.

III. LEVEL OF ORDINARY SKILL IN THE ART

17. In my opinion a person of ordinary skill in the art (“POSITA”) of the ’452 patent at the time of the alleged invention would have had a bachelor’s degree in computer graphics, display signal processing, or similar, and several years (5-6 years) experience working with digital display technology. I expect that this would

provide hands-on experience implementing the circuitry or programming in a digital signal decoder, which would relate to the key principles related to the area of the '452 patent: receiving and processing signals, converting the format of signals (for example, from MPEG2-encoded video into bitmap video for display), and displaying image or bitmap data on the display. This description is approximate and additional educational experience could make up for less work experience and vice-versa.

IV. TECHNOLOGY BACKGROUND

A. Digital Television

18. Digital television refers to television that uses digitally encoded video signals instead of conventional analog video signals. Conventional analog video signals could be sent to a picture tube for display according to well-known standards. Digital signals, on the other hand, encode color and intensity values for individual pixels on a display as digital numbers. Digital signals are typically encoded to dramatically reduce the amount of bandwidth required to transmit them from a broadcaster to a receiver. The receiver therefore needs to be able to decode the signal, and will include a processor to perform decoding and a memory to store the decoded signal before sending it to a display.

19. To a POSITA digital television generally refers to a television that is capable of receiving and processing digital signals. A POSITA would typically expect that a digital television would receive and process a transmitted digital signal.

20. I note that claim 1 of the '452 patent suggests that a digital television could be one that receives an analog signal alone, where it describes the claimed invention as having “a receiving part configured to receive at least one of digital image data and analog image data.” Ex. 1001, claim 1.

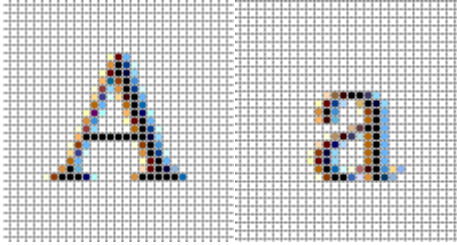
21. This suggests a digital television could receive only an analog signal because this limitation would be met by a receiving part that can receive only analog image data (“at least one of...”).

22. This is not necessarily consistent with what a POSITA would understand about a digital television at the time. Rather, a POSITA would expect at a minimum the ability to process digital signals, even though it might also be able to process analog signals. See Ex. 1001 at 2:46-47. Nonetheless, my opinion on the prior art references below is based on combinations that teach televisions that accept and display digital signals, e.g., digital televisions.

23. The “resolution” of a digital television generally refers to the highest number of pixels of a digital signal that the television can display, based on the physical limitations of the device. A common “resolution” for a modern HD television is, for example, “1080p”, which can display a picture 1920 pixels wide by 1080 pixels high because it has a grid of picture elements 1920 wide and 1080 high. While this is the most pixels that the TV can display, the television can also display images having a different number of pixels. So a picture, for example, 1280 pixels wide by 720 pixels high could be displayed by enlarging the picture so that it filled the screen (by multiplying by a factor of 1.5 in each direction). Therefore, even though a display generally has a fixed number of physical pixels, it may be able to display different resolutions because it has appropriate functionality to show an image having a different number of pixels on the screen by enlarging it to fill the screen.

B. Bitmap Graphics

24. The term “bitmap” refers to an image format that stores one or more values for the intensity and color of each pixel of an image. As a bitmap, the letter “A” may be represented by a map of bits like the following:



(Havlicek Figure 1)

25. Each character has its own bitmap, so for example the letter “A” is a different bitmap from that for the letter “a.” In Havlicek Figure 1 each dot, or pixel, of the image has an associated color value, which may be “1” for white and “0” for black. More bits may be used for each dot to represent a range of colors, but as a trade-off the total amount of memory required to store the bitmap increases. So while an image 32 dots wide by 32 dots high, which uses one bit of color per pixel, would only require 1,024 bits (32x32) to store an image, the same size image with reasonably lifelike color approximations could use over 24,000 bits.

C. Closed Captions

26. Closed captions refer to text that is transmitted alongside television video signals. These are provided so that viewers that have difficulty hearing spoken words can instead read the dialog occurring on screen as letters superimposed over the video picture.

27. Captions were originally transmitted in a special unused part of analog television signals called the “vertical blanking interval.” When closed caption data is received by an analog television, the caption portion needs to be specially processed. While the analog video data can be sent directly to the display, the caption portion contains digitally encoded character data and as such must be discriminated, usually through an analog-to-digital converter that can recover digital bits from an analog signal.

28. For closed captions sent in digital signals, the caption data can be directly extracted because it is already in a digital form. The digital bits for the caption data each represents either a character, like “A”, “a”, “B”, “b”, and so on, or a special code that gives an instruction to the receiver such as the position at which to display the character, the color, or the size of the text to display. For example, using the commonly used ASCII code set, the character “A” is represented by the decimal number 65, while the character “a” is represented by the decimal number 97. Ex. 1012, at 2.

D. Teletext

29. Teletext refers to a technology used to send interactive material to television subscribers. This was an early precursor to mass market interactive

information services like the world-wide web and was used before computers were commonplace enough for every home to have one. Teletext, like closed captions, sends text information in the vertical blanking interval of a television signal. It could also send simple programming, formatting information, as well as graphic information that could be used to display simple graphics.

30. Unlike closed captions, which must be displayed at the appropriate moment in time—such as when the corresponding line of dialog is spoken—teletext is meant to be displayed only when requested by the user. Early teletext terminals did not have bidirectional communication to allow a user to explicitly send requests to the broadcaster. *E.g.*, Ex. 1005, 1:22-26. Therefore, early teletext services were designed to transmit many “pages” of information to be stored for future use. For example, a teletext service might be able to display the local weather. Ex. 1005, 1:14-21. In such a case a broadcaster could transmit a teletext page with the relevant information, for example the temperature and current weather, and send a new version of the page periodically.

31. Teletext can transmit characters as codes, where a digital sequence is used to indicate letters to display on screen. Well-known character codes include ASCII, which uses unique sequences to identify individual letters:

				b ₇	0	0	1	1	1	1
				b ₆	1	1	0	0	1	1
				b ₅	0	1	0	1	0	1
					2	3	4	5	6	7
b ₄	b ₃	b ₂	b ₁							
0	0	0	0	0		0	@	P	`	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	#	3	C	S	c	s
0	1	0	0	4	\$	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	'	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10	*	:	J	Z	j	z
1	0	1	1	11	+	;	K	[	k	{
1	1	0	0	12	,	<	L	\	l	
1	1	0	1	13	-	=	M	]	m	}
1	1	1	0	14	.	>	N	^	n	~
1	1	1	1	15	/	?	O	_	o	

Ex. 1012 at 2.

32. The ASCII table shown in Exhibit 1012 uses a binary sequence
(where b₇ is the most-significant bit and b₁ is the least-significant bit) to represent

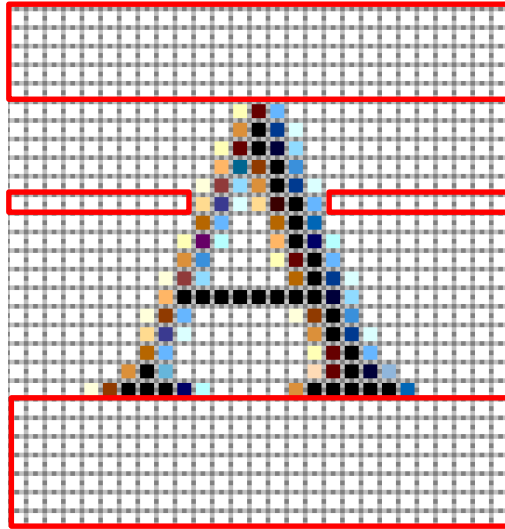
commonly used characters. So, for example, the letter “A” here is represented by a binary sequence 1000001. In ordinary binary-to-decimal conversion the binary sequence 1000001 has a value of 65, and the letter “a” which has a bit sequence in ASCII of 1100001, has a decimal value of 97.

E. **Compression / Decompression**

33. Compression and decompression refer to techniques to take one form of data and convert it into another form that takes up less space, *i.e.* a fewer number of bits, in a memory. Compression is the process of taking data and making it occupy less space in memory, and decompression is the process of restoring the data to its original form.

34. For example, the well-known MPEG video compression formats, which can be used for video and audio, encode the video or audio data in a way that makes the data take up dramatically less space. One consequence of using compression is that more processing power is required in order to compress or decompress data, but this allows further saving by avoiding the need to add additional memory to store large volumes of data. One well-known technique for image compression is “run-length encoding.” Run-length encoding replaces a sequence of several occurrences of the same value with a code indicating how

many times that value is consecutively repeated. For example, the sequence of bits “0 1 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0” could be encoded to indicate “0, 1, *six* 0’s, *two* 1’s, 0, 1, *eight* 0’s”. This type of encoding is very efficient for data that has many repeated numbers in it. For example, a bitmap that has many sequences of repeated black pixels or white pixels can be very efficiently compressed by run-length encoding. This can be shown in the following image, where certain “runs” of numbers are shown:



(Havlicek Figure 2)

V. SUMMARY OF THE '452 PATENT

35. I have been informed that the earliest application to which the '452 patent claims priority is Korean Application No. 2000-45807 filed on Aug. 8, 2000; I have assumed this date for the purposes of my analysis.

36. The '452 patent is entitled “Image Display Device in Digital TV.” It explains that “[a]n object of the present invention is to provide an image display device in a digital TV [that] can convert text data according to variation of resolution and compress bit map data.” Ex. 1001, 3:44-46. The stated purpose is to reduce the memory space needed to perform text conversion. *Id.*, 4:47-50.

37. FIG. 4 of the '452 patent illustrates the display screen:

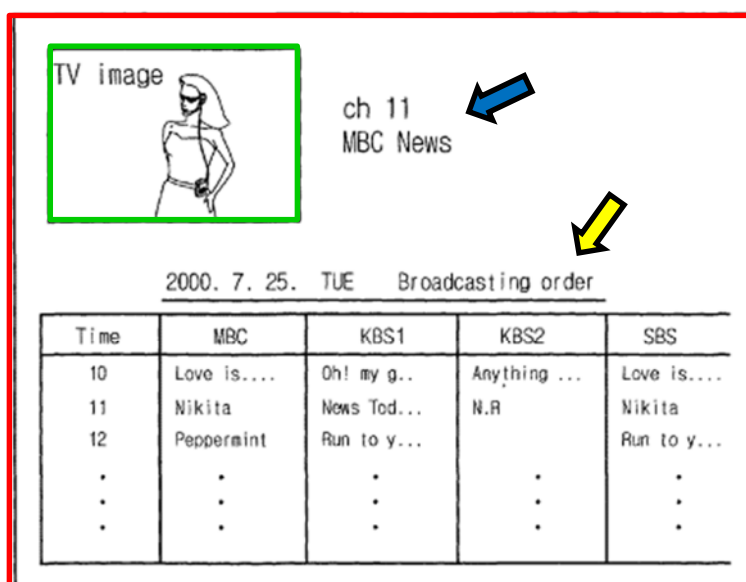


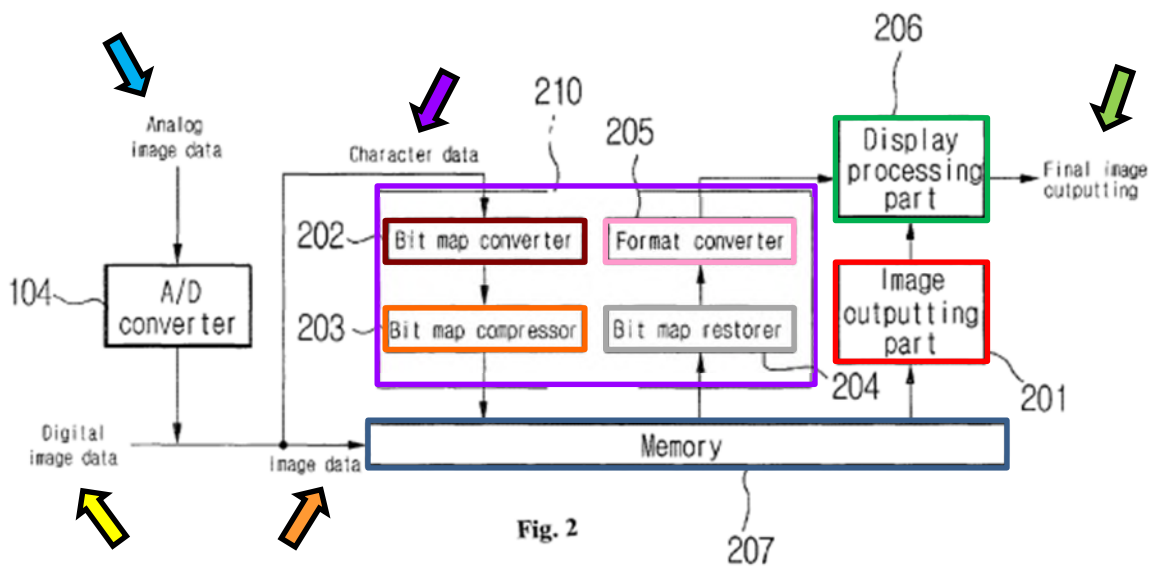
Fig. 4

Ex. 1001, FIG. 4 (annotated), 5:9-11, 9:7-9.

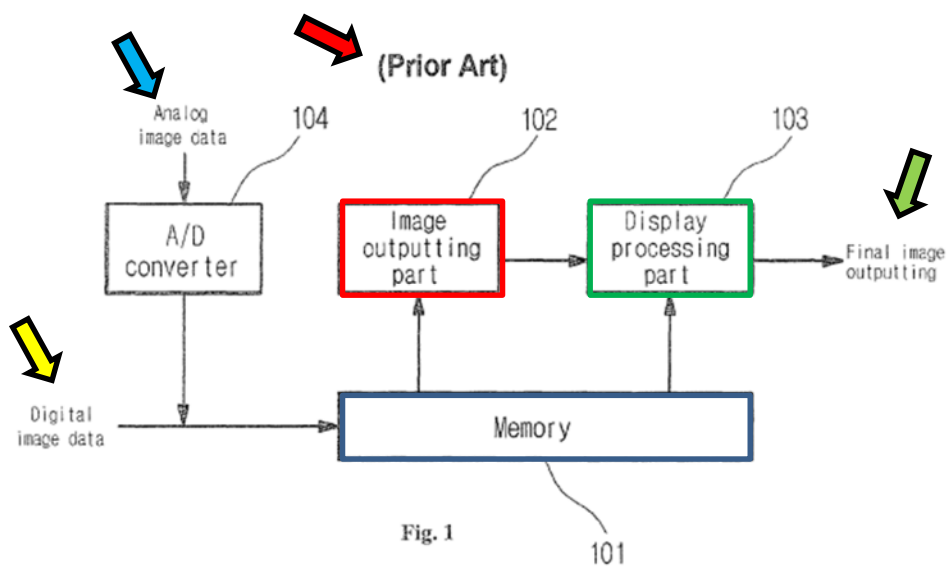
38. In this annotated version of FIG. 4, the red box indicates the display screen, which displays the “mixed result” obtained by mixing text data and image data. *Id.*, 2:34-36, 6:66-7:2, 8:35-37. The green box indicates the image data from

the television channel, and the blue and yellow arrows indicate text data mixed with the image data.

39. The '452 patent explains that it is seeking to address problems in the prior art. *Id.*, 3:40-43. FIG. 1 is labeled “Prior Art” and is referred to as “applicant’s admitted prior art” or “AAPA.” The main problem identified in connection with the AAPA is the memory requirement to convert text into different resolutions supported by digital televisions. *Id.*, 3:44-46. The way the '452 patent purports to remedy this is to add a data processing part to conventional, prior art digital televisions that includes a “format converter” and “bitmap compressor,” as shown below in FIG. 2 (juxtaposed with FIG. 1 for comparison with the prior art digital televisions):



Ex. 1001, FIG. 2 (annotated).



Ex. 1001, FIG. 1 (annotated).

40. With reference to annotated FIG. 1 and FIG. 2 above, the A/D converter 104, memory (blue box; 101 in FIG. 1 and 207 in FIG. 2), image outputting part (red box; 102 in FIG. 1 and 201 in FIG. 2), and display processing part (green box; 103 in FIG. 1 and 206 in FIG. 2) all function in an identical or substantially similar way both in the AAPA conventional image display device depicted in annotated FIG. 1 above and in the image display device according to an embodiment of the invention disclosed by the '452 patent as depicted in annotated FIG. 2 above.

41. As I mentioned earlier, the allegedly novel parts of the data processing part 210 (purple box) are a bit map converter 202 (brown box), bit map compressor 203 (orange box), bit map restorer 204 (gray box), and format converter 205 (pink box). *Id.*, 5:37-41. The '452 patent explains that the bit map converter 202 converts text data into bitmap data, although according to the '452 patent this was already known in the prior art. *Id.* at 2:29-31. Specific details of how the bit map converter 202 converts the text data into bit map data are not given in the '452 patent.

42. The bit map compressor 203 (orange box in annotated FIG. 2 above) compresses bitmap data for storage in memory. The bit map compressor uses a

“predetermined compression coding” to compress the bitmap for storage. *Id.*, 5:65-67, 4:29-31, 4:42-43, 7:31-33. One example of a “predetermined compression coding” identified in the ’452 patent is run-length encoding. *Id.*, 7:34-35, 6:1-2, 4:12-14. After the bit map data is compressed, the bitmap data is stored in memory 207. *Id.*, 6:13-15, 7:36-37.

43. The ’452 patent explains that the bit map decompressor 204 “reads the compressed bit map data from the memory 207” to restore it to the original bitmap data. *Id.*, 6:16-22, 7:38-40, 4:14-16, 4:31-33, 4:44-46. This decompression therefore simply inverts the compression done earlier. *Id.*, 6:19-22.

44. The ’452 patent focuses on the format converter 205 as key to the alleged novelty of its invention. The format converter resizes a bitmap in order to match output resolution to the resolution of the display. By generating a single bitmap, storing it in memory, and converting it to the resolution of the display, less memory is allegedly used. *Id.* at 6:35-40. One way the ’452 patent explains that the format converter resizes the bitmap is “by integrating [a] real number times to one of horizontal and vertical directions of the decompressed bit map data.” *Id.*, 4:21-24, 6:27-29, 7:45-47. The ’452 patent explains this process in more detail at 7:45 through 8:32, reciting, e.g., examples where the horizontal resolution is scaled by

1.78 and the vertical resolution is scaled by 1.5 and where the horizontal resolution is scaled by 2.67 and the vertical resolution is scaled 2.25. *Id.*, 8:17-24.

45. “[I]ntegrating [a] real number times to one of horizontal and vertical directions of the decompressed bit map data,” when reviewed in the context of the specification and the claim language would be understood by a POSITA to mean that the format converter 205 resizes or scales (1) the horizontal resolution, (2) the vertical resolution, or (3) both the horizontal and vertical resolutions of the decompressed bit map data by multiplying only the horizontal resolution, only the vertical resolution, or both the horizontal and vertical resolutions by a real number different from 1. If both the horizontal and vertical resolutions are to be adjusted, which the ‘452 patent explains is not necessarily required, the real number multipliers may be the same or different for the horizontal and vertical resolutions. This is commonly referred to as “resizing” or “scaling” the decompressed bit map data to convert it from one bit map resolution to another bit map resolution. See Ex. 1001 at 4:21-24; 6:27-29; 7:46-48; 8:56-60; and Table <1>.

46. The ‘452 patent explains “format conversion” as scaling a bit map data in memory to an appropriate resolution. In Table <1> the ‘452 patent gives exemplary numbers for the size of the bit map data in memory and the appropriate

scaling factors. *Id.*, 5:50-53, 6:27-39; 7:23-24.

Display Resolution	First Bit Map Data (720 × 480, H × 1:V × 1)	Second Bit Map Data (960 × 540)
1920 × 1080	1920 × 1080 (H × 2.67:V × 2.25)	1920 × 1080 (H × 2:V × 2)
1280 × 720	1280 × 720 (H × 1.78:V × 1.5)	1280 × 720 (H × 2:V × 2)
854 × 480	854 × 480 (H × 1.19:V × 1)	854 × 480 (H × 0.89:V × 0.89)
720 × 480	720 × 480 (H × 1:V × 1)	720 × 480 (H × 0.75:V × 0.89)

Ex. 1001 at Table 1 (annotations added).

47. So, for example, a first bit map data with resolution 720×480 has one set of scaling factors and the second bit map data of 960×540 has different scaling factors, as shown in Table <1>. *Id.*, 6:53-54. *Id.*, 7:48-50. The first column of Table <1> lists target display resolutions and the first row of Table <1> lists the bit map resolutions of the bit map data stored in the “first bit map data” and “second bit map data” of memory 207. The remaining entries in column 2 of Table <1> list out the horizontal and vertical scale factors (real numbers for “integrating” or multiplying times the horizontal or vertical directions of the decompressed bit map data) that may be used by the format converter 205 to convert the bit map resolution of the bit map data stored in the “first bit map data” (i.e., 720×480) into the bit map resolution of the display as listed in column 1. Similarly, the

remaining entries in column 3 of Table <1> list out the horizontal and vertical scale factors that may be used by the format converter 205 to convert the bit map resolution of the bit map data stored in the “second bit map data” (i.e., 960×540) into the bit map resolution of the display as listed in column 1. Many of these examples provide scaling in both the vertical and horizontal resolutions. However, scaling a 720×480 bit map to 854×480 requires scaling on the horizontal resolution by multiplying only the horizontal resolution by the real number 1.19. The vertical resolution remains unchanged.

48. This is consistent with the multiple references in the specification to “integrating real number times to either a horizontal direction or a vertical direction” and to “integrating real number times to one of horizontal and vertical directions.” Ex. 1001, claims 4, 18, and 22; 4:21-24; 7:45-47; 8:54-60, Table <1>. The specification of the ’452 patent further teaches that the format conversion performed by format converter 205 only needs to adjust the resolution in one direction. See Ex. 1001 at 4:21-24 (“The format converter can adjust the resolution by integrating real number times to one of horizontal and vertical directions of the decompressed bit map data.”); 6:27-29 (“The format conversion can be adjusted by integrating real number times to one of horizontal and vertical directions of the

decompressed bit map data.”); 7:46-48 (“The format conversion of the format converter 205 can be adjusted by integrating real number times to one of horizontal and vertical directions of the decompressed bit map data.”); 8:56-60 (“the conversion in format is carried out by integrating real number times to one of horizontal and vertical directions of the bit map data selected, such that the bit map data is adjusted in size to correspond with the resolution on the screen”); and Table I (resizing of a 720×480 bitmap to a 854×480 bitmap).

VI. BRIEF SUMMARY OF THE '452 PATENT PROSECUTION HISTORY

49. I have reviewed the prosecution history of the '452 patent, as well as the prosecution histories of the parent applications to the '452 patent, which are U.S. Pat. Appl. No. 11/374,112 and U.S. Pat. Appl. No. 09/922,863. The prosecution history does not contain any argument or discussion that I believe contradicts my opinions on patentability.

VII. CLAIM CONSTRUCTION

50. I understand that the claims of the '452 patent should be interpreted according to the plain and ordinary meaning as they would have been understood by a person of ordinary skill in the art in light of the claim language, the specification, and the prosecution history.

51. The language of the challenged claims is clear to a POSITA and is readily understood in light of the description in the patent and the prosecution history. I have applied the constructions and the understanding of a POSITA in evaluating the disclosure and claims of the '452 patent and the teachings of the prior art.

VIII. LEGAL STANDARDS FOR OBVIOUSNESS

52. I understand that a claim may be invalid under § 103(a) if the subject matter described by the claim as a whole would have been obvious to a hypothetical POSITA in view of a prior art reference, or in view of a combination of references at the time the claimed invention was made. I understand that the date the invention was made is often referred to as the priority or critical date. I understand that the prior art includes references that were known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the date the invention was allegedly made by the patent holder. For a printed publication to qualify as prior art, I understand that the Petitioners must demonstrate that the publication was disseminated or otherwise sufficiently accessible to the public.

53. I understand that the asserted claims of the patent should be read from the point of view of such a person at the time the claimed invention was made. I further understand that a hypothetical POSITA is assumed to know and to have all relevant prior art in the field of endeavor covered by the patent in suit and all analogous prior art. I understand that the standard for obviousness in an *inter partes* review proceeding is by a preponderance of the evidence, which means “more likely than not.” I understand this is the Petitioners’ burden to show.

54. I understand the preponderance of the evidence standard requires that a reasonable factfinder could find a material fact is more probable than the non-existence of that fact. It does not allow for speculation regarding specific facts and is instead focused on whether the evidence more likely than not demonstrates the existence or non-existence of specific material facts.

55. For TCL’s Petition, I understand that TCL has argued that the claims are obvious in view of certain prior art references.

56. I also understand that an analysis of whether a claimed invention would have been obvious should be considered in light of the scope and content of the prior art, the differences (if any) between the prior art and the claimed invention, and the level of ordinary skill in the pertinent art involved. I understand

as well that a prior art reference should be viewed as a whole. I understand that in considering whether an invention for a claimed combination would have been obvious, I may assess whether there are apparent reasons to combine known elements in the prior art in the manner claimed in view of interrelated teachings of multiple prior art references, the effects of demands known to the design community or present in the market place, and/or the background knowledge possessed by a POSITA.

57. It is my understanding that a patent claim is unpatentable as being obvious in view of prior art 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 alleged invention was made, to a POSITA to which said subject matter pertains. I further understand that an obviousness analysis takes into consideration factual inquiries such as the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the patent claim.

58. I understand that the U.S. Supreme Court has recognized several rationales for combining references and for modifying a reference as part of an obviousness analysis. These rationales include combining prior art elements

according to known methods to yield predictable results, simple substitution of a known element for another to obtain predictable results, a predictable use of prior art elements in accordance with their established functions, applying a known technique to improve a known device (or process) and yield predictable results, and choosing from a finite number of known predictable solutions with a reasonable expectation of success. It is further my understanding that an obviousness analysis takes into consideration whether the prior art provides a teaching, suggestion, or motivation to combine teachings of multiple prior art references to arrive at the patent claim.

59. I have also been informed that the claimed invention must be considered as a whole in analyzing obviousness or non-obviousness. In determining the differences between the prior art and the claims, the question under the obviousness inquiry is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.

60. Relatedly, I understand that it may be appropriate to consider whether there is evidence of a “teaching, suggestion, or motivation” to combine the prior art teachings in the prior art, the nature of the problem or the knowledge of a POSITA.

61. I understand that the claims of a patent are normally interpreted according to the plain and ordinary meaning as they would have been understood by a person of ordinary skill of the art in light of the claim language, the specification, and the prosecution history.

IX. THE PRIOR ART

62. I have been asked to provide my opinion whether certain pieces of prior art render obvious specific claims of the '452 patent. The references that I been asked to opine on are those asserted by the Petitioners in their petition for *inter partes* review, including:

- European Patent Application Pub. No. EP 0700211 (“Mitani,” Ex. 1003)
- Japanese Patent Publication JP-9-275563 (“Oku,” Ex. 1004)
- U.S. Patent No. 5,734,436 (“Abe,” Ex. 1005)

63. For the reasons I discuss below, it is my opinion that these prior art references invalidate the challenged claims of the '452 patent.

A. Summary of the Relevant Teachings of Mitani

64. I have been informed that Ex. 1003, entitled “Text Broadcast and Teletext Decoding Device,” European Patent Application Publication EP 070021

(“Mitani”), is prior art to the ’452 patent. I have also been informed that Mitani was not cited or considered during prosecution of the ’452 patent.

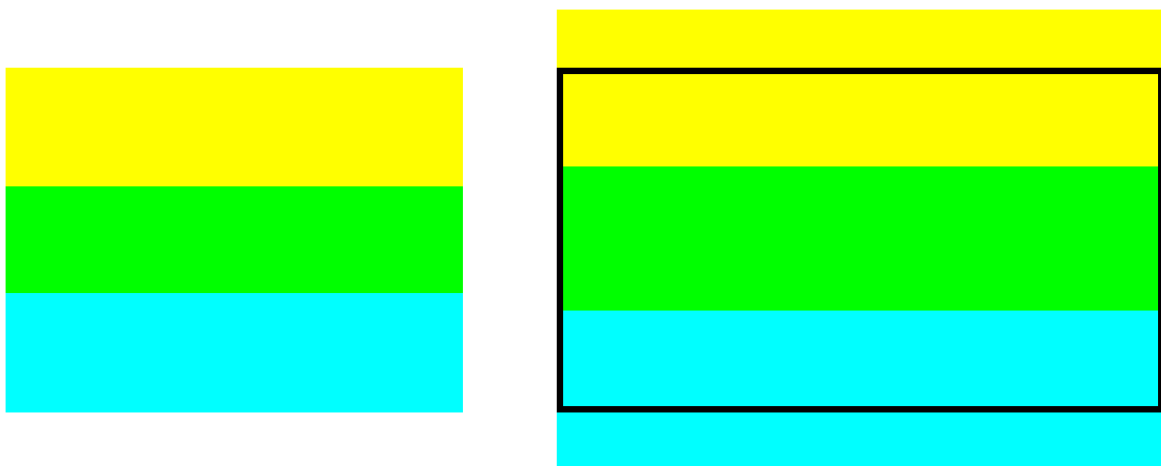
65. Mitani discloses a device for displaying teletext data on a television display screen. Ex. 1003, Abstract. In teletext, characters may be sent as codes that represent letters, but which must be converted into bitmap data (an “image”) at the receiver. Mitani includes a table of codes that shows, for example, in Fig. 10 the letter “A” which corresponds to the binary code 1000001 (decimal 65) and the letter “a” corresponding to the binary code 1100001 (decimal 97), the same as the ASCII codes I identified earlier:

FIG.10
(PRIOR ART)

				b6	0	0	0	0	1	1	1	1
				b5	0	0	1	1	0	0	1	1
				b4	0	1	0	1	0	1	0	0
				COLUMN								
b3	b2	b1	b0	ROW	0	1	2	3	4	5	6	7
0	0	0	0	0			SP	0	@	P		p
0	0	0	1	1			!	1	A	Q	a	q
0	0	1	0	2			"	2	B	R	b	r
0	0	1	1	3			#	3	C	S	c	s
0	1	0	0	4			¥	4	D	T	d	t
0	1	0	1	5			%	5	E	U	e	u
0	1	1	0	6			&	6	F	V	f	v
0	1	1	1	7			'	7	G	W	g	w
1	0	0	0	8			(	8	H	X	h	x
1	0	0	1	9			)	9	I	Y	i	y
1	0	1	0	10			*	:	J	Z	j	z
1	0	1	1	11			+	;	K	[	k	
1	1	0	0	12			,	<	L	'	l	
1	1	0	1	13			-	=	M	]	m	
1	1	1	0	14			.	>	N	^	n	—
1	1	1	1	15			/	?	O	—	o	DEL

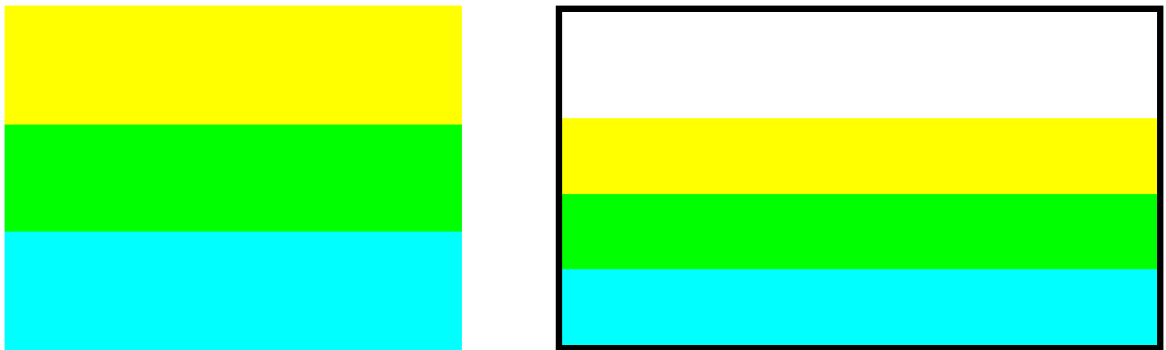
Ex. 1003, FIG. 10.

66. Mitani explains that when “a wide-aspect monitor” or “wide [screen] television receiver” is used, some of the text may not be displayed properly. *Id.*, 26:5-26. A POSITA would understand this is because an NTSC-standard TV signal displays 480 lines of video per frame, but that this actually consists of two 240-line sets, called “fields,” of alternating lines that are “interlaced.” *Id.*, 26:22-27. Teletext in Mitani displays text in columns 250 dots high and, if the user opts to enlarge the image to fill the wide-screen display, then some portions of the 240-line sets will be clipped off the top or bottom of the screen. I have prepared the following illustration, which shows a representation of a full page of teletext data on the left, with colored bands indicating the top third (yellow), middle (green), and bottom third (blue) of the data, and the clipped portions when the image is shown enlarged on a widescreen display:



(Havlicek Figure 3)

67. Mitani solves this problem by generating a “1/2-format image display.” This “1/2-format image display” reduces the text data image “vertically by a factor of 2.” *Id.*, 26:55. In other words, this aspect of Mitani resizes (or “format converts”) the text data image to correspond with display resolution. Mitani converts the format by taking the 250 lines of image data and splitting them between the two interlaced “fields.” This reduces the height of the text data image by a factor of two, which allows the text image data to fit in a smaller number of lines when the image is enlarged on the screen:



(Havlicek Figure 4)

68. Mitani explains the “1/2 format image display” adjusts the image to make it able to fit on a television display depending on the resolution:

In teletext systems, a page of 250 dots in a column by 480 dots in a row is displayed. In the television system NTSC (National Television

System Committee Color System) which uses about 240 effective scanning lines per field, a teletext image can be displayed on a television receiver. *In case of superimposing a subtitle page on a television picture on the screen of wide television receiver which may change the width and height of its screen image, the above-mentioned display area of 250 dots in a column x 480 dots in a row cannot be assured if the television picture is enlarged.* In this case, a user cannot obtain the correct teletext information.

Ex. 1003, 26:22-27 (emphasis added).

69. A POSITA would understand this to refer to the ability of widescreen televisions at the time to display an ordinary broadcast image in one of several modes, such as those shown in Mitani FIG. 25:

FIG.25A

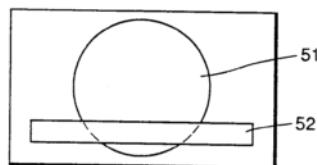


FIG.25B

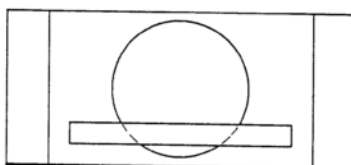


FIG.25C

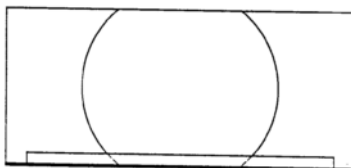
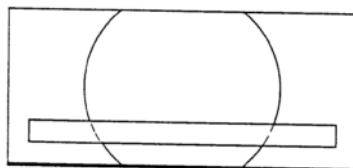


FIG.25D

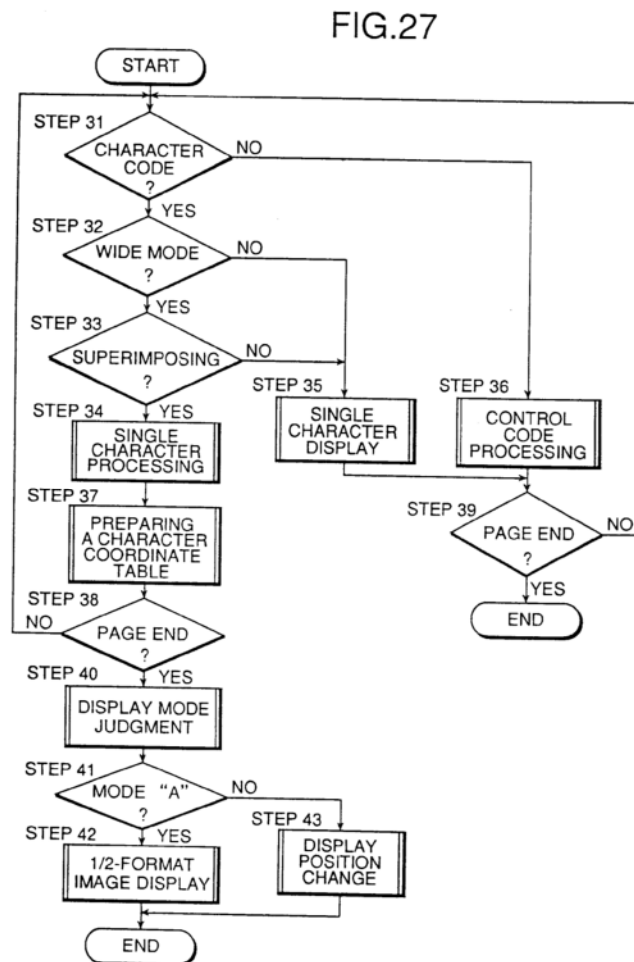


Ex. 1003, FIG. 25; *see id.*, 26:5-9.

70. Here the ordinary broadcast source image is shown in FIG. 25A with superimposed text data represented by box 52. *Id.* 26:8-9 (“Numeral 51 designates an ordinary television picture image and numeral 52 designates a display area for teletext page data according to the present invention”). When that image is displayed on a widescreen display without format conversion, it is shown as in

FIG. 25B. FIG. 25C illustrates what would happen if the image (FIG. 25A) were enlarged to fill the widescreen display; the box 52, representing text data, is clipped off the bottom edge of the screen.

71. The algorithm for the “1/2-format image display” is described principally at 26:37-27:10 and shown at Step 42 in FIG. 27:



Ex. 1003, FIG. 27.

72. In this mode Mitani describes processing each character code (step 31, “character code?” YES) depending on the screen display mode. In an ordinary screen display mode (step 32, wide mode? NO) ordinary character display occurs. In a widescreen superimposing display mode (step 32, wide mode? YES; step 33, superimposing? YES), the individual characters are converted into bitmap data in an image memory (step 34, single character processing): “A character is decoded and *the character font data is written into an image memory* but it is not displayed.” Ex. 1003 at 26:45 (emphasis added).

73. The character conversion process for teletext processes a character by retrieving a character image (i.e., bit map data representing the character according to a particular font) from a CG-ROM. “The character codes are transferred to the CG-ROM reading control portion 19 whereby dot patterns each representing actual characters corresponding to the received character codes are outputted. These dot-pattern data sets are usually sent to the teletext display control portion 56 wherein they are processed to form image signals to be displayed in the full-screen still-display mode or scroll display mode.” *Id.* at 20:22-23; 21:15-16; 21:58-22:3. A POSITA would understand this converts character codes into bitmap data because a dot pattern is the same as a sequence of bits representing dots (or “pixels”) on a

screen. At the same time the algorithm creates a table that includes a special code indicating each row of the page that has a character. *Id.* at 26:45-53.¹ Once the full page of teletext is done, the processing continues to determine whether the teletext needs to be repositioned or resized (step 40, display mode judgment).

¹ Mitani has an error in its description of forming the table, which would be readily apparent to a POSITA. Mitani determines the row on which a character is found by dividing the pixel coordinate by 12, which should be the height of the character bitmap. Ex. 1003, 26:45-53. However, 12 is not the height of the character bitmap in Mitani's teletext embodiment—rather, it is the height of the character bitmap in the *text-broadcast* embodiment. *Id.* at 15:44-47, FIG. 15A, 19:46-47. In the teletext embodiment character bitmaps are 12 dots wide by 10 dots high. *Id.*, 22:52-58. The correct math at 26:45-53 should therefore not be $120 \text{ (position)} / 12 \text{ (character height)} = 10\text{th row}$, but should instead be $120 \text{ (position)} / 10 \text{ (character height)} = 12\text{th row}$. Mitani's specification appears to have carelessly carried-over the dot heights from the text-broadcast embodiment. In any event, whatever character bitmap dimensions were used a POSITA would know how to implement the algorithm based on Mitani's description.

74. The display mode judgment section determines whether there are any characters in the top third, middle, and bottom third of the image, as I showed above in Havlicek Figure 3. If there is text in the top third (yellow) only, then text display “Mode B” is designated, if there is text in the bottom third (blue) only, then text display “Mode C” is designated, and otherwise text display “Mode A” is designated, according to the flow chart in FIG. 35.

75. If “display mode judgement” (FIG. 27 step 40) designates “mode A” (FIG. 27 step 41, mode “A”? YES) then the image in image memory is resized and displayed at half-size vertically and full-size horizontally, thereby reformatting the text to conform with the resolution of the display (in the language of the ’452 patent, this is “H x 1; V x 0.5” format conversion, see Ex. 1001 at 7:45-8:24). More specifically, “[t]he 1/2-format image display is such that 250 dots in vertical direction are distributed one by one to even field and odd field and interlaced so that an image is reduced vertically by a factor of 2.” Ex. 1003, 26:54-55.

76. A POSITA would understand the interlacing to mean that every other row of dots in the teletext image is allocated to either an odd field or an even field for display, such that the 250 rows of dots in the teletext image are displayed on only 250 scan lines out of the 480 available on the NTSC display. A POSITA

would understand that this reduces the image vertically by a factor of 2 because, otherwise, each of the 250 rows of dots in the teletext image would be allocated to both the even and the odd scan lines. This approach was known in the art in, for example, U.S. Pat. No. 5,109,279 to Ando, et al. (Ex. 1013), which describes rendering a half-height image by rendering each row of the bitmap to alternating even and odd scan lines:

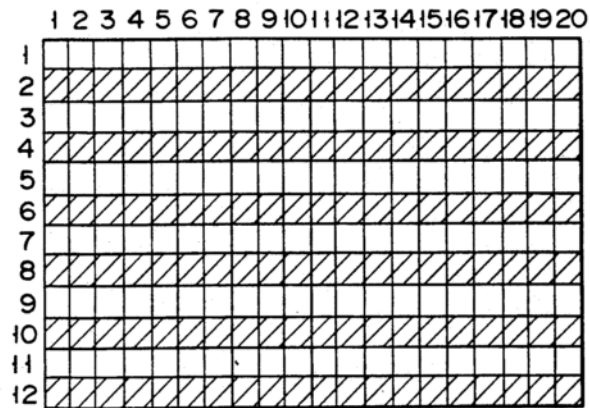


FIG. 5A

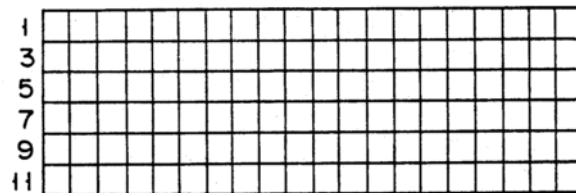


FIG. 5B

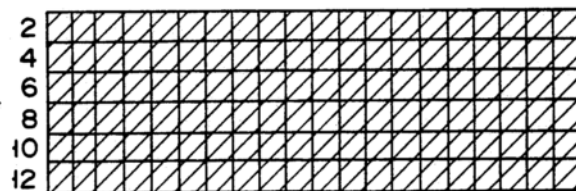


FIG. 5C

Ex. 1013, Figs. 5A-5C; *id.* at 5:61-7:2.

77. This signal is then combined with the image data to be displayed by superimposing on image data. Ex. 1003, 21:31-36.

B. Summary of the Relevant Teachings of Oku

78. I have been informed that Ex. 1004, entitled “Decompression Device for Compressed Image Data Having OSD Function and OSD Data Compression Method Used Therefor,” Japanese Patent Application Number JP-9-275563 (“Oku”), is prior art to the ’452 patent. I have also been informed that Oku was not cited or considered during prosecution of the ’452 patent.

79. Oku receives a digital signal that includes on-screen display data that can have characters and graphics: “an OSD (On Screen Display) method that overlays and displays characters and graphics on the decoded image,” Ex. 1004 at ¶ [0008]. This is done on decoded compressed image data. *Id.* at ¶ [0036]: “in addition to decoding compressed image data, overlay and display of characters and graphics are performed on the decoded image.” The image data and bitmap data are both saved into a memory in Oku, memory 13, as part of this processing. *Id.*, at ¶ [0014].

80. Oku explicitly describes OSD data, *i.e.* bitmaps, in a received signal: *Id.*, at ¶ [0023] (“OSD data are received in the form of a bitmap from the outside.”). Oku describes using a compression circuit to reduce the size of the bitmap data before storing it in memory. The compression circuit is called “OSD

compression circuit 15” and specifically compresses OSD data, which can be bitmap graphical data or bitmap text data. *Id.*, ¶ [0023] (“OSD data compression circuit 15 is comprised therein, OSD data are received in the form of a bitmap from the outside, and the data are compressed by the OSD data compression circuit 15 and written in the memory 13”). There is a matching decompression circuit that restores the original bitmap data. *Id.* at ¶ [0022].

81. Oku’s display can support a few different resolutions for an image. For example, Oku in one claim refers to “image data having a maximum size of 576 vertical lines” — which I understand to refer to 576 *rows* since this was a well-known resolution in the art — “and 720 horizontal pixels.” Ex. 1004, claim 2. Elsewhere, Oku refers to resolutions of 480 vertical lines by 720 horizontal pixels, or 240 vertical lines by 360 horizontal pixels, or 288 vertical lines by 360 horizontal pixels. *Id.* at ¶ [0003]. From this a POSITA would understand that Oku’s display supports the ability to display an image having different numbers of pixels.

C. Summary of the Relevant Teachings of Abe

82. I have been informed that Ex. 1005, entitled “Television Receiving Set Having Text Displaying Feature,” U.S. Patent Number 5,734,436 (“Abe”), is

prior art to the '452 patent. I have also been informed that Abe was not cited or considered during prosecution of the '452 patent.

83. Abe describes a television that can display characters and graphics from a teletext/data transmission decoder and is configured to display the text differently depending on the display mode of the television. Ex. 1005, at Abstract. The display uses one of several well-known display resolutions, which include NTSC resolution, Ex. 1005, at 2:10-24, and EDTV2 resolution. *Id.*, 2:20-24. NTSC, which is a conventional analog display technology used in the United States and other places, has a width/height ratio of 4:3. EDTV (“Enhanced Definition Television”), on the other hand has a vertical resolution of 480 or 576 lines and can be used to show wide-screen images with an aspect ratio of 16:9.

84. When text data is received, the text data is converted into a bitmap in memory:

As the viewer specifies a teletext program by operating the TV remote control, the CPU 27 comes under the control of the program stored in the program ROM 28 for teletext programs. Then, *the transmitted character data are converted into display data by the character font*

ROM 29 and stored in the display memory 32 by way of the display control section 31.

Id. at 7:60-67.

85. After being written to memory the contents are read out and “synthesized” to be combined with the image data in the received television signal. A POSITA would understand that “synthesis” in this context refers to combining the text data and image data for simultaneous display on a common display screen. In order to perform this synthesis the memory contents may be converted from a digital signal to an analog signal for combination with the received television signal and display on a display screen. *Id.* at 7:19-29. Abe also notes that, “[d]epending on the interface of the display apparatus,” the signal does not necessarily need to be converted into an analog signal. *Id.*, 7:29-32. A POSITA would understand this to mean that the digital bitmap signal could be synthetically combined with a digital TV video signal. This is because the synthetic combination still has to happen to overlay the text on video, and in order for the bitmap and the video image to be combined, they need to be of the same type--either both digital or both analog.

86. Abe states that the characters and graphics that are generated “can be dimensionally enlarged or reduced at will.” *Id.* at 9:59-60. One specific way that Abe determines whether to enlarge or reduce the image is

characters and graphics can be dimensionally enlarged or reduced at will.

While FIG. 8A shows the ordinary font size for characters to be displayed in the blank zone, a larger or smaller font may be used for them as shown in FIG. 8B. Additionally, characters and graphics on the blank zones may be scrolled up or down for updating as shown in FIG. 8C.

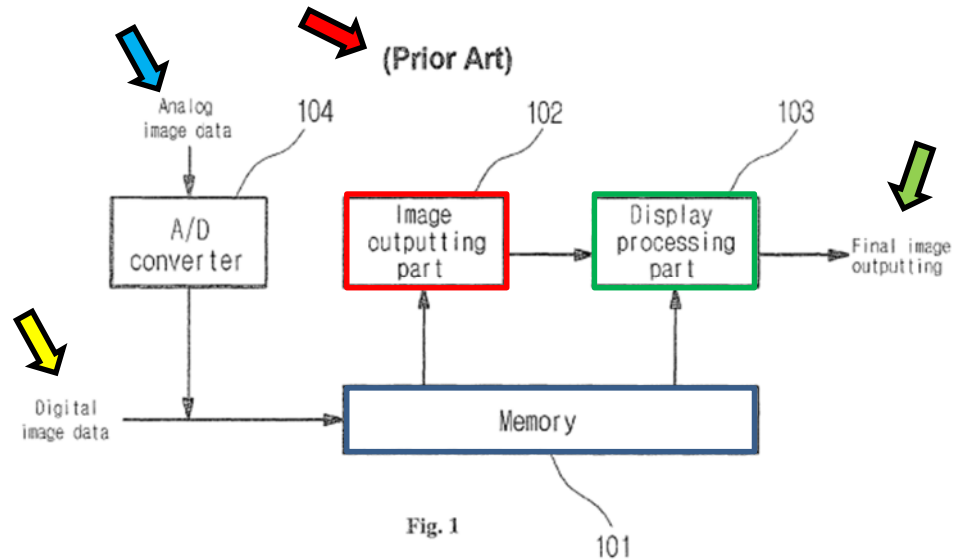
Id. at 9:59-65.

87. A POSITA would understand that changing the font size may be accomplished by format converting (“resizing”) the horizontal and vertical pixel dimensions of the text bitmap data using the enlargement processing section 142 shown in FIG. 5. *Id.* at 9:59-67, FIG. 5.

D. Summary of the ’452 Patent’s Conventional Image Display Device (Applicant Admitted Prior Art)

88. The ’452 patent describes its alleged invention in contrast to a “conventional image display device in a digital TV” shown in FIG. 1. *Id.*, 2:12-3:36. FIG. 1 is prominently labeled “**Prior Art**” (annotated below with a red arrow). I have been informed that this “conventional image display device in a

digital TV” is Applicant Admitted Prior Art (AAPA) and I have considered it as such for the purposes of my analysis.



Ex. 1001, FIG. 1 (annotated).

89. In the AAPA, digital broadcast text data and image data is received (yellow arrow above), decoded, and stored in memory 101 (blue box above). *Id.*, 2:23-28. The '452 patent further explains that “[b]efore storing in the memory 101, at this time, each of the text data and the image data may be converted into bit map data,” although this is not shown in FIG. 1. *Id.*, 2:29-31.

90. The '452 patent clearly states that the text and image data read *out* of memory 101 (blue box above) for display *are* bit map data: “the display processing

part 103 [green box above] mixes **the text data (i.e., bit map data)** read from the memory 101 [blue box above] and **the image data (i.e., bit map data)** and outputs the mixed result [green arrow above] on the predetermined display screen.” *Id.*, 2:40-43 (emphasis added). This confirms that the text data has been converted into a bitmap. The display processing part 103 then mixes the image data (i.e., bit map data) from the image outputting part 102 and the text data (i.e., bit map data) from memory 101 to output (green arrow above) on a display screen. *Id.*, 2:17-19, 2:32-36.

91. Because the '452 patent specifies at 2:40-42 that the text data and the image data as stored in memory 101 (blue box above) *are* bit map data, a POSITA would understand the statement “each of the text data and the image data may be converted into bit map data” (*Id.*, 2:29-31) to mean that the AAPA conventional image display device would, upon receiving any text data or image data in a format *other than* bit map data, convert that text data or image data into bit map data for storage in memory 101. Thus, a POSITA would understand that if the AAPA conventional image display device were to receive text data as, for example, ASCII character codes, then that text data would be converted into bit map data and would be stored in memory 101 (blue box above) as bit map data. In the specification and

claims of the '452 patent, this operation of converting text data from some other format such as ASCII character codes into bit map data is referred to as *bit map conversion* (see *Id.*, Abstract, 3:63, 3:67, 5:38, 9:52-53, 9:56).

92. At 2:54-3:36, the '452 patent identifies two alleged problems with the conventional digital TV comprising the AAPA conventional image display device of FIG. 1. First, the '452 patent alleges that the AAPA conventional image display device “does not have any function” (*Id.*, 2:65) to convert “the text data into the display format according to the variation of resolution.” Thus, according to the '452 patent, in order to have a capability of displaying the text data at a resolution which corresponds to the current display resolution, the AAPA conventional image display device must store the text data in memory 101 (blue box in annotated FIG. 1 above) in bit map format multiple times – once for each resolution that might be needed for display. *Id.*, 2:66-3:3, 3:29-33. Second, the '452 patent alleges that the AAPA conventional image display device stores the bit map data in memory 101 without compression, thus requiring a large memory space. *Id.*, 3:34-36.

93. More specifically, the '452 patent explains that the conventional digital TV “can handle” images having a variety of interlaced and progressive frame rates (including 24 Hz, 30 Hz, 60 Hz, and so on) and can display images

having resolutions of 720×480, 854×480, 1280×720, and 1920×1080. *Id.*, 2:54-58.

The '452 patent then states that, in order to support these various display resolutions, “the image data and the text data should be convertible according to variation of the resolution.” *Id.*, 2:59-61.

94. The '452 patent then states that the AAPA “conventional image display device *can* convert **the image data** into display format according to the variation of resolution and display it” (*Id.*, 2:63-64, emphasis added), but alleges that the AAPA conventional image display device can *not* convert “**the text data** into the display format according to the variation of resolution.” *Id.*, 2:64-66 (emphasis added). Since the '452 patent previously stated at 2:29-31 that the AAPA conventional image display device *is* capable of converting the text data into bit map data, ostensibly at arbitrary resolutions, a POSITA would understand the alleged deficiency (*cannot* convert “the text data into the display format according to the variation of resolution”, *Id.*, 2:64-66) to mean that, allegedly, the AAPA conventional image display device is unable to convert the bit map data associated with the text data from one (bit map) resolution to another (bit map) resolution. However, it should be noted that such conversion of bit map data from one resolution to another resolution was well-known in the art at the time (as

described, e.g., by Abe, Ex. 1005 at 9:57-63) and was generally referred to as *resizing* or *scaling*. A POSITA would appreciate the fact that once the text data is converted into a bitmap, the resulting text bitmap data is a 2D array of pixel values, viz. *a digital image*, such that standard image processing operations could be applied to it.² In particular, a POSITA would be familiar with numerous well-

² The fact that a POSTIA would understand text *bit map data* to be an *image* is confirmed by, e.g., Ex. 1022, p. 818 (“In the digital network world, documents are usually distributed in either text file *or image format*, where the former is a sequence of character codes (e.g., ASCII) and *the latter is a bitmap*”) (emphasis added); Ex. 1023, p. 324 (“An *image object I* consists of a *body B* and a *header H*. *The body is a binary bitmap image*. The header is a metadata that describes the content of the image”) (emphasis added); *id.*, p. 329 (“*The images are 256-color bitmaps* with a variety of contents”) (emphasis added); Ex. 1024 p. 191 (“This paper proposes that *bitmaps, or raster images*, should be given full citizenship in the world of computer science”) (emphasis added); Ex. 1025, p. 285 (“In this paper, an approach is presented for the analysis and retrieval of images (we will refer to examples of both graphic and *bit-map images*)”) (emphasis added); Ex.

known techniques that were widely used at the time to scale (i.e., *resize*) such an image or “bit map data” from one resolution to another resolution. Ex. 1018 at 182-183 (“The transformations can, in general, include a translation, *scaling*, rotation, and an additional clipping operation”; “The *scaling* needed to *enlarge* an image is trivially accomplished by repeating pixel values from within the window”; “Figure 4.28 shows the effect of *scaling up a letter* and adjoining line by a factor of 2”) (emphasis added); *id.* at 821-826 (“Suppose we wish to *scale* an image by a factor p/q (where $p > q$, and p and q are integers with no common factors)...”) (emphasis added); Ex. 1019 at 187 (“A *scaling transformation alters the size of an object.*”; “*Any positive numeric values can be assigned to the scaling factors s_x and s_y . Values less than 1 reduce the size of objects; values greater than 1 produce an enlargement.*”) (emphasis added); Ex. 1020 at p. 565 (“*resampling the original images is very much desired in order improve the resolution*”) (emphasis added); *id.* (“Typically, there are two different processes of converting one sampling rate to another depending on whether the sampling rate

1026, p. 138 (“A *bitmap* is a dot-matrix representation of a rectangular *image*”) (emphasis added).

conversion obtained results in a higher sampling rate than the original sampling rate, in which case the process is generally called *interpolation*, or lower than the original sampling rate and referred to as *decimation*. These techniques *are becoming common place tools* for many applications”) (emphasis added); *id.*, p. 566 (“*Currently, several interpolation functions are in use* for image resampling... The simplest of these is *the nearest neighbour function*... [a]nother function frequently used is *bilinear interpolation*... [m]ore elaborate functions... are also in use. The *cubic interpolation* and *B-spline functions*... are representatives...” (emphasis added); Ex. 1021, p. 901, referring to “*Traditional image interpolation methods*” (emphasis added) including “Linear interpolation,” “bicubic interpolation,” and “splines.”

95. The '452 patent then states that, as a result of the alleged inability to convert the bit maps associated with text data from one resolution to another resolution, the AAPA conventional image display device “has to store the bit map data corresponding to the kinds of the resolution, in order to display the image according to each resolution, and the bit map data has a substantially large data size as the resolution is high.” Ex. 1001, 3:29-33.

96. In other words, according to the '452 patent the AAPA conventional image display device must store the text data in memory in bit map format at different bit map resolutions in order to be able “to display the image according to each resolution” (*Id.*, 3:31-32), thus using a large amount of memory. *Id.* at 3:32-33.

97. The '452 patent then states a second alleged problem with the AAPA conventional image display device: “[a]dditionally, the bit map data in the conventional image display device is not compressed, thereby resulting in the occupation of a large memory space.” *Id.*, 3:34-36.

X. GROUND 1: CLAIMS 1-3, 5-17, 19-21, AND 23 OF THE '452 PATENT WOULD HAVE BEEN OBVIOUS OVER THE COMBINATION OF MITANI AND OKU

98. It is my opinion that Claims 1-3, 5-17, 19-21, and 23 of the '452 patent would have been obvious over the combination of Mitani and Oku. I discuss below how each limitation is disclosed in the combination of these two references.

99. Mitani teaches a TV that receives analog video signals. However, in view of, e.g., Exs. 1010, 1011, a POSITA would have recognized that analog television signals were becoming obsolete and would have understood that a television that could only process analog signals would cease to be commercially

competitive. A skilled artisan would realize that digital televisions had been developed in the field and would consult that art in adapting the television in Mitani to work with digital television signals. A POSITA would recognize that in a digital television the ability to process and display text that is transmitted alongside image data, as in Mitani, would still be useful because digital standards for television retain closed caption and subtitle data and Mitani would help improve legibility of that text with changing display resolution.

100. Mitani and Oku are both references from the same field of television art. Mitani is a technology to separate a received signal into analog video (image) data and digital text data, convert character codes into bitmap data, adjust the size of the text bit map data based on display resolution, and mix the text bit map data with the video images to display on the screen. Oku is a digital technology to separate received digital television signals into digital video data and digital OSD data, which can be text or graphics. The OSD data is mixed with the video image data and is displayed. The combination of Mitani and Oku is therefore just the substitution of a digital video processing circuit in Oku for the analog video processing circuit in Mitani. Each performs its ordinary role in the combination.

101. Both Mitani and Oku are from the same field, television, and both specifically relate to techniques for displaying text or graphics data together with video images on a television display screen — that is, enhancing a television experience through the display of supplemental information. In Mitani this supplemental information is teletext data or text-broadcast data, while in Oku it is on screen display data. Both teletext data and on screen display data are text or graphics information displayed on screen to supplement the video information already being shown. The two references solve different problems: in Mitani, how to display text at different locations on display images that may have different resolutions, and in Oku, how to display text on a display image in a digital television with a single limited memory. These are complementary references, and a person of ordinary skill would have been motivated to combine them by the impending transition to digital television and would have sought to keep the advantages of both.

102. A POSITA would be motivated to combine Mitani with Oku to enable the television in Mitani to display digital instead of analog video signals. Digital video promised much better resolution and quality using lower bandwidth, and so could fairly be hailed as a strictly superior technology that was already widely

known and adopted. Indeed, the '452 patent acknowledged that the “digital revolution” was well underway, as the patent acknowledges. Ex. 1001, 1:21-23, 1:28-32. A POSITA would recognize that market forces would prompt the use of digital video processing in place of analog video processing in any application where it could be done. A POSITA would therefore reasonably consider digital technology, like Oku, to update Mitani to work with the most current and best-performing technologies.

103. Market forces would have led a POSITA to combine Mitani and Oku. At the time of the '452 patent analog television was still being used, but it was being phased out. The US government determined that analog transmission in the US would be terminated in order to make more efficient use of radio spectrum using digital transmission. From this a POSITA would know that analog televisions would not be successful commercially and a television would need to be digital to be attractive to consumers. Digital video processing had already become widespread in the same field of endeavor—*i.e.* consumer televisions—and a POSITA would recognize that an analog TV set in that field of endeavor could be modified to use the same technology and, indeed, would need to be capable of

receiving and displaying digital television signals to remain commercially competitive.

104. This combination would also be obvious to try as there were only a small number—in fact, only two—of broadcast technologies in wide use in the US at the time: analog transmission and digital transmission. Market forces would encourage updating known text-processing techniques to work with modern digital televisions because it would be obvious to try using techniques that had reasonable claims to utility in analog technologies, like Mitani, with digital technologies, like Oku.

105. Oku has a digital television processing pipeline that a POSITA would recognize could readily be combined with Mitani. Mitani incorporates analog signal processing in “TV signal processing circuit 11,” which could be replaced with digital signal processing from Oku. Like analog signal processing, digital signal processing receives an input signal and generates an output signal for display on a television.

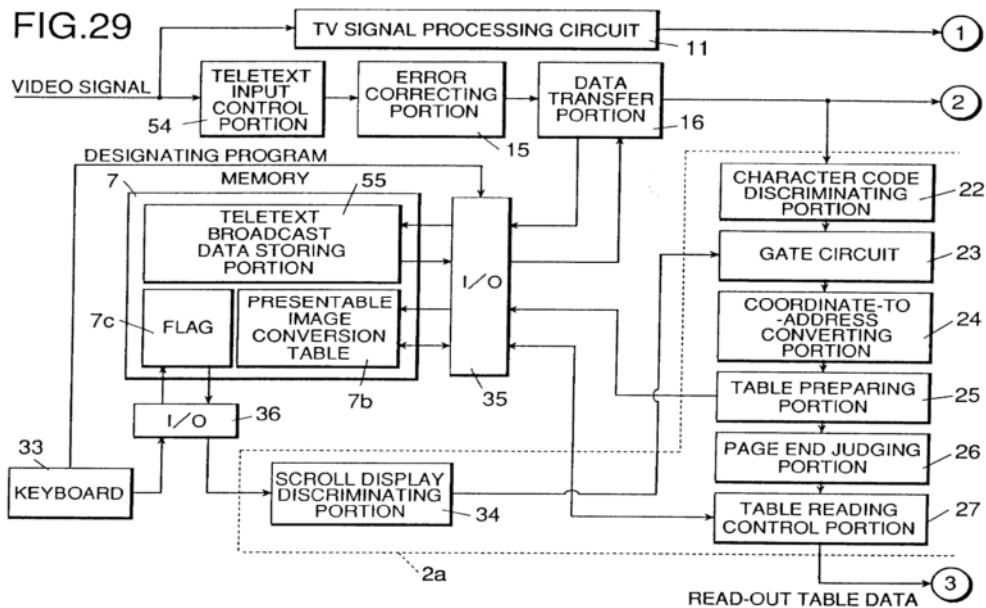
106. A person having skill in the art would seek to combine the text processing in Mitani with the digital image processing and text compression of Oku. This is because Oku teaches the receipt and processing of text and graphics as

bit map data, but not the converting of text character codes into bit map data.

Notably, in the U.S. digital transmission still uses text closed captions and text subtitles that may be encoded using character codes, and so a digital television destined for that market would need to have the ability to convert text character codes into bit map data, a feature that is not expressed in Oku. Nor would a POSITA have any reason to believe that the digital transition would remove closed captions or subtitles. Therefore a POSITA would recognize that Mitani would be useful in a digital television, even if teletext was not specifically being used.

107. This combination would be well within the capabilities of a POSITA. As can be seen in Mitani, the video processing is done separately from the text processing, and a skilled artisan would therefore find it reasonable to try to simply replace the (analog) video signal processing in Mitani with the digital video signal processing of Oku.

108. The TV signal processing circuit 11 in Mitani is a separate element, as shown in FIG. 29:



Ex. 1003, FIG. 29.

109. The decoder shown in Oku could readily be inserted in place of the TV signal processing circuit 11 of Mitani, thereby enabling a digital video signal to be received as the “encoding data” in FIG. 2 of Oku and to be processed as in Oku:

memory that could store the bitmap data in Mitani could store the image data in Oku equally well, in particular based on the disclosure that the memory in Oku was “general-purpose.” Ex. 1004, ¶ [0007]. The combination would merely have led a POSITA to combine Mitani’s memory storing bitmap data and Oku’s memory storing image data. The memory would behave as expected to store the appropriate data received from the various components of Mitani and Oku.

111. A POSITA would also be motivated to combine Oku’s compression and decompression with Mitani. Both Mitani and Oku each have only a single writeable, random access memory (RAM); Mitani has memory 7 shown in FIG. 29 and Oku has memory 13 shown in FIG. 2. A POSITA would recognize that the memory in Mitani would be unlikely to be large enough to simultaneously store the teletext bitmap data as well as the digital video images including *reference images* needed to decode and display digital video data (see Ex. 1004, [Claim 1], ¶¶ [0004-5]), because Mitani does not store analog video data in the memory and the digitized video data in FIG. 17A is also not stored in memory. There would be no reason for the memory to be any larger than what is required. Moreover, Oku teaches that, at the time of the invention, “constructing the decoding device within

the memory capacity range of 16 Mbit is *important in terms of cost.*” Ex. 1004, ¶ [0006], emphasis added.

112. Oku teaches that a standard memory is not large enough to store both decoded digital image data and OSD bitmap data:

On the other hand, an OSD (On Screen Display) method that overlays and displays characters and graphics on the decoded image is effective as a user interface of a decoding device for compressed image data.

However, in order to realize such an OSD, a new memory area is required; so that in the case of an image corresponding to the PAL method having a large image size as described above, it exceeds the frame of a 16 Mbit general-purpose memory.

Ex. 1004, ¶ [0008].

113. Oku also teaches that in order to solve this problem, compression and decompression allows the single standard memory to be used to store both digital video image data and OSD bitmap data (comprising text characters and graphics) at the same time:

To solve the above-mentioned problem, the object of the present invention is to provide a decompression device for compressed image

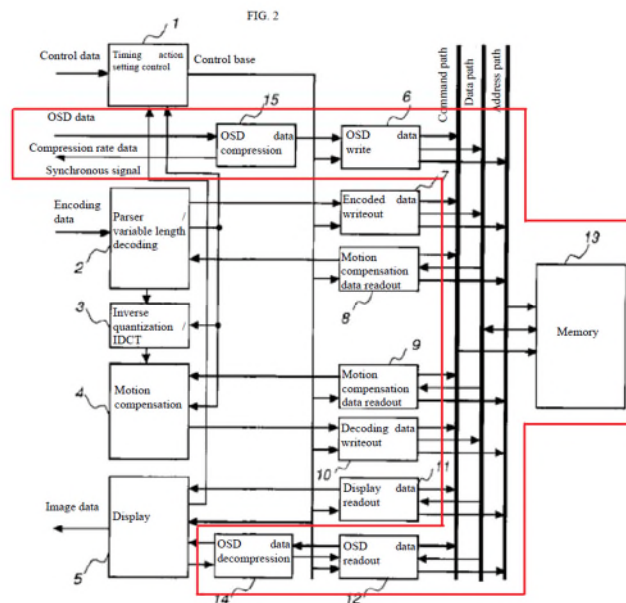
data having OSD function that that secures a memory area for OSD data in a 16Mbit capacity frame and has an OSD function, and an OSD data compression method used therefor.

Id., ¶ [0009].

114. Thus, a POSITA would understand that the compression and decompression circuits in Oku are a necessary part of Oku that must be kept when combined with Mitani in order to ensure that the memory can store both the digital video image data and the teletext or text-broadcast bitmap data. Combining the compressor and decompressor of Oku would also provide the benefit that the memory in Oku could be more efficiently used, which would reduce the cost of the device and improve its competitiveness in the marketplace. Oku implicitly teaches that this approach is preferable to simply adding more memory, because it favors adding a compressor to adding more memory. A POSITA would recognize the common problem from digital design of trading-off computational power against memory. That is, by using a higher-performance processor the need for a larger memory can be obviated by using a technique like compression.

115. A POSITA would have a reasonable expectation of success in combining Oku's compressor with Mitani and Oku. A POSITA would be certain

that the compressor and decompressor would work with the digital processing in Oku because they are part of Oku's disclosure. A POSITA would recognize that to combine the compressor and decompressor with bitmap conversion and format conversion in Mitani, all that would be necessary would be to direct memory reads and writes in Mitani to the OSD data compression circuit 15 and OSD data decompression circuit 14 shown in Oku's FIG. 2, in exactly the same way that Oku directs OSD bitmap writes and reads to those circuits.

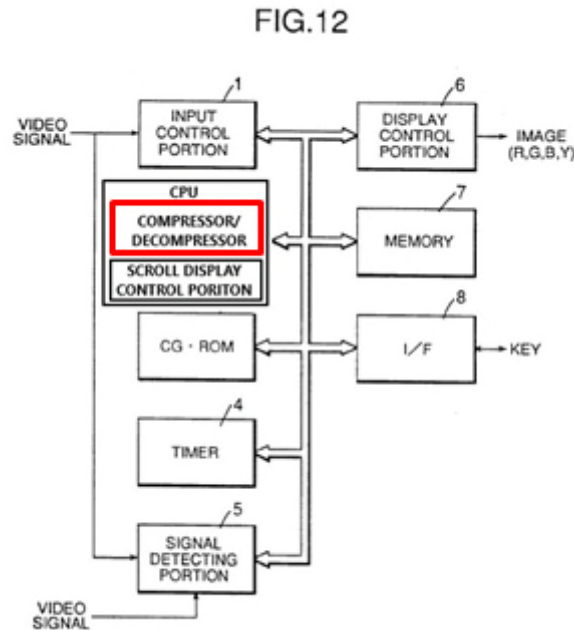


Ex. 1004, FIG. 2 (annotated).

116. Mitani states that CPU 2 generates the “1/2-format image display” by preparing a page of data in “image memory.” Ex. 1003, 26:38-45 (“The decoding

processing is executed by the CPU 2. . . [a] character is decoded and the character font data is written into an image memory but it is not displayed.”).

117. Mitani shows a bus interface between the CPU and memory:



Ex. 1003, FIG. 12 (annotated to include compressor/decompressor in the CPU).

118. A POSITA would have no difficulty in placing the compressor/decompressor of Oku in an interface between CPU 2 and memory 7 in Mitani (as shown in Mitani annotated FIG. 12 above) so that select bitmap data would be compressed when written by the CPU into memory 7 and decompressed when read out from memory 7. As such this would simply be using the circuitry in

Oku for its original purpose in the combination of Mitani and Oku and would be well within the capabilities of a skilled artisan.

A. Independent Claim 1

1. Limitation 1[a], “A digital television having a display, comprising:”

119. Oku teaches a digital television. It teaches a decoder receiving and processing a digital video signal for display on a display means, which is the heart of what it means to be a “digital television” as that term is used in the ’452 patent. Ex. 1004, ¶ [0010] (“display means for synchronously displaying the decoded image data and the decompressed on-screen display data”). A POSITA would understand that the digital image data received and processed by Oku is a digital video signal as opposed to digital still image data because Oku repeatedly refers to the digital image data being encoded according to MPEG, a well-known digital *video* coding method. *Id.*, ¶¶ [0002, 0003, 0006]. A POSITA would further understand that Oku is directed to a device for use in a digital television because, in explaining the embodiments of the invention, Oku states that:

FIG. 7 shows an OSD picture made up of bitmap OSD data and an OSD block as a compression unit. The OSD picture has almost the same size as the picture shown in FIG. 3, and has a size of 576

vertical pixels × 704 horizontal pixels corresponding to the PAL system image. Although the number of horizontal pixels is slightly smaller than the size in FIG. 3, the difference between the two can be ignored considering the overscan *of the television receiver*.

Id., ¶ [0024], emphasis added.

120. Oku’s digital processing is handled by “parser / variable length decoding circuit 2” which receives encoded data and stores it in memory 13, for subsequent decoding using “inverse quantizer / IDCT circuit 3” which works in cooperation with “motion compensation circuit 4.” Ex. 1004, ¶¶ [0013-17]. The decoded data is itself then stored in memory where it can be read by display circuit 5. *Id.*, ¶ [0018].

121. Because individual data values are stored for pixels in the decoded MPEG video, and are stored in memory for display on a synchronous display means, a POSITA would understand that this discloses a display device in a digital television.

2. Limitation 1[b], “a receiving part configured to receive at least one of digital image data and analog image data;”

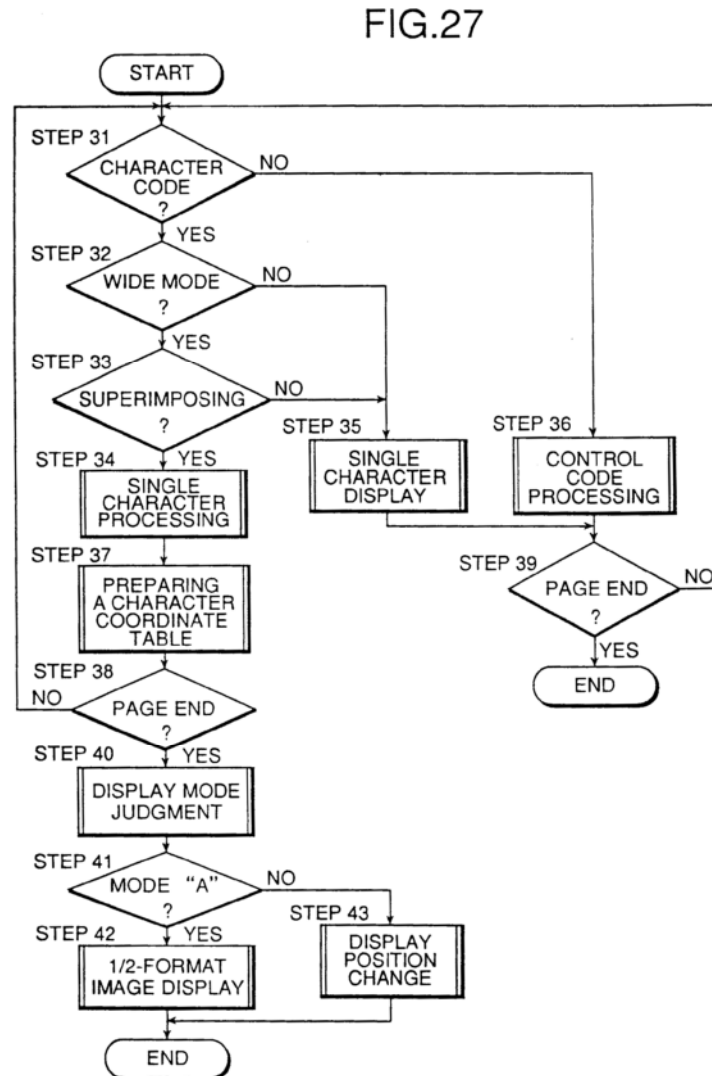
122. Oku discloses “parser / variable length decoding circuit 2” decoding MPEG-encoded video, which is a type of digital video identified by the ’452

patent. *Compare* Ex. 1004 ¶¶ [0003-6]; Ex. 1001, at 1:27-52. Oku describes a decoding circuit that receives encoded digital image data. Ex. 1004, ¶ [0013-18] (“The compressed image data (encoded data) is input to the parser / variable length decoding circuit 2”).

3. Limitation 1[c]: “a data processing part configured to execute bit map conversion and format-conversion for text data to be displayed on the display;”

123. Mitani’s CPU 2 does bitmap conversion and format conversion, as a POSITA would understand those terms from the ’452 patent, and does so for the purpose of displaying the text data on a display screen. Bitmap conversion is disclosed by Mitani’s CPU 2 generating a bitmap using a character code. While Mitani describes a few different kinds of format conversion, for purposes of this declaration the best example to show that the technique of the ’452 patent was known is the “processing for displaying a 1/2-format image” performed by a teletext decoding device according to the invention disclosed by Mitani. The teletext decoding device is described in Mitani at 20:14 through 27:16 and the processing for displaying a 1/2-format image in the teletext decoding device is described at 26:53-27:10 of Mitani.

124. That embodiment describes processing text data into bitmap data with reference to FIG. 27, which is reproduced below:



Ex. 1003, FIG. 27.

125. The “single character processing” in step 34 “decode[s]” the character code and retrieves the corresponding bitmap from the CG-ROM 3 in FIG. 30 to

generate “dot patterns.” Ex. 1003, at 20:58-21:1 (“A teletext signal processing section... consists of a character code discriminating portion 22, ...”); 21:15-16 (“The CG-ROM reading control portion 19 receives a character code and reads a designated character from the CG-ROM 3.”); 22:45-47 (“When the code is judged by the character code/control code discriminating portion 17 to be a character code, it is transferred to the CG-ROM reading control portion 19 whereby dot-pattern data representing an actual character corresponding to the received character code is read-out”); 23:23-24 (“the character information through the memory 7 is converted into an image signal by the CG-ROM portion 3 storing a character font corresponding to the character information”); 25:56-57 (“font data for the character code is read from the CG-ROM 3 and transferred into the display control portion 6 for displaying the information in the scroll mode.”)

126. The result of this character processing is a “dot pattern,” which a POSITA would understand is a bitmap, and it is written to image memory. *Id.*, 26:40 (“A character is decoded and the character font data is written into an image memory”). A POSITA would appreciate that “single character processing” in Mitani takes text data in the form of a character code as input and generates bit map data (a “dot pattern”) as output, in the same way that the bit map converter in

the '452 patent takes undefined “text data” as input and generates bit map data as output. Ex. 1001, 5:42-45; 9:65-10:1. A POSITA would also understand that this character processing is performed for the purpose of displaying the text data on the display screen. Ex. 1003, 20:25-26 (“Every time when a teletext page is received, the timer generates an interrupt requesting CPU 2 to display a received page”), 20:39-41 (“the CPU 2 prepares a presentable image conversion table 7b for one page (i.e., a screenful) and outputs characters one by one from the beginning of the table for displaying them in the scroll mode on the display screen.”), 21:31-34 (“The TV/teletext display control portion 57 receives a switch control signal, selects a TV video image or an ordinary teletext image or an 1/2-format ordinary teletext image or a scroll display image and, then, separately outputs the image onto the screen of a display device (not shown) or superimposes the teletext image on an ordinary television image displayed thereon.”), 25:56-57 (“font data for the character code is read from the CG-ROM 3 and transferred into the display control portion 6 for displaying the information in the scroll mode.”), 26:53 (“The processing for displaying a 1/2-format image is performed (Step S42 [see FIG. 27 above]) when the mode is judged to be A.”

127. In its “processing for displaying a 1/2-format image” (*Id.*, 26:53), Mitani also discloses format conversion that is performed for the purpose of displaying the text data on the display screen. When teletext data is to be displayed simultaneously with received television images, the display data is adjusted as explained below when the display is in widescreen mode.

128. Mitani explains that the received teletext information is organized into pages and “a [teletext information] page of 250 dots in a column by 480 dots in a row is displayed.” *Id.*, 26:22. But a widescreen television “may change the width and height of its screen image” with the result that a “display area of 250 dots in a column $\times$ 480 dots in a row can not be assured if the television picture is enlarged. In this case, a user can not obtain the correct teletext information.” *Id.*, 26:25-27. As depicted in FIG. 27 above, Mitani provides a device which “enables a user to view a complete and easily readable image of text information even on the wide screen of a wide television receiver” when “the display area detected by the detecting portion is reduced because of enlargement of television picture on a wide-vision display” *Id.*, 26:28-33. Mitani explains that:

In the process of decoding a teletext page, a table of character coordinates for detecting an area for indicating teletext information is

prepared and, after decoding all data for a page, the display mode is judged according to the prepared table and then the information is displayed.

FIG. 27 is a flow chart of data processing in the above-mentioned embodiment of the present invention.

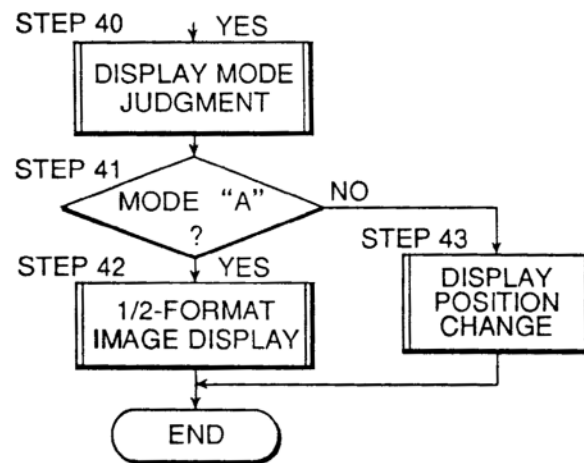
Id., 26:34-37.

129. Judging of the display mode for displaying text, as described at 27:1-10 in Mitani and illustrated in FIG. 35, is performed in Step 41 of FIG. 27 which is excerpted in detail view below:³

³ A POSITA would understand that terms such as “mode,” “display mode,” and “mode A” are used differently in different paragraphs of Mitani. For example, FIG. 25 illustrates “examples of images displayed in different modes on the screen of a wide-aspect monitor” (Ex. 1003 at 26:5-8), where “FIG. 25B shows a screen image in mode A, FIG. 25C shows a screen image in mode B... and FIG. 25D shows another screen image in mode B” (*Id.*, 26:6-8). These are different display modes *for the screen of the wide-screen TV receiver* that are *selected by the viewer* using the remote control. See, e.g., *Id.* at 21:44-46 (“In case of viewing an

ordinary television program on a wide-aspect screen of a TV receiver set, a user is required only to control the display mode control portion 12 through a remote control to select a wide-screen image”), 26:15 (“In Fig. 20, there is shown a remote control transmitter having display mode selecting keys B, C and D”). By contrast, the *text display mode judgement* shown in Step 41 of FIG. 27 and detailed in FIG. 35, which is performed *only* if the user has selected a “wide mode” for the screen of the TV receiver, *automatically* determines the *text display mode* (Mode “A”, Mode “B”, or Mode “C” as shown in FIG. 35 steps 81, 83, and 82) based solely on the *content of the text data* and *without intervention by the user*. *Id.*, 27:1-10.

Thus, a POSITA would clearly understand that the automatically determined *text* display modes (e.g., mode “A”, mode “B”) referred to by Mitani at 26:53-27:10 and in FIG. 27 and FIG. 35 are distinct from the user selected *screen* display modes (e.g., mode A, mode B) referred to at 26:5-8 and in FIG. 25.



Ex. 1003, FIG. 27 (partial).

130. When the display mode is judged to be A, the teletext information is displayed as a “1/2-format image” where the vertical size (i.e., the vertical *resolution*; the *format*) of the text bit map image is reduced (i.e., “adjusted” or “format converted” in the language of the ’452 patent) by a factor of two to correspond with display resolution. Mitani explains that:

The processing for displaying a 1/2-format image is performed (Step S42 [in FIG. 27 above]) when the mode is judged to be A (Step S42).

The 1/2-format image display is such that 250 dots in vertical direction are distributed one by one to even field and odd field and interlaced *so that an image is reduced vertically by a factor of 2*.

When the mode is B or C, the information stored in the image

memory is displayed in a different predetermined area, e.g., below (in mode B) or above (in mode C) on the screen of a display device (Step S43).

Id., 26:54-57 (emphasis added).

131. Thus, in text display Mode A, as referenced in FIGs. 27 and 35 (Ex. 1003), the text data is format converted for display at half vertical size. In the language of the '452 patent, this is $(H \times 1; V \times 0.5)$ format conversion. Ex. 1001, 7:45-8:24. A POSITA would recognize this is a form of “integrating” a “real number” times the bitmap, as described in the '452 patent, because the pixels of the bitmap are not being mapped one-to-one to the display. Instead, the mapping of pixels to the display is adjusted by multiplying or “integrating” a real number times the vertical size of the bitmap so that the number of pixels read out to the display for each vertical column of the text bitmap is adjusted, through multiplication times a real number, to correspond with display resolution.

132. As I have already explained, a POSITA would understand that Mitani’s “1/2-format image display” reduces the vertical size of a teletext data bitmap image by a factor of two to accommodate the display resolution of the TV screen, i.e., widescreen mode. The '452 patent is silent with regard to how to

resize one bitmap to obtain a bitmap with a different resolution. In an embodiment of Mitani, the bitmap is resized to correspond with a widescreen TV display resolution by allocating each one of the 250 rows of dots (i.e., pixels) in the teletext data bitmap image to just one of the interlaced even and odd fields for display – as opposed to allocating each row of dots to both fields. Ex. 1003 at 26:53-55.

133. A POSITA would understand that the processing in Mitani for displaying a 1/2-format image is conversion of the format of the text bitmap data. This teaching in Mitani results in modifying the size (or resolution) of the text bitmap image in the same way as is later disclosed by the '452 patent in its preferred embodiment.

134. A POSITA would further understand that the format conversion of the text bitmap in Mitani is done in order to adapt the bitmap for the display resolution because they are performed based on whether or not the television screen is being operated in widescreen mode and whether or not the television picture is enlarged. *See* Ex. 1003 at 26:21-27, Ex. 1001 at 7:48-8:24.

4. Limitation 1[d]: “a memory configured to store the bit map data obtained according to the bit map conversion in the data processing part and image data inputted from an arbitrary receiving part;”

135. Mitani discloses a memory used to store bitmap data generated in the bitmap conversion process in its “image memory”:

“A character is decoded and the character font data is written into an image memory but it is not displayed.”

Ex. 1003 at 26:45.

136. While Mitani does not label the memory used to store the decoded character font data, Mitani has only one writeable memory, “memory 7,” shown in FIG. 29. Memory 7 explicitly includes data structures like the “presentable image conversion table 7b”, which is used to store the layout of character codes and character data prior to performing rendering, as discussed in the embodiments in Mitani at, e.g., Ex. 1003, 15:9-11, and the “teletext broadcast data storing portion 55”, which is used to store broadcast teletext data prior to processing. *Id.* at 21:50-51 (“data transfer portion 16 transfers the error-corrected signals through the memory input/output control portion 35 into the teletext data storing portion 55 of the memory 7.”). Because there is no other memory shown, a POSITA would understand that the “image memory” is necessarily memory 7.

137. As I stated above, Mitani does not discuss storing “image data inputted from an arbitrary receiving part,” but this would be obvious in view of Oku.

138. The combination of Oku and Mitani uses a single memory to store both image data and bit map data. Oku teaches:

[A]n OSD (On Screen Display) method that overlays and displays characters and graphics on the decoded image is effective as a user interface of a decoding device for compressed image data. However, in order to realize such an OSD, a new memory area is required; so that in the case of an image corresponding to the PAL method having a large image size as described above, it exceeds the frame of a 16 Mbit general-purpose memory.

Ex. 1004, ¶ [0008]. Oku stores image data from its receiving part in Oku’s memory 13: “The compressed image data (encoded data) is input to the parser / variable length decoding circuit 2, and further stored in the encoded data buffer area of the memory 13 via the encoded data writeout circuit 7.” Ex. 1004, ¶ [0014]. Oku discloses both encoded and decoded image data stored in memory 13.

139. Both Mitani and Oku each use a single memory for all of their storage purposes, and a POSITA would be motivated to use a single memory in their combination to avoid complicating the design of the device by using unnecessary separate memories. Because each of Mitani and Oku already uses a single memory, a POSITA would recognize that it would require more work, and complicate the combination, to add additional memories rather than using a single memory as taught by both Mitani and Oku.

5. Limitation 1[e]: “an image outputting part configured to read image data from the memory;”

140. Oku discloses digital video (*i.e.* “image data”) stored in its memory, and includes coding data read control circuit 8 to read out MPEG-encoded video from memory 13 in Oku. Oku also discloses display data readout control circuit 11 reading out decoded video from the same memory 13. Either coding data read control circuit 8 or display data readout circuit 11 qualifies as an “image outputting part” since both read out image data from the memory 13.

6. Limitation 1[f]: “a display processing part configured to mix image data read from the image outputting part and the bit map data converted in format by the data processing part.”

141. The additional limitations here are obvious in the combination of Mitani and Oku.

142. Oku discloses display circuit 5 mixing together digital image data retrieved from memory 13 by display data readout control circuit 11 and the digital bitmap data retrieved from memory 13 by OSD data readout control circuit 12. Ex. 1004, ¶ [0018].

143. While Oku uses the term “overlay” and the ’452 patent uses the term “mix,” this difference in terminology does not impact my opinion. “Overlay” in Oku refers to placing characters and graphics on top of image data so that it appears as an on screen display user interface: “On the other hand, an OSD (On Screen Display) method that overlays and displays characters and graphics on the decoded image is effective as a user interface of a decoding device for compressed image data.” Ex. 1004, ¶ [0008].

144. A POSITA would understand that this requires “mixing” the OSD bitmap data and the video image data together because both are stored as bitmaps and, when one bitmap is overlaid on another this may be done by selecting, for each pixel, the corresponding value from the OSD bitmap data (if there is one) or from the video image data (if there is not a corresponding pixel in the OSD bitmap data). This results in “mixing” the pixels from the two bitmaps together.

145. In summary, my opinion is that claim 1 is invalid as obvious over the combination of Mitani and Oku.

B. **Claim 2: “The digital television as defined in claim 1, wherein the data processing part comprises a bit map converter configured to determine whether the text data is the bit map data and that converts the text data into the bit map data, based upon the determined result, and a bit map compressor configured to compress the bit map data by using compression coding.”**

146. The additional limitations of claim 2 are obvious in the combination of Mitani and Oku.

147. Mitani has a bitmap converter that determines whether the text data is “the bit map data” and converts the text data into the bit map data. I assume for purposes of this declaration that “the bit map data” refers to the format of the text data. This limitation is, therefore, disclosed by a data processing part that converts text data that is not already bit map data into bit map data, and does not convert text data that is already bit map data.

148. Mitani discloses this limitation in the form of CPU 2 which executes the algorithm shown in FIG. 27 for processing received teletext data. “A received code is first checked whether it is a character code or not . . . When the code is judged to be a character code (Step S31),” then processing goes to subsequent steps that render the character code into an image. Ex. 1003, at 26:38-40.

149. When the code is judged to not be a character code, then it means the data is a control code, which is processed differently. *Id.*, 26:39 (“If not, the control code processing is performed (Step S36) and the operation proceeds to Step S39.”). Both of these steps are steps of “determin[ing] whether the text data is the bit map data and that converts the text data into the bit map data, based upon the determined result” because if the code is a character code (*i.e.* is not a bitmap), it is converted. This meets the limitation because, as in the preferred embodiments of the ’452 patent, received text data that is not already bitmap data is converted into bitmap data. Ex. 1001, at 7:21-24 (“In other words, if it is determined that the text data is not the bit map data, the bit map converter 202 converts the text data into the bit map data, using one of the first bit map data and the second bit map data stored in the memory 207.”). In addition, Oku teaches the reception of OSD text data that is already bit map data and is therefore not converted into bit map data. *See* Ex. 1004, ¶ [0023].

150. Turning to compression of bitmap data, Oku teaches compressing bit map data using an “OSD data compression circuit 15.” Oku says explicitly that OSD data is bitmap data and that it is received from outside of the circuit: “OSD data are received *in the form of a bitmap from the outside*, and *the data are*

compressed by the OSD data compression circuit 15 and written in the memory 13 via the OSD data writeout circuit 6.” Ex. 1004, ¶ [0023] (emphasis added).

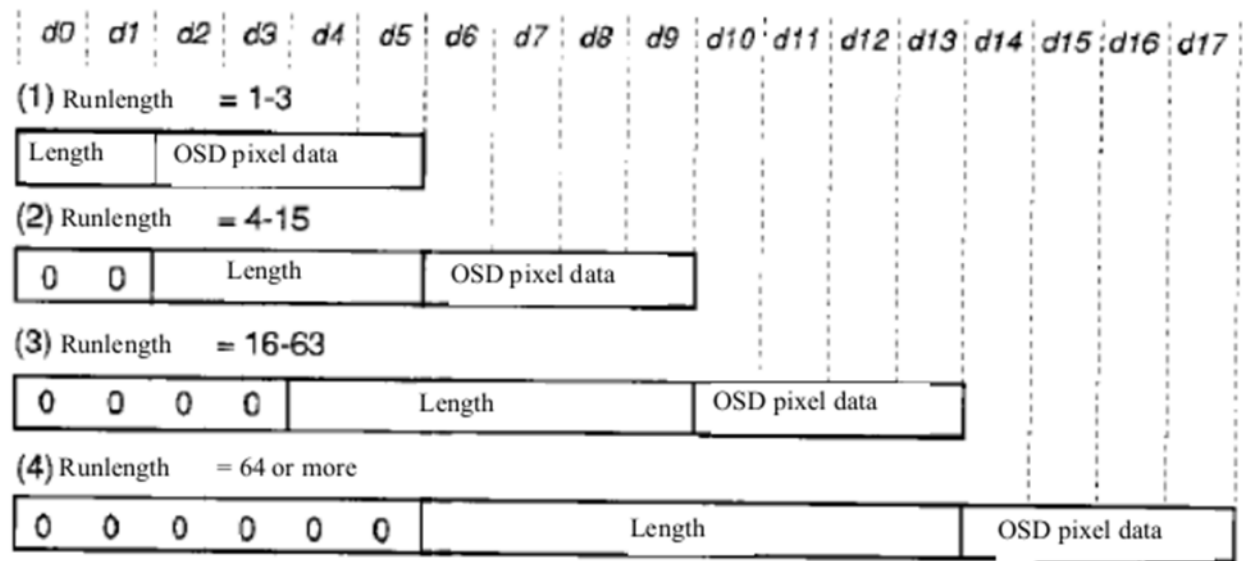
151. The bitmap data is received and compressed. Oku also discloses compression coding using many different available compression codings, including run-length encoding.

FIG. 8 shows a codebook used for the compression of OSD data. OSD data per pixel are 4bit to make the number of colors 16 colors; this codebook is applied when performing run length compression. Each code consists of a prefix unit consisting of 0, 2, 4, and 6 "0" s, a length unit, and an OSD pixel data unit; this indicates that the OSD pixel data shown in the pixel data unit are continuous for the length shown in the length unit.

Ex. 1004, ¶ [0025].

152. This is shown in more detail in FIG. 8, which shows a sample codebook for run-length encoding that illustrates how sequences of values can be significantly reduced:

FIG. 8



Ex. 1004, FIG. 8.

- C. **Claim 3: “The digital television as defined in claim 2, wherein the data processing part further comprises a bit map decompressor configured to read the compressed bit map data from the memory to thereby restore the read data to its original bit map data, and a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution.”**

153. The additional limitations here are obvious in the combination of Mitani and Oku.

154. Oku discloses a bitmap decompressor that reads the compressed bitmap data stored in memory, viz. OSD data decompression circuit 14. This retrieves compressed bitmap data from memory 13 for subsequent use as the original bitmap data. Ex. 1004, ¶ [0022] (“The OSD data decompression circuit 14

decompresses the compressed OSD data and restores the OSD data corresponding to the original bitmap.”). The combination of Mitani and Oku necessarily includes bitmap decompression in order to retrieve compressed data and use it for providing display of text bitmap data. Once data has been compressed in memory it must be decompressed in order to be used for display as described in Mitani and Oku.

155. Turning to the limitation of “a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution,” Mitani discloses the conversion of decompressed bit map data to correspond with the display resolution. Mitani’s processing for “displaying a 1/2-format image” (*see* Ex. 1003, 26:53-57) first prepares the characters in image memory, as I discussed above for claim 1, and then, in step 42 of FIG. 27, adjusts the format of the decompressed bitmap data based on the display resolution. As I already explained, if the TV screen is in widescreen display mode and the text display mode is judged to be “mode A” (FIG. 27 step 41, mode “A”? YES) then the text data image in image memory is resized and displayed at half-size vertically and full-size horizontally, thereby reformatting the text to correspond with the resolution of the display. A POSITA would understand that the format conversion of Mitani must be applied to uncompressed bitmap data, since the bitmap data in

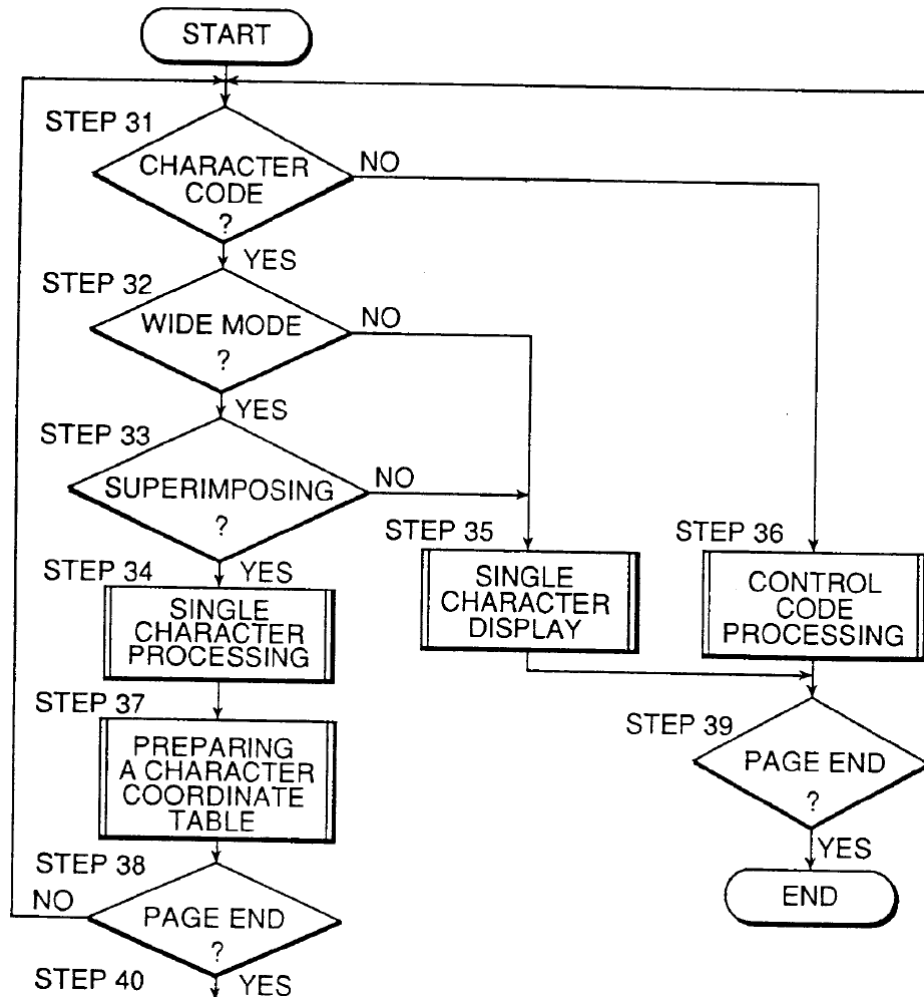
Mitani is uncompressed, and moreover it was understood in the art at the time to apply bitmap scaling to uncompressed data rather than compressed data.

D. **Claim 5: “The digital television as defined in claim 2, wherein the bit map converter converts the text data into the bit map data, if it is determined that the text data is not the bit map data.”**

156. The additional limitations here are obvious in the combination of Mitani and Oku. Mitani discloses that when text data is not already bit map data, the text data is converted into bit map data by doing single character text processing. “A received code is first checked whether it is a character code or not... When the code is judged to be a character code” – which is not bitmap data – (FIG. 27 step 31), then processing goes to subsequent steps that render the character code into a bitmap image. Ex. 1003, at 26:38-45.

157. Moreover, this is verified in FIG. 27.

FIG.27



Ex. 1003, FIG. 27 (partial).

158. At STEP 31 the input data is checked to see if it is a character code. A determination that it is a character code is a determination that it is not a bit map. A character code is converted into a bitmap in either STEP 34 or in STEP 35,

depending on whether the television screen is in a widescreen superimposing mode. *Id.* at 26:37-48.

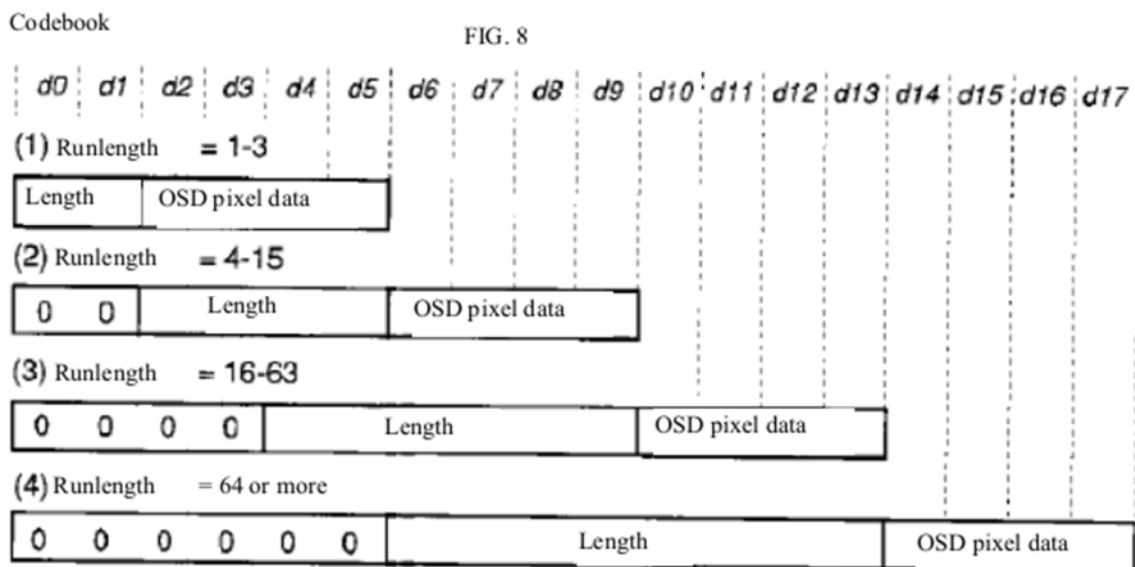
E. **Claim 6: “The digital television as defined in claim 2, wherein the bit map converter bypasses the text data, if it is determined that the text data is the bit map data.”**

159. The additional limitations here are obvious in the combination of Mitani and Oku. It would be obvious to a POSITA that the bitmap converter in the combination of Mitani and Oku would bypass text data if the text data were already bitmap data. Oku discloses receiving bitmap data and not converting it before compression and storage in memory. Ex. 1004, at ¶ [0028] (“OSD data in the form of bitmap is received and temporarily stored in a buffer inside the OSD data compression circuit 15.”). Bitmaps that are received do not need to be bitmap converted because they are already in the appropriate format for mixing. A POSITA would understand that Oku does not bitmap convert text data that is received as bitmap data, because Oku does not identify any such conversion and such conversion is not necessary.

F. **Claim 7: “The digital television as defined in claim 2, wherein the predetermined compression coding is a run-length compression coding.”**

160. In my opinion claim 2 is obvious for the reasons described above.

161. Claim 7 is also obvious because Oku discloses run-length compression coding as predetermined compression coding. Ex. 1004, ¶ [0025] (“FIG. 8 shows a codebook used for the compression of OSD data. OSD data per pixel are 4bit to make the number of colors 16 colors; this codebook is applied when performing run length compression.”).



Ex. 1004, FIG. 8.

162. As such Oku discloses run-length encoding as one predetermined compression technique.

- G. **Claim 8: “The digital television as defined in claim 1, wherein the text data is at least one among HTML data, DHTML data, XML data, SGML data and bit map data.”**

163. In my opinion claim 1 is obvious for the reasons described above.

Claim 8 is also obvious because Oku discloses receiving character data in bitmap format “from the outside.” Ex. 1004, ¶ [0023] (“OSD data are received in the form of a bitmap *from the outside*”) (emphasis added). This suffices to meet this limitation since only one of the listed types must be supported (“at least *one among*.”).

- H. **Claim 9: “The digital television as defined in claim 1, wherein the memory stores first bit map data or second bit map data.”**

164. In my opinion claim 1 is obvious for the reasons described above. The limitations of claim 9 are also met because the claim only requires that one of first or second bit map data is stored in the memory. Mitani stores one of first or second bit map data in memory when the character font bitmap data output from CG-ROM 3 is written into an image memory. Ex. 1003, 20:22-23 (“The character generating read-only-memory (CG-ROM) 3 holds therein character fonts which are used for converting character information into respective character image signals”), 26:45 (“A character is decoded and *the character font data is written into an image memory* but it is not displayed”) (emphasis added). Since a POSITA

would clearly understand that the character font data read out of CG-ROM 3 in Mitani is bitmap data (see, e.g., *Id.* at 21:58-22:1 — “The character codes are transferred to the CG-ROM reading control portion 19 whereby dot patterns each representing actual characters corresponding to the received character codes are outputted”), this meets the requirement for storing first bit map data in memory, thereby meeting the literal scope of claim 9.

165. The ’452 patent describes the “first bit map data” and “second bit map data” as bit map images of different sizes of bitmap-converted text used for format conversion.

Display Resolution	First Bit Map Data (720 × 480, H × 1:V × 1)	Second Bit Map Data (960 × 540)
1920 × 1080	1920 × 1080 (H × 2.67:V × 2.25)	1920 × 1080 (H × 2:V × 2)
1280 × 720	1280 × 720 (H × 1.78:V × 1.5)	1280 × 720 (H × 2:V × 2)
854 × 480	854 × 480 (H × 1.19:V × 1)	854 × 480 (H × 0.89:V × 0.89)
720 × 480	720 × 480 (H × 1:V × 1)	720 × 480 (H × 0.75:V × 0.89)

Ex. 1001 at Table 1.

166. Claim 9 recites that the memory stores only first bit map data or second bit map data, but not necessarily both. *Id.* at 10:26-27.

167. A POSITA would not understand claim 9 to require any particular resolution for the first or second bitmap data because no such requirement is recited in the language of the claim. Moreover, Patent Owner states that “first bitmap data” and “second bitmap data” should be construed according to their plain and ordinary meaning. Ex. 1015, Ex. A, p. 32. Mitani’s “image memory,” which stores the bitmap-converted text data, is a “memory [that] stores ... bitmap data,” See, e.g., *Id.* 1003 at 26:45 (“A character is decoded and the character font data is written into an image memory but it is not displayed.”).

I. Claims 10, 17, and 21: “The digital television as defined in claim [1/12/20], wherein the conversion of the text data is carried out by using either first bit map data or second bit map data [previously stored in the memory].”

168. These three claims, which depend from three different parent claims, recite a similar limitation and for brevity I address them together:

169. I understand that Patent Owner has previously taken the position that “first bitmap data” and “second bitmap data” do not require construction and should be interpreted in accordance with their plain meanings in light of the specification of the ’452 patent. Ex. 1015, Exhibit A at p. 32, citing Ex. 1001 at 7:49-8:32. That portion indicates that the “first bitmap data” and “second bitmap data” refer to the result of the bitmap conversion process, and the passage makes

no reference to the data being “previously stored.” Relying on Patent Owner’s asserted meaning of the term, the additional limitation of claim 10 is disclosed in Mitani. Specifically, this is because the memory in Mitani stores the result of the bitmap conversion process and as a consequence it stores (and meets) either the “first bitmap data” or “second bitmap data” limitations as Patent Owner asserts those terms should be interpreted. Ex. 1003, at 26:45.

170. Claims 17 and 21 include the further limitation that the bitmap is “previously stored in the memory.” Patent Owner asserts the meaning of “first bitmap data” and “second bitmap data” are governed by the same interpretation. Ex. 1015, Exhibit A at p. 35. Therefore, Mitani’s disclosure of storing the result of the bitmap conversion process also discloses this limitation, under Patent Owner’s asserted meaning of the claims.

171. In the alternative, Mitani discloses other bitmaps that are “previously stored in memory.” Specifically, Mitani’s font generating read-only memory (CG-ROM) 3 contains bitmaps of the fonts used for performing bitmap conversion on received character codes, and is “previously stored” in that it is present in memory prior to performing bitmap conversion, as it is stored in ROM. Ex. 1003, 20:22-23.

J. Claims 11, 19, and 23: “The digital television as defined in claim [1/12/20], wherein the display displays different resolution images.”

172. These three claims all recite the same additional limitation on three different parent claims.

173. The display in Mitani displays “different resolution images” as those terms are used in the ’452 patent. For example, Mitani describes displaying according to the television system NTSC:

In teletext systems, a page of 250 dots in a column by 480 dots in a row is displayed. In the television system NTSC (National Television System Committee Color System) which uses about 240 effective scanning lines per field, a teletext image can be displayed on a television receiver.

Ex. 1003, at 26:22-24.

174. Mitani also discloses a widescreen television display which allows the user of the device to select and display different resolution images:

In case of superimposing a subtitle page on a television picture on the screen of *wide television receiver which may change the width and height of its screen image*, the above-mentioned display area of 250

dots in a column × 480 dots in a row can not be assured *if the television picture is enlarged*. In this case, a user can not obtain the correct teletext information.

Id., at 26:24-27 (emphasis added).

175. Mitani also describes that this adjustment from normal aspect ratio to widescreen aspect ratio is possible:

In this case, the TV/teletext display control portion 57 selects the television program receiving mode and transmits the processed data to the display device. In case of viewing an ordinary television program on a wide-aspect screen of a TV receiver set, a user is required only to control the display mode control portion 12 through a remote control to select a wide-screen image.

Id., at 21:42-46.

176. Mitani further discusses that the remote control may be used to adjust the television display screen to display different resolution images at *Id.*, 21:7-8 (“The display mode control portion 12 controls different aspect screen modes according to a remote control signal input”) and at *Id.*, 24:22-24 (“Figure 20 depicts an example of a remote control transmitter according to the present

invention. In Fig. 20, reference character A designates a trigger key for selecting a mode of the present invention, characters B, C and D designate screen-mode selecting keys...”).

177. A POSITA would understand that the widescreen aspect is one choice of display aspects usable on television receivers, and that televisions that support widescreen display aspects support both normal and widescreen aspect ratio displays, because not every signal is a widescreen aspect signal. Wide screen and normal aspect ratios are “different resolutions” because each renders a display image into a different size viewable area of the television screen. That is, Mitani’s widescreen capable display can display a normal aspect ratio signal at a normal aspect ratio without resizing overlaid teletext data, and a normal aspect ratio signal or a widescreen signal at a widescreen aspect ratio with resizing of overlaid text data. From this, a POSITA would understand that the resolutions are “different.” This understanding is further confirmed at *Id.*, 26:25 where Mitani teaches a “wide television receiver ***which may change the width and height of its screen image***” (emphasis added) and at FIG. 25, which illustrates “examples of display screen modes according to the present invention” (*Id.*, 10:4) and wherein FIG. 25B and FIG. 25C illustrate the display of different resolution images. *Id.*, 26:5-8.

K. Independent Claim 12

178. Claim 12 is essentially the same in relevant part as claim 1 (as it relates to bitmap conversion and format conversion) and claims 2 and 3 (as they relate to compressor, decompressor, and format conversion). My opinion with respect to claim 12 is therefore also that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to those limitations in claims 1, 2, and 3.

L. Claim 13: “The digital television as defined in claim 12, wherein the text data is at least one among HTML data, DHTML data, XML data, SGML data and bit map data.”

179. Claim 13 is essentially the same in relevant part as claim 8. My opinion with respect to claim 13 is therefore also that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to those limitations.

M. Claim 14: “The digital television as defined in claim 12, wherein the bit map converter converts the text data into bit map data if it is determined that the text data is not bit map data.”

180. Claim 14 is essentially the same in relevant part as claim 5. My opinion with respect to claim 14 is therefore also that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to those limitations.

- N. **Claim 15: “The digital television as defined in claim 12, wherein the bit map converter bypasses the text data if it is determined that the text data is bit map data.”**

181. Claim 15 is essentially the same in relevant part as claim 6. My opinion with respect to claim 15 is therefore also that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to those limitations.

- O. **Claim 16: “The digital television as defined in claim 12, wherein the predetermined compression coding is a run-length compression coding.”**

182. Claim 16 is essentially the same as claim 7. My opinion with respect to claim 16 is that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to those limitations.

P. **Independent Claim 20**

183. Claim 20 is essentially the same in relevant part as claim 12. The following table compares the limitations of the two claims, although I have rearranged the limitations of claim 20 so that the two line up:

Claim 12	Claim 20
-----------------	-----------------

12[a] A digital television having a data processing device and a display, comprising:	20[a] A digital television having a data processing device and a display, comprising:
12[b] a bit map converter configured to determine whether text data to be displayed on the display is bit map data and to convert the text data into bit map data;	20[b] a bit map converter configured to determine whether text data to be displayed on the display is bit map data and configured to convert the text data into bit map data;
12[c] a bit map compressor configured to compress the bit map data by using compression coding;	20[d] a bit map compressor configured to compress the bit map data by using compression coding;
12[d] a bit map decompressor configured to read the compressed bit map data from a memory for restoring read data to its original bit map data; and	20[e] a bit map decompressor configured to read the compressed bit map data from a memory for restoring the read data back to its original bit map data.

12[e] a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution.	20[c] a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution;
--	--

184. Other than differences in a few words that do not impact my analysis, the claims are identical. My opinion with respect to claim 20 is therefore also that it is invalid in light of the combination of Mitani and Oku for the reasons I discussed with respect to the limitations of claim 12.

XI. GROUND 2: CLAIMS 1 AND 8-11 OF THE '452 PATENT WOULD HAVE BEEN OBVIOUS OVER THE COMBINATION OF ABE AND APPLICANT ADMITTED PRIOR ART

185. It is my opinion that Claims 1 and 8-11 of the '452 patent would have been obvious over the combination of Abe and the Applicant Admitted Prior Art (the "AAPA"). I discuss below how each limitation is disclosed in the combination of these two references.

186. It would be obvious to combine Abe and the AAPA for a number of reasons. First, both references are from the same field, displaying text on a television display. Ex. 1005, Title ("TELEVISION RECEIVING SET HAVING

TEXT DISPLAYING FEATURE”); 2:54-58 (“it is therefore the object of the present invention to provide a television receiving set having a text displaying feature that is designed to display characters and graphics of supplementary programs in a specific way to display clearly discernible characters and graphics..”). *See also* Ex. 1001, Title (“IMAGE DISPLAY DEVICE IN DIGITAL TV”); 2:4-11 (“the image display device is applicable to data broadcasting in the digital TV. ... For example, the data broadcasting outputs daily program order with the image during broadcasting or outputs an additional explanation on the image being broadcast.”). Both disclose a processing path that receives a signal and then separates image data from text data, processes the text data into a format for display, and then overlays the text bitmap data onto the image data:

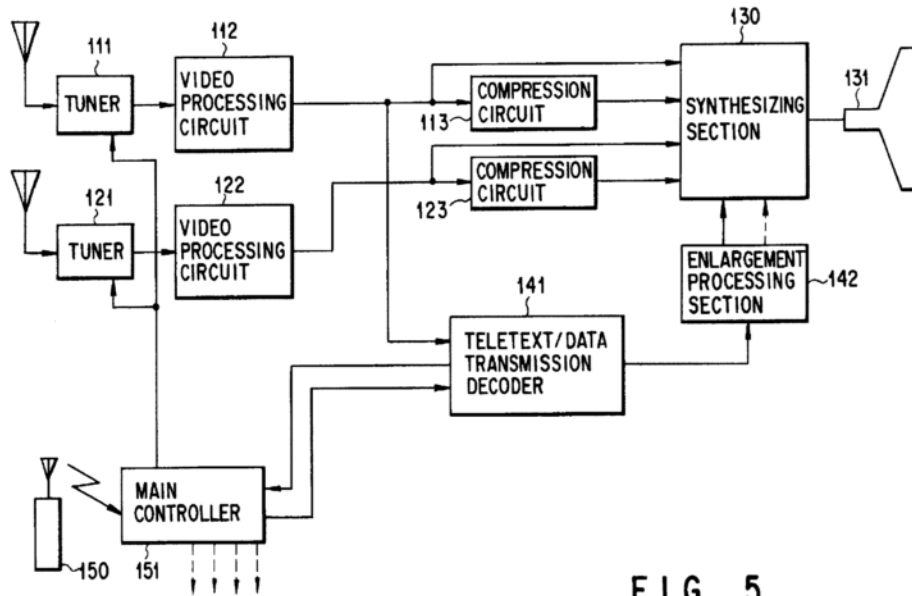
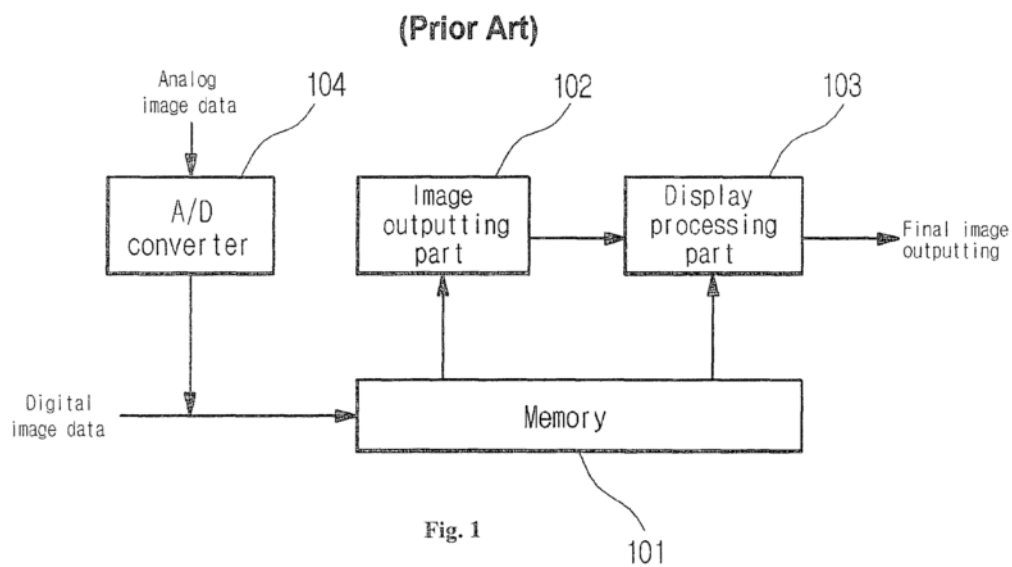


FIG. 5

Ex. 1005, FIG. 5.



Ex. 1001, FIG. 1.

187. The combination of Abe and the AAPA would be obvious to a POSITA. It would be obvious to combine Abe and the AAPA because Abe teaches a TV that only receives analog video signals. A POSITA would recognize that analog television signals were becoming obsolete and a television that can only process analog signals would cease to be commercially competitive. This pending obsolescence provides an explicit teaching, suggestion, or motivation to move analog technology, like Abe, to digital technology. The AAPA is an example of prior art that a POSITA may consider which provides the capability to receive and display digital television signals. Abe does not include a digital processing pipeline for digitally-encoded video using, e.g., the MPEG standard. A POSITA would recognize that the ability to process and display text that is transmitted alongside image data, as in Abe, would be useful because digital standards for television retain closed caption and subtitle data, and this would still need to be displayed on the screen, and would still be subject to some of the concerns identified in Abe, such as that subtitles and captions can be displayed more clearly if they are enlarged and positioned at a different location on the screen.

188. The combination of the digital video pipeline in the AAPA with the analog video device in Abe is also just the simple combination of known elements. Digital video processing was known in the AAPA, and analog video processing was known in Abe. A POSITA would understand that these two elements could readily be combined, in the same way that the AAPA supported both analog video and digital video with a single bit map converter to process the text extracted from either type of received signal. Ex. 1001, 2:46-53. The analog processing path in Abe is separate from the text-processing segment:

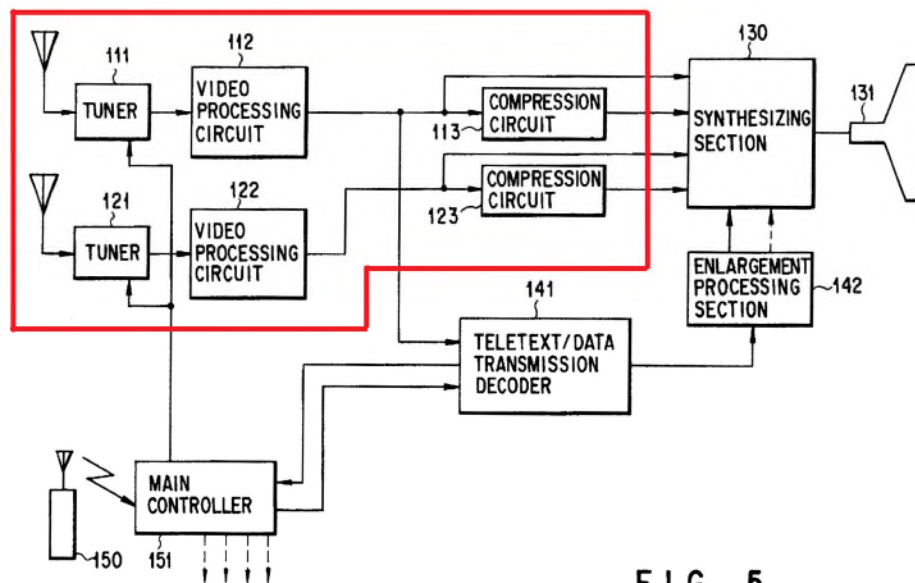


FIG. 5

Ex. 1005, FIG. 5 (annotation added on the analog signal processing portion).

189. The substitution of the analog portion with the digital elements would yield a predictable result because both receive a video signal as input, separate text

data, process the video, and then overlay bitmap text data. The only difference is the portion for processing the video based on digital, rather than analog, technology, which is within the level of ordinary skill in the art. Indeed, analog and digital processing paths take the same inputs (signal data) and generate the same output (display data). A POSITA would consider this a straightforward substitution.

190. A person motivated to combine Abe with the AAPA, for instance based on the market forces pushing towards the obsolescence of analog television signals, would consider the combination obvious to try because digital signal processing is one of only a small number of possible signal processing methods available. There are analog signals and digital signals, and a POSITA would recognize that the choice of processing path is dependent on what sorts of signals are being transmitted by broadcasters. In an environment where digital signals become more prevalent it would be obvious to try using digital video processing in lieu of analog processing.

191. In my opinion it would have been obvious to combine Abe and the AAPA. It would have been obvious because they are both from the same field, which relates to television, and more specifically displaying received text and

graphics on top of a video signal—that is, enhancing a television experience through the use of supplemental information. In Abe this is teletext program data, and in the AAPA this includes data broadcasting such as subtitles, captions, or daily program order. Ex. 1001, 2:4-11. Both teletext data and subtitles and captions are text and graphics information displayed on-screen to supplement information already being shown. In this respect the two references come from the same field and are directed to solving related problems: in Abe, how to display text on a television display that may have a different resolution from intended (Ex. 1005, 2:40-53), and in the AAPA, how to display text on a digital television image.

192. Market forces would have led a POSITA to combine Abe and the AAPA. At the time of the '452 patent, analog television was still being used but was being phased out. The US government determined that analog transmission in the US would be terminated in order to make more efficient use of the radio frequency spectrum using digital transmission. From this a POSITA would know that analog televisions would not be successful commercially and a television would need to be digital to be attractive to consumers. Digital video processing had already become widespread in the same field of endeavor—*i.e.* consumer televisions—and a POSITA would recognize that an analog television in that field

of endeavor could be modified to use the same technology, and indeed would need to be to remain commercially competitive as analog broadcasters ceased broadcasting due to FCC regulations.

193. A POSITA would have a reasonable expectation of success in combining Abe and the AAPA. Both Abe and the AAPA have separate processing paths for video and text data. A POSITA would readily appreciate that when a television signal is received it can be subjected to analog video processing or digital video processing as appropriate without impacting the text processing at all:

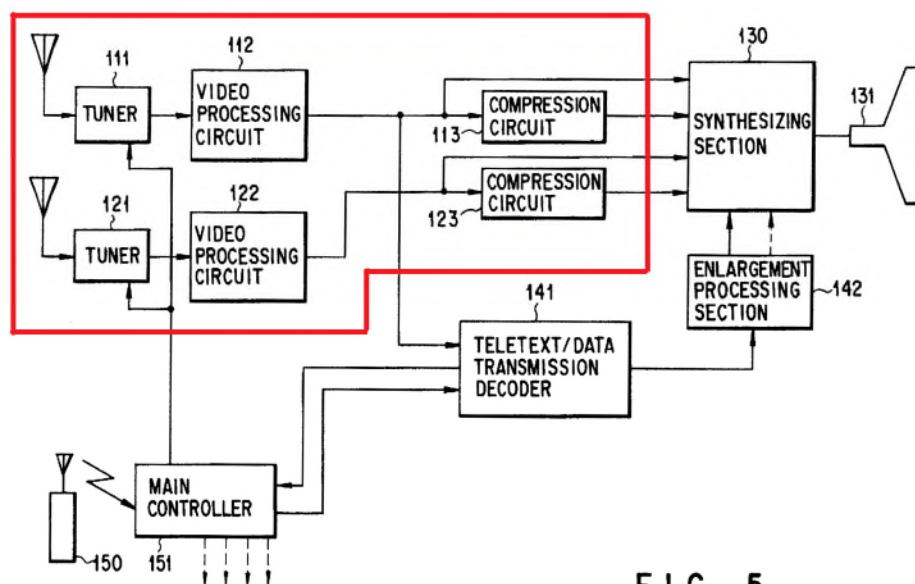


FIG. 5

Ex. 1005, FIG. 5 (annotated).

194. In Abe, the red-circled analog processing path shown above in annotated FIG. 5 receives analog television signals as input. The video processing

circuits 112 and 122 perform detection and gamma correction, while the compression circuits 113 and 123 may resize the analog video images for display. The detected video signals are simultaneously input to teletext/data transmission decoder 141, which pulls out the text data and processes it separately. The separately processed video and text data are finally mixed in synthesizing section 130. The AAPA, as described, decodes digital text and image data and stores each in memory. Ex. 1001, 2:27-31 (“decodes the text data and the image data, respectively and stores the decoded data in the memory 101. Before storing in the memory 101, at this time, each of the text data and the image data may be converted into bit map data.”). *Id.*, 2:29-33. The display processing part then mixes the decoded image data and bitmap-converted text data. *Id.*, 2:34-36.

195. Abe also contemplates that it will be used with a digital display, like the AAPA, in its teaching that the digital/analog converter 34 in the teletext decoder circuit 141 is optional and can be omitted in such a case. Ex. 1005, 7:29-32 (“Depending on the interface of the display apparatus, the D/A converter 34 [shown in FIG. 4 below] may be omitted and the RGB signal produced by the color map memory 33 may be directly produced as an output signal.”)

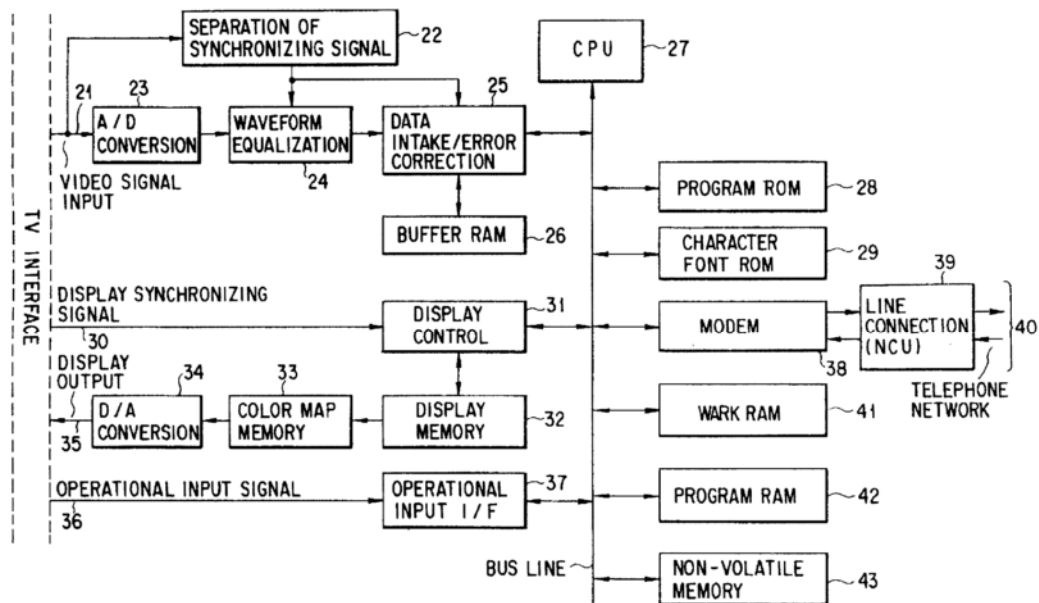


FIG. 4

Ex. 1005, FIG. 4.

A. **Claim 1**

1. **Limitation 1[a], “A digital television having a display, comprising:”**

196. The preamble would be obvious in view of the combination of Abe with the AAPA. The AAPA discloses a digital television with a display. Ex. 1001, 2:12-3:38 (“FIG. 1 illustrates a conventional image display device in a digital TV.”).

2. Limitation 1[b], “a receiving part configured to receive at least one of digital image data and analog image data;”

197. The AAPA discloses receiving both analog and digital image data. Ex. 1001, 2:23-28; 2:46-47. Because this limitation requires receiving analog or digital image data, either analog or digital image data reception would be sufficient to disclose this limitation.

3. Limitation 1[c], “a data processing part configured to execute bit map conversion and format-conversion for text data to be displayed on the display;”

198. Abe discloses that its teletext/data transmission decoder 141 converts text data into bitmap data, and that subsequently enlargement processing section 142 resizes the bitmap data for display. Collectively, these two components in Abe teach the claimed “data processing part” that executes “bitmap conversion” and “format conversion.”

199. After text data is received as character data embedded in the video signal, it is passed off to teletext/data transmission decoder 141 which extracts and processes the text data. Ex. 1005, at 1:14-20; 6:63-7:3; 8:17-21. The text data is then converted into display data (i.e., bit map data) by using a character font ROM 29 shown in FIG. 4 above. *Id.*, 7:5-9. A POSITA would understand this is done, as explained in Abe, by having the character codes referenced into the font ROM to

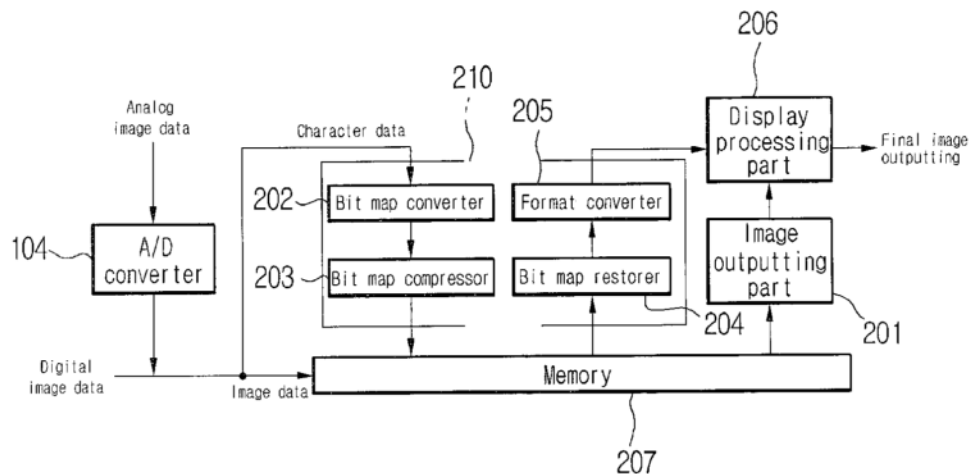
find a bitmap for each character, and then copying the appropriate character “display data” (i.e., bit map data) into the working space, viz. display memory 32. *Id.*, 7:61-67. A POSITA would recognize the data stored in display memory 32 is a bitmap because it stores “image pixel data.” *Id.*, 9:67-10:3. A bitmap stores intensity and color values for each pixel of an image. Similarly, Abe discloses that the image data can be format converted, e.g. by enlarging, just like the ’452 patent. *Id.*, 9:59-10:3. A POSITA would have understood that Abe discloses receipt of graphics data that is already in bitmap form in the data signal (see, e.g., *Id.* at 5:38-46, 8:12-15), or in the alternative receipt of text data that needs to be converted into bitmap data by decoder 141 (see, e.g., *Id.* at 7:5-9, 7:61-67). The detection of text data results in Abe’s decoder 141, which meets the limitation of the bit map converter, converting text data into bit map data.

200. Abe discloses “format conversion” on a bitmap stored in memory. Abe uses resizing enlargement processing section 142 to resize bitmap data representing characters for display. Enlargement processing section 142 receives the bitmap contents of display memory 32 through decoder 141 and the bitmap is “enlarged or reduced at will.” Ex. 1005, 3:7-8; 8:22-25; 9:59-60.

201. A POSITA would understand that the “format conversion” in the ’452 patent is met by resizing a text bitmap image so that it better corresponds to the resolution of the output display. Abe explains that certain currently available television sets could split the screen into multiple sections and display different received television programs on the different sections. *Id.*, 2:10-15. Other TV’s could adapt the screen to both a 4:3 aspect ratio for displaying ordinary NTSC images and to a 16:9 aspect ratio “for displaying wide images of the EDTV2 system” with “upper and lower blank zones” *Id.*, 2:16-24. As a result of these changes in display resolution, teletext “supplementary program” information that was superimposed onto the video image of a received television program, or “proper program” as it is called in Abe, might become “difficult to discriminate” from the proper program (*Id.*, 2:32-34), “hardly recognizable” (*Id.*, 2:34-35), or “hardly discernable from the proper program” (*Id.*, 2:48-50). Abe solved these problems with two aspects of the disclosed invention: first, the supplementary text information can be relocated to a different area of the screen (*Id.*, 2:60-3:6); and second, “***characters and graphics on the television screen can be enlarged to make them clearly visible.***” *Id.*, 3:7-8, emphasis added. I also note that the format conversion does not need to occur *in situ* in memory, as the ’452 patent discloses

that the bitmap data can be read from memory, then format converted, then displayed, with no intervening re-write back into memory. A POSITA would understand that Abe's disclosure of enlarging or reducing corresponds to "format conversion." *Id.* at 9:66-10:3.

202. See Ex. 1001, FIG. 2:



Ex. 1001, FIG. 2.

203. For this reason any conversion of the bitmap, whether in memory itself or as the memory is read out or displayed would meet this limitation.

4. Limitation 1[d], "a memory configured to store the bit map data obtained according to the bit map conversion in the data processing part and image data inputted from an arbitrary receiving part;"

204. The AAPA describes storing received image data in memory for subsequent combination with bitmap data. Ex. 1001, 2:14-17 ("As shown, the

image display device is comprised of a memory 101 in which image data and text data are stored, an image outputting part 102 for reading the image data from the memory 101, and a display processing part 103 for reading the text data from the memory 101 and mixing the image data and the text data.”). Abe discloses receiving text data, converting the text data into bitmap data, and then storing it into a memory:

As the viewer specifies a teletext program by operating the TV remote control, the CPU 27 comes under the control of the program stored in the program ROM 28 for teletext programs. Then, *the transmitted character data are converted into display data by the character font ROM 29 and stored in the display memory 32* by way of the display control section 31.

Id. at 7:60-67. Abe does not discuss storing “image data inputted from an arbitrary receiving part,” but this would be obvious in view of the AAPA. In the combination of Abe and the AAPA, the digital video pipeline of the AAPA receives digital image data (or alternatively receives analog image data and converts it into digital image data using A/D converter 104; see Ex. 1001 at FIG. 1, 2:46-51) and then stores the image data in memory 101. *Id.*, 2:23-28, 2:46-53.

Moreover, the AAPA explicitly teaches that memory 101 is already large enough to store both image data and text bit map data (see *Id.* at 2:14-15, 2:23-28). In the combination of Abe and the AAPA, a POSITA would therefore be motivated to implement display memory 32 (Ex. 1005, FIG. 4), which stores “the bit map data obtained according to the bit map conversion,” as part of memory 101 (Ex. 1001, FIG. 1) to avoid complicating the design of the device by using unnecessary separate memories. A POSITA would recognize that using memory 101 (*Id.*) as a single memory for its express intended purpose of storing both image data and text bit map data would reduce the cost of the device and improve its competitiveness in the marketplace.

5. Limitation 1[e], “an image outputting part configured to read image data from the memory;”

205. This limitation is disclosed by the AAPA’s image outputting part 102 which would be obvious in view of Abe and the AAPA. Ex. 1001, 2:15-17.

6. Limitation 1[f], “a display processing part configured to mix image data read from the image outputting part and the bit map data converted in format by the data processing part.”

206. This limitation is obvious in view of Abe with the AAPA. Here the display processing part 103 in the AAPA discloses mixing bit map data read from memory (as in Abe) with the image data read from the memory in the AAPA. Ex.

1001, 2:40-43 (“[D]isplay processing part 103 mixes the text data (i.e., bit map data) read from the memory 101 and the image data (i.e., bit map data) and outputs the mixed result on the predetermined display screen.”).

207. As such, a POSITA would recognize the combination of Abe and the AAPA meets this limitation because both Abe and the AAPA disclose a portion that combines image data with bitmap data, and as such the combination would do so as well.

B. Claim 8: “The digital television as defined in claim 1, wherein the text data is at least one among HTML data, DHTML data, XML data, SGML data and bit map data.”

208. In my opinion claim 1 is obvious for the reasons described above. The further limitation is disclosed by the AAPA which discloses that the text data is at least bitmap data. The AAPA discloses that “text data” includes bitmap data that was converted and stored in memory: “the image display device is comprised of a Memory 101 in which image data and *text data are stored*. Ex. 1001, 2:14-15 (emphasis added).

209. The AAPA states that text data can be converted into bitmap data. Ex. 1001, 2:29-31. But it also states that the converted text data remains text data, because when it is stored in the memory of the AAPA it is still “text data”:

When predetermined information is provided to a user, when set contents and functions of the TV are changed or when various images are provided with the text data, of course, the display processing part 103 *mixes the text data (i.e., bit map data) read from the memory 101* and the image data (i.e., bit map data) and outputs the mixed result on the predetermined display screen.

Id., 2:37-43 (emphasis added); *id.*, 2:14-15.

210. The AAPA explicitly defines “text data” to include text data that has been converted into bitmap data and stored in memory, which the AAPA also discloses. Because the AAPA discloses storing text data as a bitmap in memory, the text data in the AAPA includes bitmap data.

211. The ’452 patent does not provide any further definition for the claimed “text data.” Further, the claims do not require that the text data be (1) information received from outside the claimed apparatus, (2) information that has not yet been stored in memory, (3) information that has not been converted. On the contrary, the ’452 patent confirms that (1) text data can be data stored in the apparatus, *see* Ex. 1001, 7:12-14 (“In case where the text data is inputted by an operator at the time when the digital TV is produced. . .”); (2) text data can be data

stored in memory, *see id.*, 2:14-15 (“the image display device is comprised of a memory 101 in which image data and text data are stored”); 2:40-41 (“the text data (i.e., bit map data)”); and (3) text data includes both bitmap data that has already been converted and bitmap data that does not need to be converted into bitmap data. *Id.*, 2:29-31; 5:43-58.

212. If Patent Owner were to argue that converted text data does not meet this limitation, a POSITA would understand that the AAPA also discloses processing text data that is already bitmap data. Specifically, the AAPA discloses receiving text data, *id.*, 2:6-8, and mixing text data in bitmap form with image data. *Id.*, 2:40-43. In between, the AAPA states that it “may” convert the text data into bitmap data. *Id.*, 2:29-31. A POSITA would recognize that because the text data does not need to be converted into bitmap data, but instead merely *may* be converted into bitmap data, that the AAPA necessarily encompasses text data that is already in bitmap format. Were it otherwise, it would not be a mere possibility that text data be converted into bitmap data, but instead a requirement. The AAPA therefore expressly discloses this limitation.

C. Claim 9: “The digital television as defined in claim 1, wherein the memory stores first bit map data or second bit map data.”

213. It is my opinion that claim 1 is obvious for the reasons described above. The further limitation of claim 9 is also obvious in the combination of Abe and the AAPA. This limitation is disclosed by Abe combined with the AAPA under Patent Owner’s identified portion of the specification that guides interpretation of this term, *see* Ex. 1015. Exhibit A at p. 32.

214. Abe discloses that display memory 32 stores bitmap data that has been converted from character codes. Ex. 1005, 7:4-18; 7:60-67 (“Then, the transmitted character data are converted into display data by the character font ROM 29 and stored in the display memory 32 by way of the display control section 31.”). This meets the limitation of “first bit map data or second bit map data” because there is necessarily a location in display memory 32 that stores the converted bitmap data obtained by translating character codes into character font ROM bitmaps.

D. Claim 10: “The digital television as defined in claim 1, wherein the conversion of the text data is carried out by using either first bit map data or second bit map data.”

215. In my opinion claim 1 is obvious for the reasons described above, and the limitations of claim 10 are met for the same reasons I discussed earlier for Ground 2, claim 9.

E. **Claim 11: “The digital television as defined in claim 1, wherein the display displays different resolution images.”**

216. In my opinion claim 1 is obvious for the reasons described above. The display in the AAPA displays “different resolution images” as those terms are used in the ’452 patent. For example, the AAPA describes displaying at several different well-known high-definition digital television resolutions:

On the other hand, the digital TV can handle the image having various frame rates in interlace and progressive scanning of 24 Hz, 30 Hz, 60 Hz and so on and display various images having resolution of 720x480, 854x480, 1280x720 and 1920x1080.

Ex. 1001, 2:52-58.

217. Based on this, a POSITA would understand that the digital television in the AAPA, and in particular the television in Abe when modified in view of the digital television of the AAPA, would support these display resolutions.

XII. GROUND 3: CLAIMS 2, 3, 5-7, 12-17, 19-21, AND 23 WOULD HAVE BEEN OBVIOUS OVER THE COMBINATION OF ABE, AAPA AND OKU

218. It is my opinion that Claims 2, 3, 5-7, 12-17, 19-21 and 23 would have been obvious over the combination of Abe in view of AAPA and Oku. I discuss below how each limitation is disclosed in the combination of these references.

219. A necessary part of this analysis is the discussion above in Section XI about how Abe and the AAPA together invalidate claims 1 and 8-11 – that is, the claims that do not involve a “compressor” or “decompressor.” The compressor and decompressor limitations are obvious in view of Oku. Reiterating my discussion above in Section XI briefly (although please refer there for the full discussion), it would be obvious to combine Abe and the AAPA because Abe does not explicitly teach a digital television, and market forces as well as the imminent switch from analog broadcasting to digital-only broadcasting in the United States would make it obvious to a POSITA to update Abe to make it work with digital display signals, which is taught by the AAPA.

220. Among Oku’s teachings is the teaching that a general purpose 16 Mbit memory chip is often not large enough to store both decoded digital image data and bitmap data. Ex. 1004, ¶¶ [0006, 0008]. Oku identifies this issue as being “important in terms of cost.” *Id.*, ¶ [0009]. Oku also teaches that in order to solve this problem, compression and decompression allows the single standard memory chip to be used to store both image memory and bitmap overlays at the same time. *Id.*, ¶ [0009]. In the combination of the AAPA and Abe a single memory is used for bitmap data and image data, and the amount of memory required may be quite

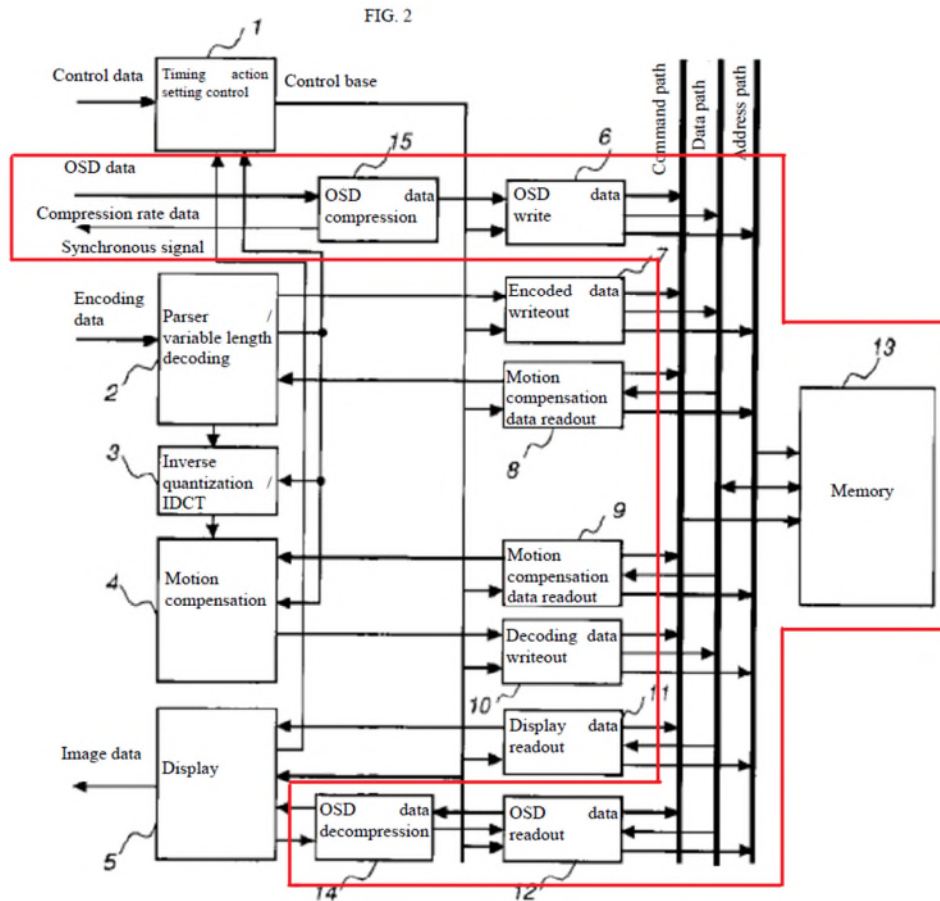
large. Ex. 1001, at 3:32-33. A POSITA would recognize that combining the compressor and decompressor of Oku with digital processing in the AAPA would allow the memory in the decoder to be used more efficiently. This would have the predictable benefit of allowing less memory to be used, because a general purpose 16 Mbit memory chip could be made sufficient in a way that would not be the case if compression were not used. Ex. 1004, ¶¶ [0006-9]. Using less memory would in turn provide the well-understood benefit of reducing the cost of the decoder, thereby improving its competitiveness in the marketplace.

221. Using compression for the express purpose of reducing memory requirements in digital televisions for storing image data and bitmap representations of text data was therefore well-known in the art as a solution to the problem of limited memory, as shown by Oku. Ex. 1004, ¶¶ [0007-9]. It would therefore be obvious to a POSITA to try to use compression when confronted with the problem of limited memory, such as was explicitly identified in the AAPA. Ex. 1001, 3:15-33. Moreover, it would also have been obvious that reducing memory costs would improve the competitiveness of the television decoder, and adding further memory would reduce competitiveness due to the associated cost. A POSITA would recognize that market forces would encourage combinations that

would be expected to reduce the cost of the device, such as the compression and decompression in Oku.

222. The well-understood desirability of using compression to conserve scarce memory resources would also have motivated a POSITA to add the compression circuit from Oku to the digital television disclosed by Abe and the AAPA. They were both known prior art elements performing their known methods, and the method of combining them was also well-known and the results would be predictable. The compression circuit would perform its predicted function on the data received from the digital television. Moreover, digital televisions were at the time “ready for improvement” because the needs for sufficient memory to handle both digital television signals and OSD text were known, as described in Oku, and the addition of a compression circuit would be merely predictable.

223. A POSITA would have a reasonable expectation of success in combining the compressor and decompressor in Oku with the AAPA and Abe because the compression and decompression circuitry in Oku could simply be placed inline where bitmap data is written to and read from memory, exactly as was done in Oku:



Ex. 1004, FIG. 2 (annotated).

224. The AAPA suggests a mechanism to read and write bitmaps to and from memory. Ex. 1001, 2:23-53. Abe and Oku explicitly disclose a data bus connected to memory. Ex. 1005, 7:43-49; Ex. 1004, ¶ [0014]. Because the AAPA already includes a functional arrangement of storing and restoring data to memory, and Abe and Oku include memory buses, a POSITA would recognize that the

compressor and decompressor would perform their expected functions if connected to a data bus providing access to memory, as in Abe and Oku.

225. A POSITA would be motivated to include Oku's compression and decompression in the combination. Abe teaches a memory bus that connects through display control 31 to display memory 32. Ex. 1005, at 7:63-67.

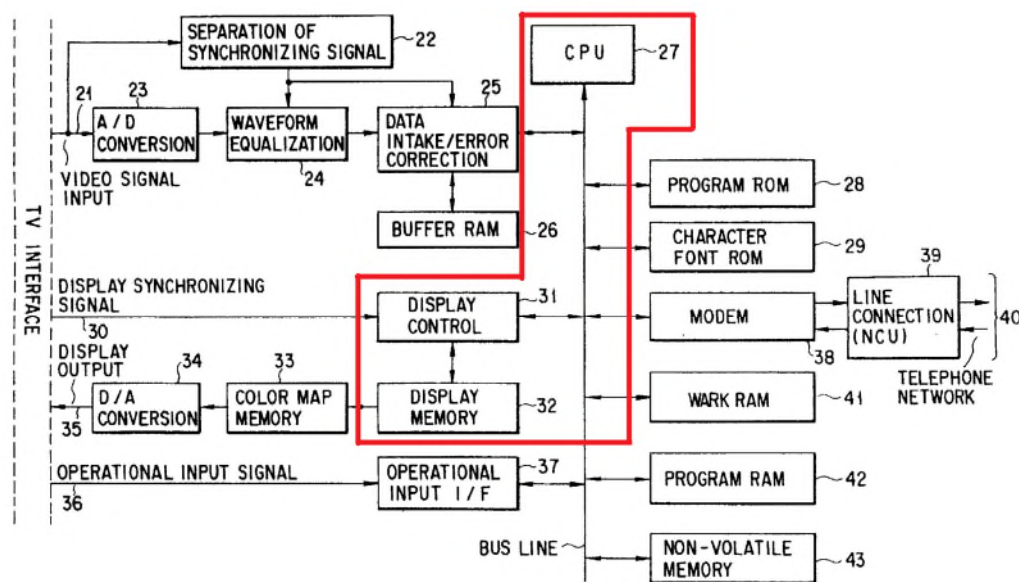
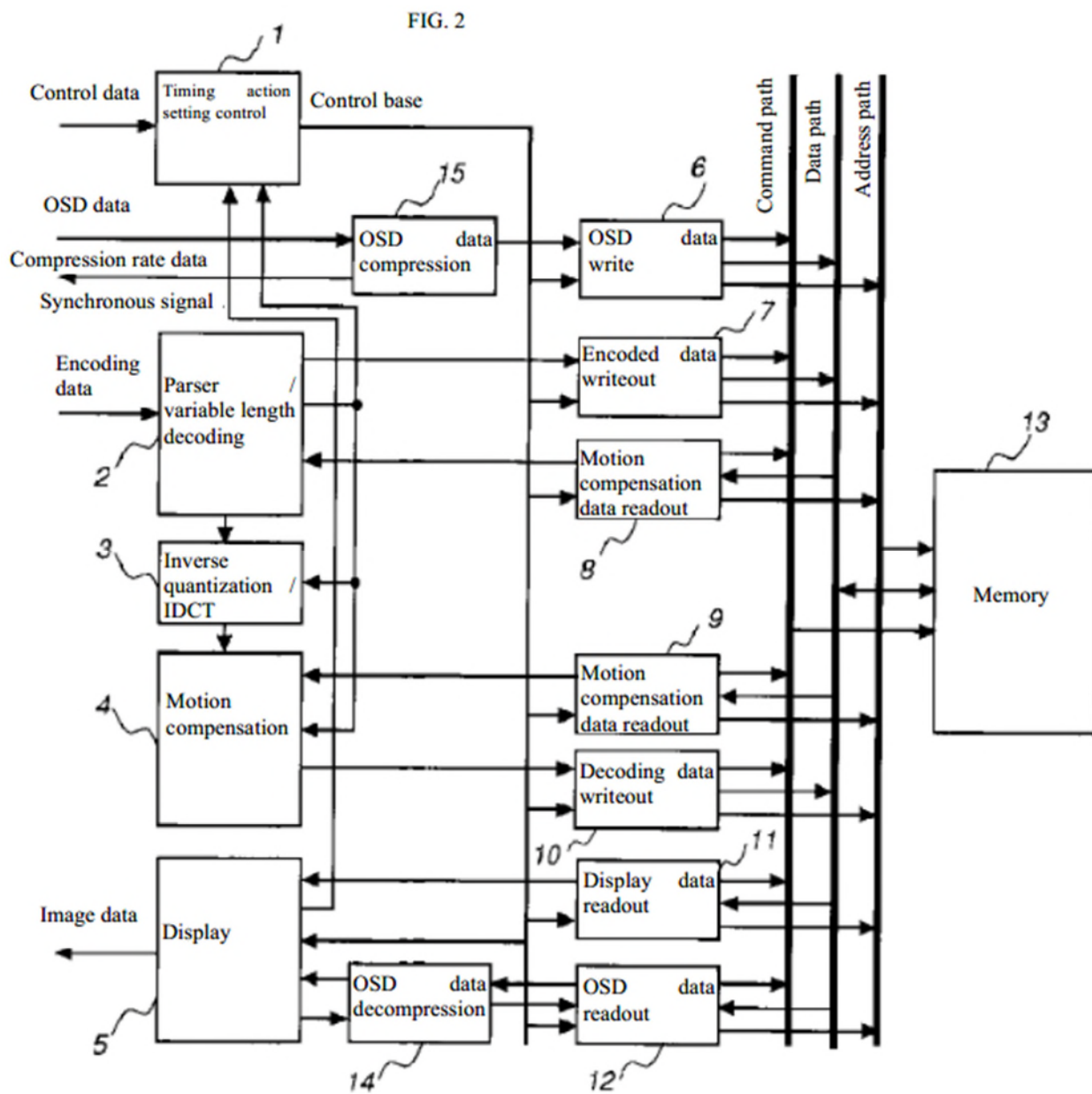


FIG. 4

Ex. 1005, FIG. 4 (annotated).

226. A POSITA would recognize that compression would allow display memory 32 to be used more efficiently; less memory would be required and the cost of the system could be significantly reduced.



Ex. 1004, FIG. 2.

- A. **Claim 2: “The digital television as defined in claim 1, wherein the data processing part comprises a bit map converter configured to determine whether the text data is the bit map data and that converts the text data into the bit map data, based upon the determined result, and a bit map compressor configured to compress the bit map data by using compression coding.”**

227. In my opinion claim 1 is obvious in view of Abe and the AAPA for the reasons described above in section XI. The further combination with Oku does nothing to disturb my opinion that claim 1 is obvious in view of the combination of the three references, and that claim 2 is also obvious because a POSITA would be motivated to simply add the compression and decompression circuits of Oku to the solution of Abe with the AAPA.

228. Abe’s bitmap converter determines whether the text data is “bit map data” and converts the text data into bit map data under the control of CPU 27 executing a program stored in program ROM 28. Ex. 1005, 7:60-67. The conversion program would inherently include code to determine the character that any code corresponds to, and would be configured to only convert such characters, and therefore must “determine whether the text data is the bit map data and that converts the text data into the bit map data, based upon the determined result.” This meets the limitation because, as in the preferred embodiments of the ’452 patent, received text data that is not already bitmap data is converted into bitmap

data. Ex. 1001, at 7:21-24 (“In other words, if it is determined that the text data is not the bit map data, the bit map converter 202 converts the text data into the bit map data, using one of the first bit map data and the second bit map data stored in the memory 207.”). There is, by contrast, no conversion described for data that is already graphics data. *See also*, ¶¶ 238-244, *infra*.

229. Oku discloses “a bit map compressor configured to compress the bit map data by using compression coding.” Oku teaches compressing bit map data using an “OSD data compression circuit 15,” using many different available compression codings, including run-length encoding. Ex. 1004, ¶ [0026]. The combination of Abe, AAPA, and Oku would include the compression circuit described in Oku because a POSITA would appreciate that including compression as described in Oku would allow the memory of Oku to be used more efficiently with no diminution in quality.

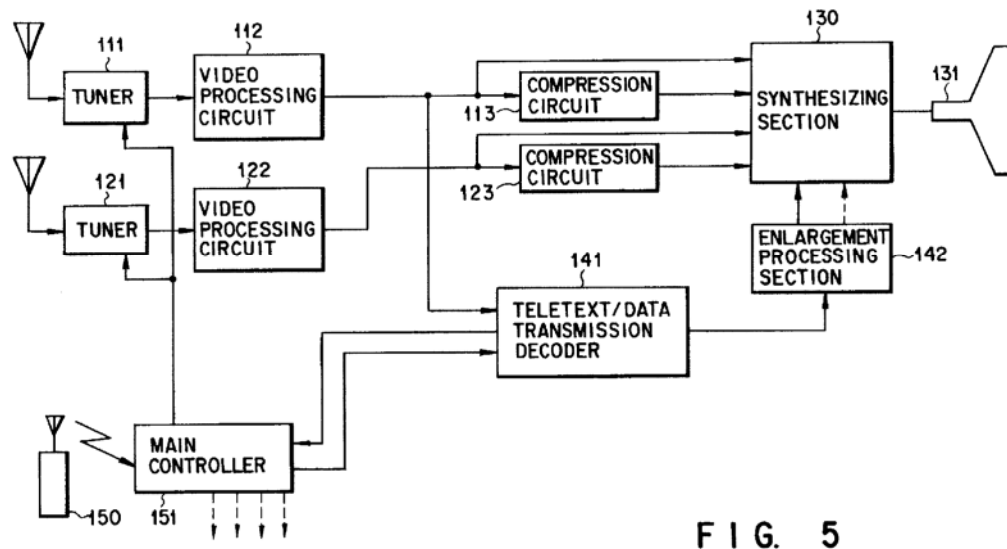
- B. **Claim 3: “The digital television as defined in claim 2, wherein the data processing part further comprises a bit map decompressor configured to read the compressed bit map data from the memory to thereby restore the read data to its original bit map data, and a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution.”**

230. In my opinion claim 2 is obvious for the reasons described above with respect to the combination of Abe, the AAPA, and Oku. The additional limitations from claim 3 are also obvious in the combination of Abe, the AAPA, and Oku.

231. Oku discloses OSD data decompression circuit 14, which is a bitmap decompressor that reads the compressed bitmap data stored in memory. This retrieves compressed bitmap data from memory 13 and restores it for subsequent use as the original bitmap data. Ex. 1004, ¶ [0022] (“The OSD data decompression circuit 14 decompresses the compressed OSD data and restores the OSD data corresponding to the original bitmap.”).

232. Turning to the limitation of “a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution,” Abe discloses a television receiving set that is configured to convert the format of the decompressed bit map data to correspond with the display resolution. Abe’s processing first prepares the character “display data” (i.e., bit

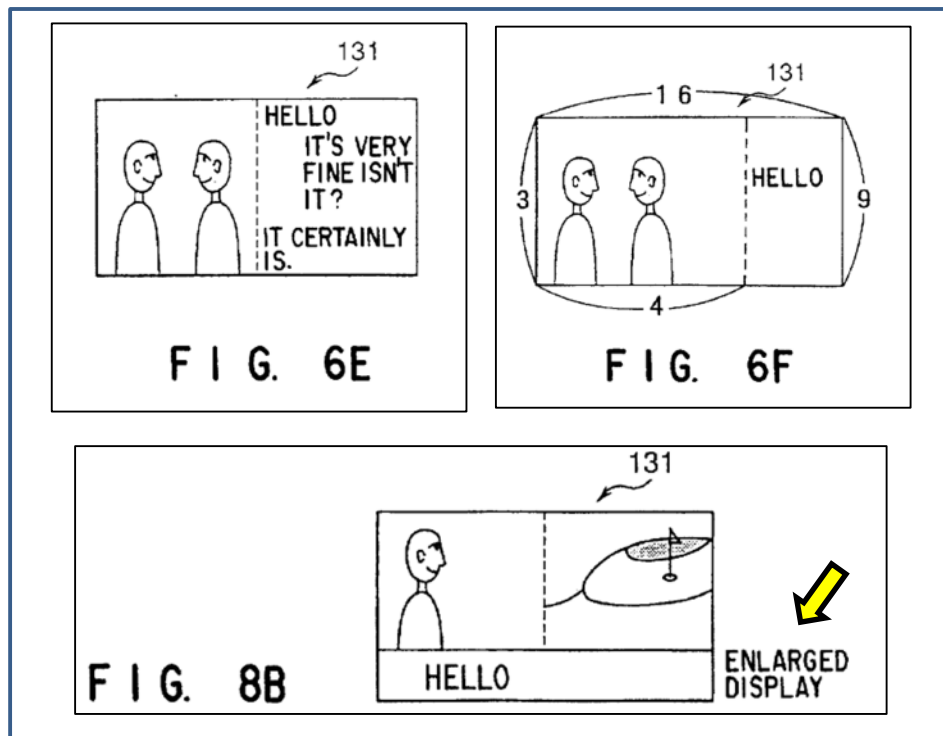
map data) in memory, as I discussed above in section XI for claim 1[c]. The “enlargement processing section 142” may then resize the teletext text and graphics in order to match the output display resolution.



Ex. 1005, FIG. 5.

233. Abe teaches that television receiving sets at the time were already capable of displaying one television image, or even a plurality of television images, at a variety of different display resolutions. *Id.* at 2:10-11 (“Television receiving sets having an image memory and a multi-image displaying feature are also currently available”), 2:12-15 (“Some television receiving sets are provided with a feature of splitting the screen into two sections and simultaneously

displaying two television images received through two different television channels on the respective sections”), 2:40-45 (“currently, some television receiving sets are provided with the feature of splitting the screen into two or more than two sections to display different programs transmitted through different channels while some are provided with the feature of producing upper and lower blank zones to display images for a wide screen”), 2:16-21 (“with currently available EDTV2 (extended definition television 2) system television receiving sets that are compatible with the NTSC system, the screen is adapted both to the aspect ratio of 4:3 for displaying ordinary images of the NTSC system and to that of 16:9 for displaying wide images of the EDTV2 system”). Some illustrative examples from Abe showing one or two television images being displayed at different display resolutions on the television screen with superimposed text are reproduced below:



Ex. 1005, FIGS. 6, 8 (annotated).

234. When the television receiving set splits the screen into two or more sections or displays images for a wide screen, Abe further teaches that superimposing text and graphics (referred to as a *supplementary program* in Abe) on a television image (referred to as the *proper program* in Abe) may lead to problems with the clarity and visibility of the text. *Id.*, 2:40-52. In particular, Abe teaches that the text and graphics may become “hardly discernable from the proper program” (*Id.*, 2:48-49) or “hardly recognizable” (*Id.*, 2:34-35) and that the text characters and graphics “*can be enlarged to make them clearly visible.*” (*Id.*, 3:7-

8, emphasis added). This is shown, e.g., in FIG. 8B above where the yellow arrow (added) points to the original annotation “ENLARGED DISPLAY” indicating that the superimposed text on the television screen has been enlarged. *Id.*, 9:59-63.

235. Enlarging the superimposed text as illustrated in FIG. 8B to make it clearly visible is one of the express, intended purposes of Abe’s Enlargement Processing Section 142 shown in the embodiments of FIG. 5 and FIG. 12. *Id.* at 3:7-8, 8:22-25, 9:59-67, 11:9-14. In the combination of Abe, the AAPA, and Oku, once the compressed text bit map data has been read out of memory and restored by Oku’s decompression circuit 14 as I discussed above, then Abe’s Enlargement Processing Section 142 can resize the decompressed text bit map data *at will*. Ex. 1005, 9:59-60. A POSITA would understand that “at will” includes the specific case where the text must be **enlarged** to make it clearly visible (*Id.*, 3:7-8) because the television screen has been divided into two or more sections (*Id.* at 2:12-13, 2:27-32, 2:40-45) as shown in FIGS. 6E, 6F, and 8B above with the result that teletext data originally intended to be displayed on the entire television screen is instead displayed on a smaller section of the screen and becomes too small to be clearly visible without enlargement. This enlargement of the text by Abe’s Enlargement Processing Section 142 meets the limitation of “a format converter

configured to convert the format of the decompressed bit map data to correspond with display resolution” because the text is being enlarged to make it clearly visible when displayed in a small section of the screen that has a different display resolution compared to the display resolution of the entire screen.

236. In Abe’s embodiments shown in FIG. 5 and FIG. 12, I note that Abe’s Enlargement Processing Section 142 is activated “by the user operating a remote control unit.” *Id.* at 8:22-25; see also *Id.* at 11:24-26. This does not change my opinion that Abe’s Enlargement Processing Section 142 meets the limitation of “a format converter configured to convert the format of the decompressed bit map data to correspond with display resolution” in the combination of Abe, the AAPA, and Oku. There are at least two reasons why it does not change my opinion. First, the limitation requires only that the format converter be *configured* to convert the format of the decompressed bit map data to correspond with display resolution. In the combination of Abe, the AAPA, and Oku, Abe’s Enlargement Processing Section 142 as disclosed in the embodiments of FIG. 5 and FIG. 12 is *configured* to convert the format of the decompressed bit map data upon receiving a signal from the remote control unit. *Id.* at 8:22-25, 11:24-26. The ’452 patent itself is silent as to how the format conversion is to be performed and nowhere recites

language that would preclude the use of a remote control signal to activate the format conversion.

237. Another option that is within the scope of Abe's disclosed invention and would have been obvious for a POSITA to try in the combination of Abe, the AAPA, and Oku would be for Abe's Enlargement Processing Section 142 to be activated automatically based on display resolution. A POSITA would appreciate that with the different supported display resolutions in the AAPA, presenting fixed-sized text bitmaps in the image may make the displayed text too small to be readily or clearly legible, which is one of the problems that Abe explicitly intended to solve. Ex. 1005, 2:26-53 ("characters and graphics of the supplementary program can be hardly discernible from the proper program"); 3:7-8 ("characters and graphics on the television screen can be enlarged to make them clearly visible"); 2:54-59 ("it is therefore the object of the present invention to provide a television receiving set having a text displaying feature that is designed to display characters and graphics of supplementary programs in a specific way to display clearly discernible characters and graphics"). In particular, when displaying a full-screen image of bit map teletext data such as that shown in Abe's FIG. 7B (*Id.* at 9:41-44), a POSITA would realize that a text font bitmap that displayed legibly on

a television screen with a resolution of 720 x 480 would be approximately 2.25 times smaller if rendered on a screen with a resolution of 1920 x 1080. Because Abe discloses a single character font ROM and using enlargement to make the text more legible, a POSITA would understand that the format conversion in Abe is particularly well-suited to the combination of Abe, the AAPA, and Oku. In order to realize the combination a POSITA would use the enlargement processing section to allow the resizing of text data in Abe in a digital television according to the AAPA. In so-doing, the enlargement processing section would work as expected, enlarging the bitmap where appropriate to improve legibility of the text.

C. **Claim 5: “The digital television as defined in claim 2, wherein the bit map converter converts the text data into the bit map data, if it is determined that the text data is not the bit map data.”**

238. My opinion is that claim 2 is obvious for the reasons described above. The additional limitations are also obvious in the combination of Abe with the AAPA and Oku. I have discussed the context for this limitation, and whether text data is or is not “the bitmap data”, in the context of claim 2, above. Abe discloses converting text data into bitmap data when it is not bitmap data. Specifically, Abe receives “transmitted character data” that is “converted” into bitmap data so that it can be displayed:

the CPU 27 comes under the control of the program stored in the program ROM 28 for teletext programs. Then, the transmitted character data are converted into display data by the character font ROM 29 and stored in the display memory 32 by way of the display control section 31.

Ex. 1005, at 7:62-67.

239. In addition to “characters,” teletext programs in Abe may also include “images”:

A script is produced by the TV broadcasting station 12 and signals for it are transmitted with ordinary video and audio signals. A script is realized as a set of objects as listed below.

- (1) background/displaying materials
- (2) operational buttons
- (3) a sequence of characters
- (4) images

Ex. 1005, at 5:38-46.

240. Abe also discloses that the teletext includes both “characters” and “graphics”: “...the signal coming from the teletext/data transmission decoder 141 and *representing characters and graphics...*” *Id.*, at 8:12-14 (emphasis added).

241. The conversion of the text data is described in a way well-understood by a POSITA, by looking up the character in a character font ROM that corresponds to a received code: “Character font ROM 29 stores character fonts to be used for displaying characters so that the CPU 27 addresses the desired characters and reads out character data for the ROM 29 corresponding to the addressed characters.” *Id.*, at 7:5-8.

242. There is no disclosure of any processing done that converts a received graphic into a bitmap, while Abe does explain (as I noted above) that the received “images” and converted character data are in the form of a signal from display memory 32 that can be overlaid.

243. A POSITA would understand that because the character data is converted into a bitmap, and is assembled with graphics, the graphics would also inherently and necessarily be a bitmap, and because no processing is described the received graphics are inherently a bitmap.

D. **Claim 6: “The digital television as defined in claim 2, wherein the bit map converter bypasses the text data, if it is determined that the text data is the bit map data.”**

244. In my opinion claim 2 is obvious for the reasons described above. The additional limitations are also obvious in the combination of Abe with the AAPA and Oku. Abe describes how character text data is converted into a bitmap by the character font ROM 29 under the control of CPU 27. As I have just discussed above in relation to claim 5, teletext programs according to the teachings of Abe may include graphics and images in addition to character text data and a POSITA would understand that such graphics and images would inherently and necessarily be received as bitmap data. However, Abe does not describe any conversion of bitmap data using character font ROM 29 and CPU 27. The claimed “bit map converter” in Abe therefore does not do any processing to bitmaps in order to ensure they are properly displayed. As such they are “bypass[ed]” and not processed by the bit map converter.

E. **Claim 7: “The digital television as defined in claim 2, wherein the predetermined compression coding is a run-length compression coding.”**

245. My opinion is that claim 2 is obvious for the reasons described above. The additional limitations are also obvious in the combination of Abe with the AAPA and Oku. Oku discloses run-length compression coding as predetermined

compression coding. Ex. 1004, ¶ [0025]. As such Oku discloses run-length encoding as one predetermined compression technique, and a person having ordinary skill would understand that this compression technique would be used in the combination of Abe and the AAPA with Oku because it is integral to the disclosed advantage of Oku in storing bitmap data efficiently in limited memory.

F. Independent Claim 12

246. Claim 12 is essentially the same in relevant part as claim 1 (as it relates to bitmap conversion and format conversion) and claims 2 and 3 (as they relate to compressor and decompressor). My opinion with respect to claim 12 is therefore that it is invalid in light of the combination of Abe in combination with the AAPA and Oku, for the reasons I discussed with respect to Ground 2, claims 1-3.

G. Claim 13: “The digital television as defined in claim 12, wherein the text data is at least one among HTML data, DHTML data, XML data, SGML data and bit map data.”

247. Claim 13 is essentially the same in relevant part as claim 8. My opinion with respect to claim 13 is therefore also that it is invalid in light of the combination of Abe with the AAPA and Oku for the reasons I provided for Ground 2, claim 8.

- H. **Claim 14: “The digital television as defined in claim 12, wherein the bit map converter converts the text data into bit map data if it is determined that the text data is not bit map data.”**

248. Claim 14 is essentially the same in relevant part as claim 5. My opinion with respect to claim 14 is therefore also that it is invalid in light of the combination of Abe with the AAPA and Oku for the reasons I provided for Ground 3, claim 5.

- I. **Claim 15: “The digital television as defined in claim 12, wherein the bit map converter bypasses the text data if it is determined that the text data is bit map data.”**

249. Claim 15 is essentially the same in relevant part as claim 6. My opinion with respect to claim 15 is therefore also that it is invalid in light of the combination of Abe with the AAPA and Oku for the reasons provided for Ground 3, claim 6.

- J. **Claim 16: “The digital television as defined in claim 12, wherein the predetermined compression coding is a run-length compression coding.”**

250. Claim 16 is essentially the same in relevant part as claim 7. My opinion with respect to claim 16 is that it is invalid in light of the combination of Abe with the AAPA and Oku for the reasons I provided for Ground 3, claim 7.

- K. **Claims 17/21: “The digital television as defined in claim 12/20, wherein the conversion of the text data is carried out by using either first bit map data or second bit map data previously stored in the memory.”**

251. Claims 17 and 21 are essentially the same in relevant part as claims 9 and 10, with the addition that the bitmap information be “previously stored.” As I discussed above in section XI, *supra*, Patent Owner has taken the position that this limitation, including the requirement that the “first bitmap data” and “second bitmap data” be “previously stored” is explained in the ’452 patent at 7:49-8:32. Moreover, a POSITA would understand that the compressed bitmap data, i.e., the output of the bitmap compressor, would be stored in memory and the input to the bitmap decompressor, the same compressed bitmap data, would be retrieved from memory. This is shown in Oku at ¶¶ [0022-23]. Under the plain meaning of this limitation, and the knowledge of a POSITA, this limitation is met by Abe modified in view of the AAPA and Oku for the same reasons as I explained for Ground 2, claim 10.

- L. **Claim 19: “The digital television as defined in claim 12, wherein the display displays different resolution images.”**

252. Claim 19 is essentially the same in relevant part as claim 11. My opinion with respect to claim 19 is therefore also that it is invalid in light of the

combination of Abe with the AAPA and Oku for the reasons I discussed with respect to those limitations in Ground 2, claim 11.

M. Independent Claim 20

253. Claim 20 is essentially the same in relevant part as claim 12. My opinion with respect to claim 20 is therefore that it is also invalid in light of the combination of Abe with the AAPA and Oku for the reasons I discussed with respect to the limitations of Ground 3, claim 12.

N. Claim 23: “The digital television as defined in claim 20, wherein the display displays different resolution images.”

254. Claim 23 is essentially the same in relevant part as claim 11. My opinion with respect to claim 23 is that it is invalid in light of the combination of Abe with the AAPA and Oku for the reasons I discussed with respect to Ground 2, claim 11.

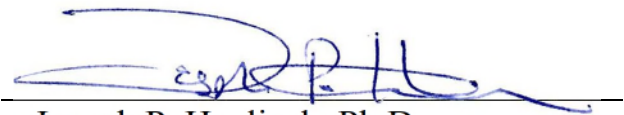
XIII. DECLARATION IN LIEU OF OATH

255. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and

that such willful false statements may jeopardize the validity of the application, or any patent issued thereon. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

256. I declare under penalty of perjury that the foregoing is true and correct.

January 13, 2023



Joseph P. Havlicek, Ph.D.