

HAYNES BOONE

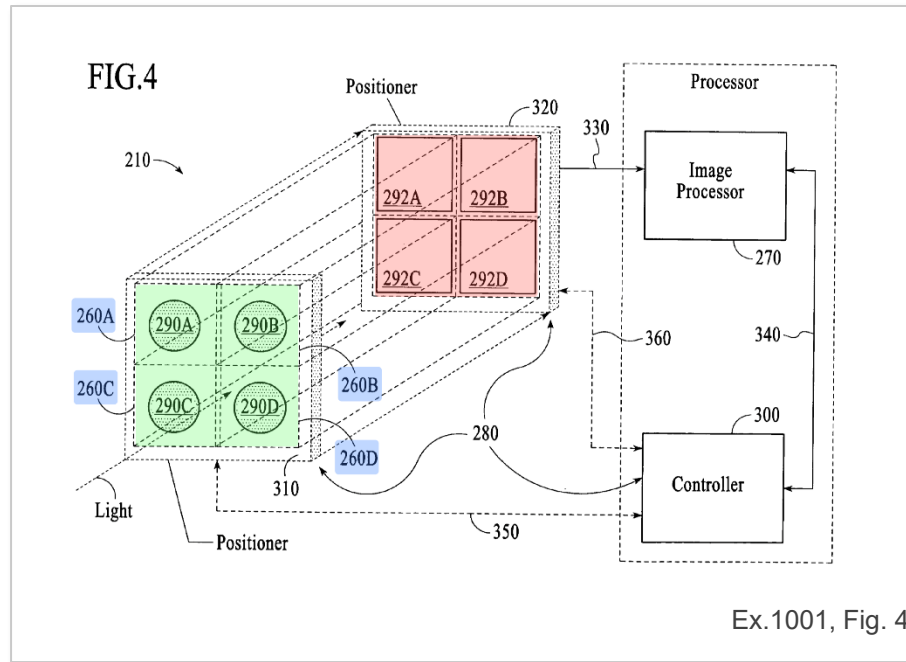
***TESLA, INC. V. INTELLECTUAL
VENTURES II LLC***

IPR2025-00339 (7,916,180)

Jonathan Bowser, Hong Shi
Counsel for Petitioner



The '180 Patent

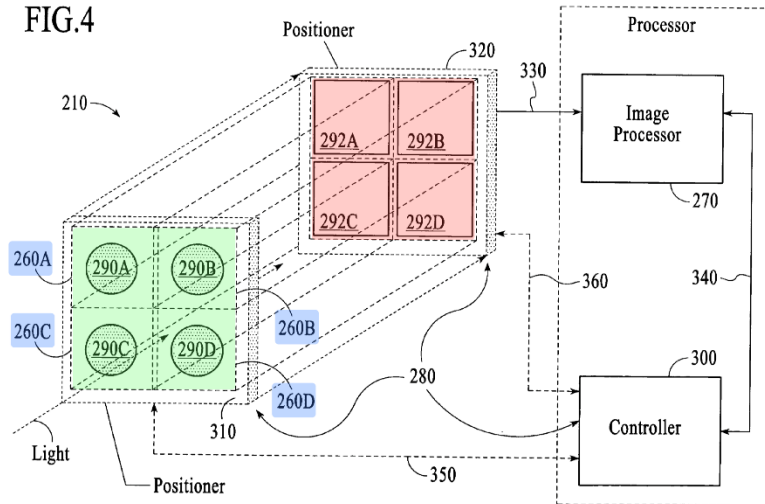


In operation, the sensor array **1504A**, is exposed to light on a sequential line per line basis (similar to a scanner, for example) or globally (similar to conventional film camera exposure, for example). After being exposed to light for certain period of time (exposure time), the pixels **1580_{1,1}-1580_{n,m}**, are read out, e.g., on a sequential line per line basis.

Ex.1001, 17:29-34

The '180 Patent, Claim 22

FIG.4



22. A method comprising:
configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;
configuring a second optics component relative to a second image sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;
independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
combining data received during the frame from one or more of the first and second channels to provide an image.

Ex.1001, claim 22

Disputed Claim Limitations

The parties have focused arguments on [22.3].

22. A method comprising:
configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;
configuring a second optics component relative to a second image sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;
[22.3] independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
combining data received during the frame from one or more of the first and second channels to provide an image.

Ex.1001, claim 22

Limitation [1.2.2] is similar to [22.3] but lacks “*during a frame.*”

Grounds

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 10–12, 22, 24, 25, 28, 30, 32, 33	103(a) ¹	Matsushima ² , Yu ³
28, 30	103(a)	Matsushima, Yu, Weldy ⁴
22, 23, 28, 30, 33	103(a)	Choi ⁵ , Labaziewicz ⁶ , Yu

Inst. Dec., 6

Ground 1 Issue Summary

- Ground 1: Matsushima and/or Matsushima + Yu
 - The Board should adopt Petitioner’s construction for *“during a frame.”*
 - IV’s construction includes only part of the image frame acquisition process (“exposure interval”).
 - *“during a frame”* includes both (1) capturing the light and (2) the readout period that generates image data.
 - IV’s patentability arguments depend entirely on its narrow construction.
 - Petitioner has shown the claims are unpatentable under
 - Petitioner’s construction, and
 - IV’s construction

Discussion Roadmap

- Claim Construction:
 - “*during a frame*” Slides 8-16
- Ground 1: Matsushima renders obvious
“*simultaneous data acquisition...during a frame*” Slides 18-25
- Ground 1: Matsushima renders obvious
“*independently controlling...*” Slides 27-32
- Ground 1: Matsushima and Yu render obvious
“*independently controlling...*” Slides 34-36
- Ground 3: Choi, Labaziewicz, and Yu render the
challenged claims obvious Slides 38-45

Construction of “*during a frame*”

[22.3] “*independently controlling simultaneous data acquisition with each of the first and second channels during a frame*”

Petitioner’s construction

“... during a period of time when data for an image frame is acquired”

IV’s construction

“... at some point between the beginning and the end of the exposure interval during which an image sensor captures a single image”

Pet., 7; Reply, 3-6; POR, 16-18

Petitioner's construction of “*during a frame*”

[22.3] “*independently controlling simultaneous data acquisition with each of the first and second channels during a frame*”

Petitioner's construction

“... during a period of time when data for an image frame is acquired”

Petitioner's construction:

- “*during a frame*” imposes a temporal requirement for “*data acquisition*”
- distinguishes from definition of “frame” in '180 patent as a physical component of a camera.

“Frame” or “thin plate” means the component of the DCS that is used to hold the lenses and mount to the image sensor.

Ex.1001, 22:8-9

Pet., 7; Ex.1003, ¶70; Reply, 3, 9; Inst., Dec., 20

Petitioner's construction of “*during a frame*”

[22.3] “*independently controlling simultaneous data acquisition with each of the first and second channels during a frame*”

Petitioner's construction

“... during a period of time when data for an image frame is acquired”

Petitioner's construction is supported by the surrounding claim language:

- [22.3] independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
- [22.4] combining data received during the frame from one or more of the first and second channels to provide an image.

Ex.1001, cl. 22

Pet., 7-8; Reply, 3

“during a frame” includes a period for acquiring digital data of a frame

Digital data of a frame is acquired *“during a frame.”*

tion time, respectively). The data from all sensors can be digitally combined to provide a much greater dynamic range within one frame of digital camera data. The raw digital camera data could be used by digital signal processing of the scene. The digital data can also be stored and displayed to exhibit low light or bright light characteristics as desired.

Ex.1001, 20:19-24

Claim 22 combines (digital) data *“received during the frame.”*

[22.3] independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and

[22.4] combining data received during the frame from one or more of the first and second channels to provide an image.

Ex.1001, cl. 22

Reply, 4; Ex.1069, ¶12

Kodak: frame time includes readout

1994 Kodak Paper on Terminology:

Frame Rate:

The frame period (T_p) of an imager is the time lapsed between successive image readouts, and the frame rate is the number of images which can be read out during one second ($F_p = 1/T_p$).

Ex.1021, 20

IV's own evidence shows that a "frame time" includes a readout time

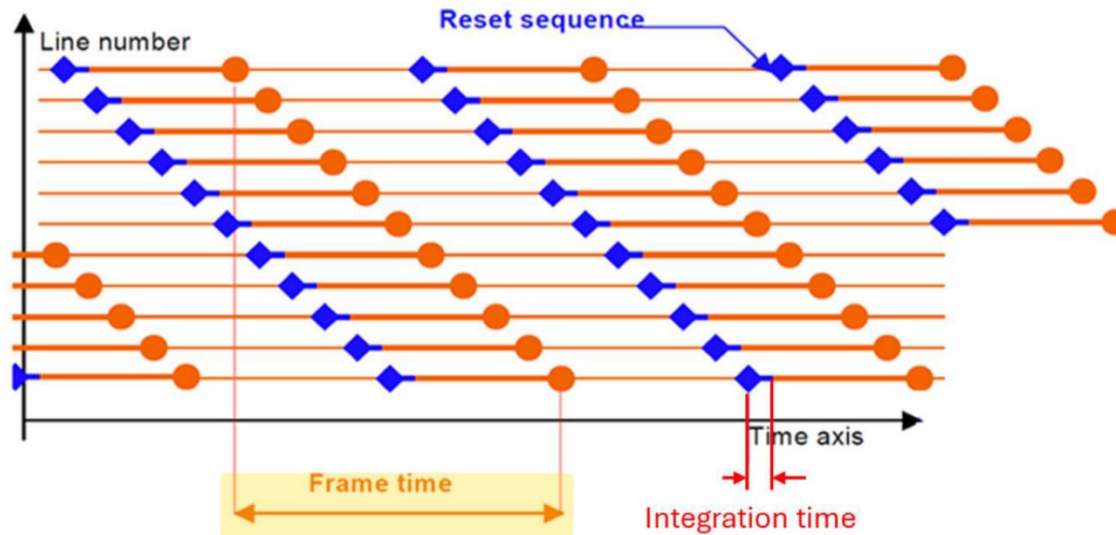


FIG. 13 Rolling Shutter mode

17. As shown in annotated FIGS. 13 and 14 of Ex.2008 above, the **frame time** (either under rolling shutter or snap-shot shutter) includes the integration time (shown in blue) and the readout time (shown in orange). Ex.2008, FIGS. 13, 14, 10-11.

Ex.1069, ¶¶ 16-17 (citing Ex.2008, 3)

Reply, 5

IV's construction of “*during a frame*” is wrong

[22.3] “*independently controlling simultaneous data acquisition with each of the first and second channels during a frame*”

IV's construction

“... at some point **between the beginning and the end of the exposure interval** during which an image sensor captures a single image”

IV's construction is wrong because:

- It excludes a readout period for data acquisition
- It contradicts IV's expert

Reply, 3-6; POR, 16-21

IV's construction of “*during a frame*” is wrong

[22.3] “*independently controlling simultaneous data acquisition with each of the first and second channels during a frame*”

IV's construction

“... at some point **between the beginning and the end of the exposure interval** during which an image sensor captures a single image”

IV's construction excludes a readout period for data acquisition.

In operation, the sensor array **1504A**, is exposed to light on a sequential line per line basis (similar to a scanner, for example) or globally (similar to conventional film camera exposure, for example). After being exposed to light for certain period of time (exposure time), the pixels **1580_{1,1} - 1580_{n,m}**, are read out, e.g., on a sequential line per line basis.

Ex.1001, 17:29-34

IV's expert admits that data acquisition includes a readout

Dr. Saber's deposition

Q. Any other steps are part of the data acquisition process?

A. I mean, obviously you may have some amplifications or filtering techniques are embedded into the design. You know, conversion, let's say, from analog to digital. I mean, there are some, you know, steps in the process there.

Ex.1070, 64:14-20

* * * *

Q. Does Figure 3 have components that perform the readout?

* * * *

[A.] So obviously you have a series of photo detectors on a semiconductor substrate. So think of that as a CCD array. So obviously when you collect the data on those CCD arrays, you have to read it out; otherwise, what's the point of collecting it.

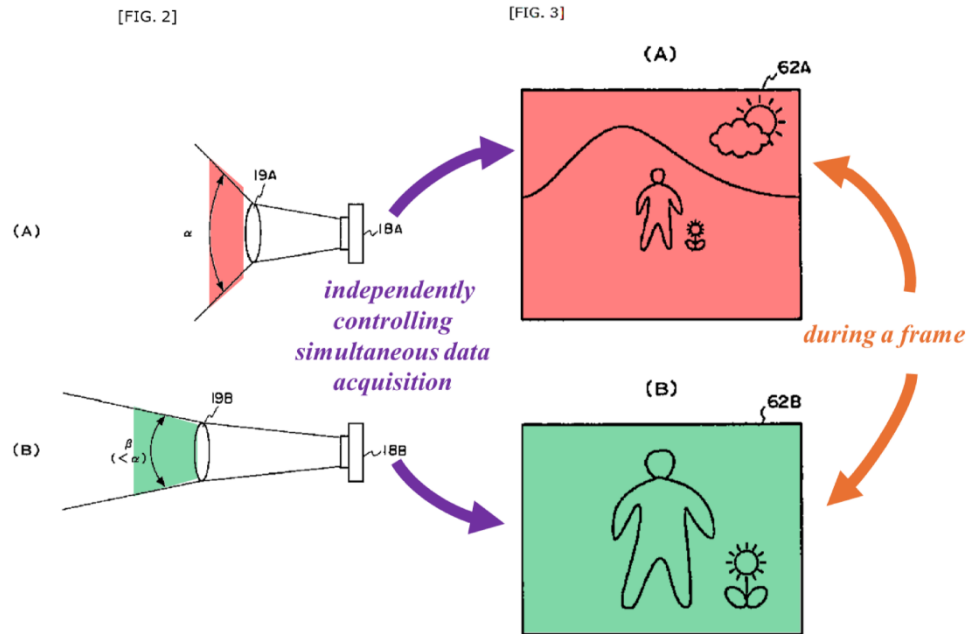
Ex.1070, 66:3-67:4

Discussion Roadmap

- Claim Construction:
 - “*during a frame*” Slides 8-16
- Ground 1: Matsushima renders obvious
“*simultaneous data acquisition...during a frame*” Slides 18-25
- Ground 1: Matsushima renders obvious
“*independently controlling...*” Slides 27-32
- Ground 1: Matsushima and Yu render obvious
“*independently controlling...*” Slides 34-36
- Ground 3: Choi, Labaziewicz, and Yu render the
challenged claims obvious Slides 38-45

Matsushima's dual-channel system simultaneously acquires two images of the same scene at different fields of view (FOVs)

Matsushima



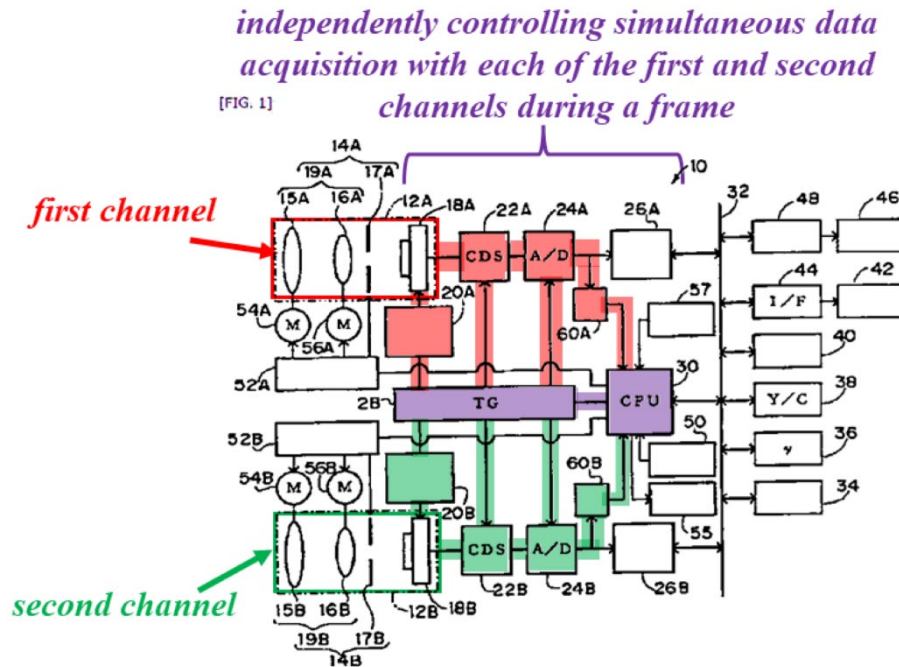
Ex.1007, FIGS. 2 and 3, annotated; Ex.1003, ¶96.

[0021] In addition, CCD 18A and CCD 18B can be, for example, CCDs of the same size, that is, the same number of pixels. Therefore, when the image captured with the first imaging system 12A is the captured image 62A shown in FIG. 3 (A), the image captured by the second imaging system 12B is the scaled-up captured image 62B at the center of FIG. 3 (A), as shown in FIG. 3 (B).

Ex.1007, [0021]

Matsushima's dual-channel system renders obvious “simultaneous data acquisition...during a frame”

Matsushima



Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.

[0017] FIG. 1 is a block diagram showing the configuration of a digital camera. This digital camera 10 has two independent imaging systems (a first imaging system 12A and a second imaging system 12B), and subject images are formed on the light-receiving surfaces of CCD 18A and 18B via imaging optics 14A and 14B, respectively.

Ex.1007, [0017]

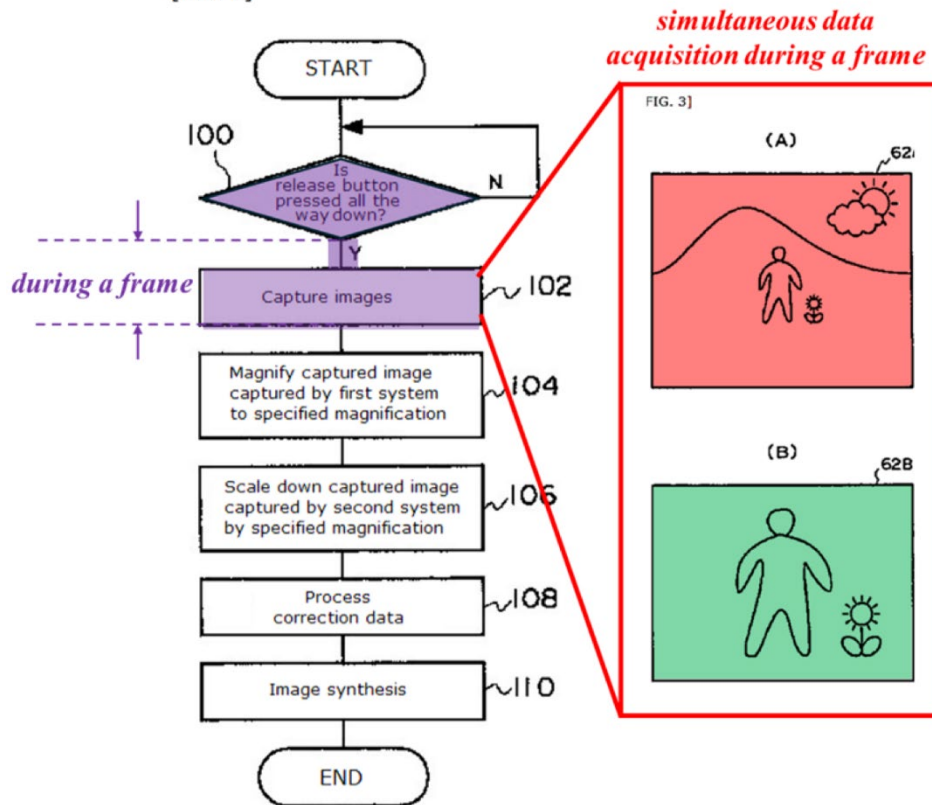
[0027] A timing signal generating circuit (TG) 28 provides appropriate timing signals to the CCD drive circuits 20A and 20B, the CDS circuits 22A and 22B, and the A/D converters 24A and 24B in response to commands from the CPU 30, and each circuit is driven synchronously by timing signals applied from the timing signal generating circuit 28.

Ex.1007, [0027]

Matsushima renders obvious “*simultaneous data acquisition...during a frame*”

Matsushima

[FIG. 7]



[0063] In step 100, it is determined whether the release button has been fully pressed. If the release button has not been pressed, the determination in step 100 is NO and the camera goes into standby until the release button is pressed.

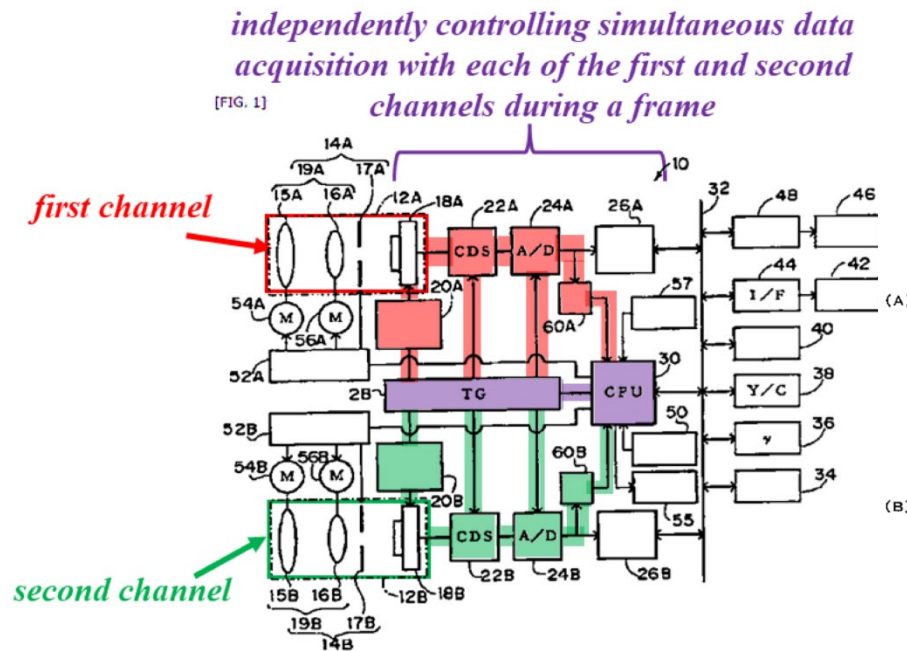
[0064] If the release button has been pressed, the determination in step 100 is YES and the process advances to step 102. Imaging processing is performed in each of the first imaging system 12A and second imaging system 12B as described above. As a result, captured image 62A and captured image 62B are stored in memory 26A and 26B, respectively.

Ex.1007, [0063]-[0064]

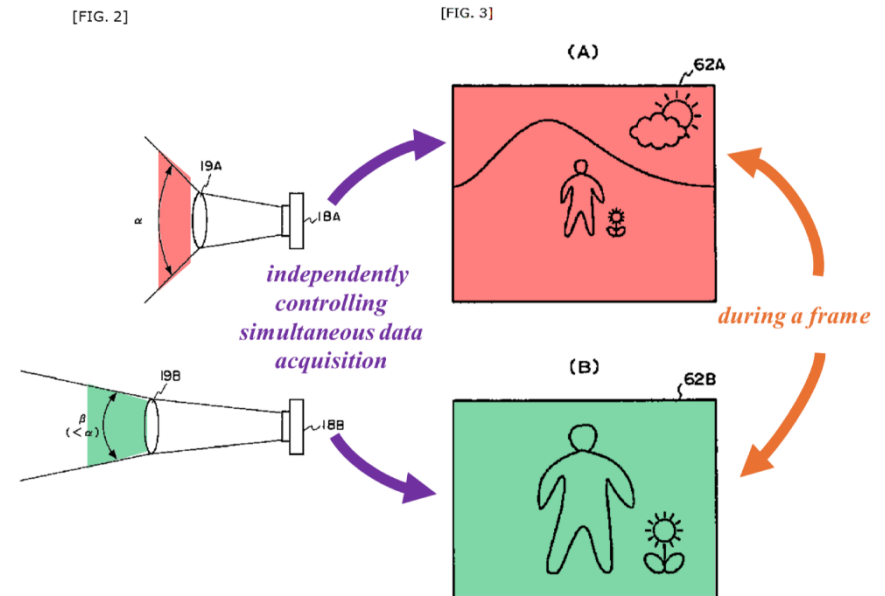
Ex.1007, FIGS. 3 and 7, annotated; Pet. 23, 25; Ex.1069, ¶54.

IV mischaracterizes Matsushima as providing sequentially captured images

Matsushima captures images of the same scene at the same time.



Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.



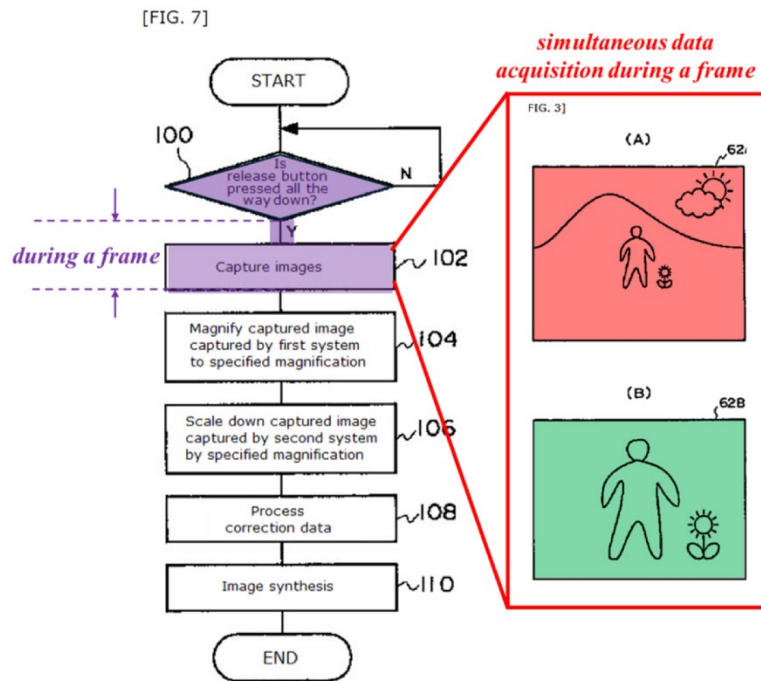
Ex.1007, FIGS. 2 and 3, annotated; Ex.1003, ¶96.

Matsushima renders obvious “*simultaneous data acquisition...during a frame*” under Petitioner’s construction

“...during a frame”

Petitioner’s construction: “... during a period of time when data for an image frame is acquired”

The period between block 100 (release button confirmation) and the end of block 102 (providing captured images) teaches “*during a frame*.”



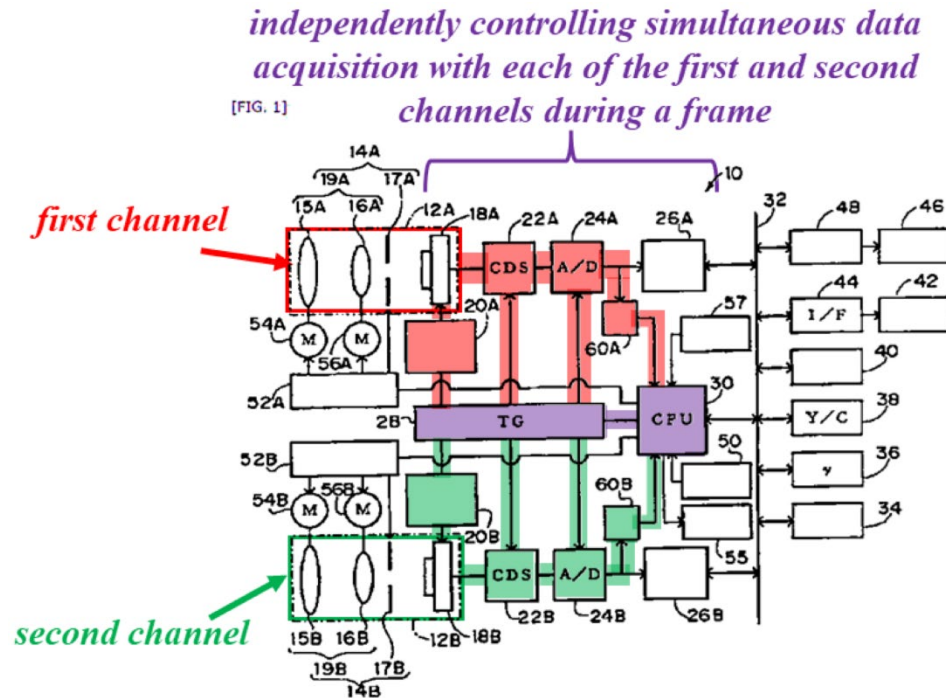
[0021] In addition, CCD 18A and CCD 18B can be, for example, CCDs of the same size, that is, the same number of pixels. Therefore, when the image captured with the first imaging system 12A is the captured image 62A shown in FIG. 3 (A), the image captured by the second imaging system 12B is the scaled-up captured image 62B at the center of FIG. 3 (A), as shown in FIG. 3 (B).

Ex.1007, [0021]

Ex.1007, FIGS. 3 and 7, annotated; Pet. 23, 25; Ex.1069, ¶54.

Matsushima's data acquisition includes retrieval from the CCDs and subsequent processing

Matsushima's data acquisition is based on image signals from CCDs.



Ex.1007, FIG. 1, annotated; Ex.1003, ¶98.

[0025] The signals retrieved from CCD 18A and CCD 18B are processed by correlated double sampling (CDS) in CDS circuits 22A and 22B, and by color separation into R, G, and B color signals, and the signal level of each color signal is adjusted (for example, by prewhite balance processing).

[0026] Image signals that have undergone the prescribed analog signal processing are applied to A/D converters 24A and 24B, converted to R, G, and B digital signals by A/D converters 24A and 24B, and then stored in memories 26A and 26B. The memories 26A and 26B may be a single memory, or a separate memory for each imaging system. Data other than image data is also stored in memories 26A and 26B.

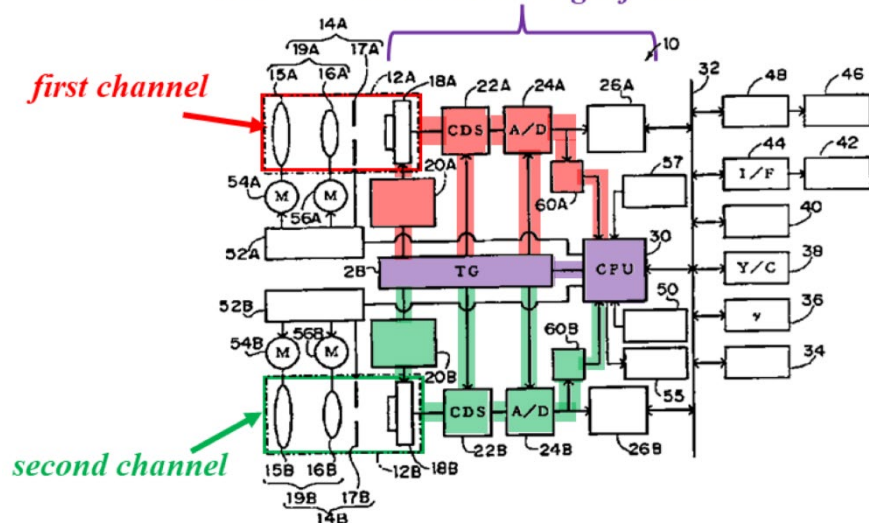
Ex.1007, [0025]-[0026]

“simultaneous data acquisition...during a frame” encompasses control data acquisition associated with each channel

[22.3] *“independently controlling simultaneous data acquisition with each of the first and second channels during a frame”*

independently controlling simultaneous data acquisition with each of the first and second channels during a frame

[FIG. 1]



Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.

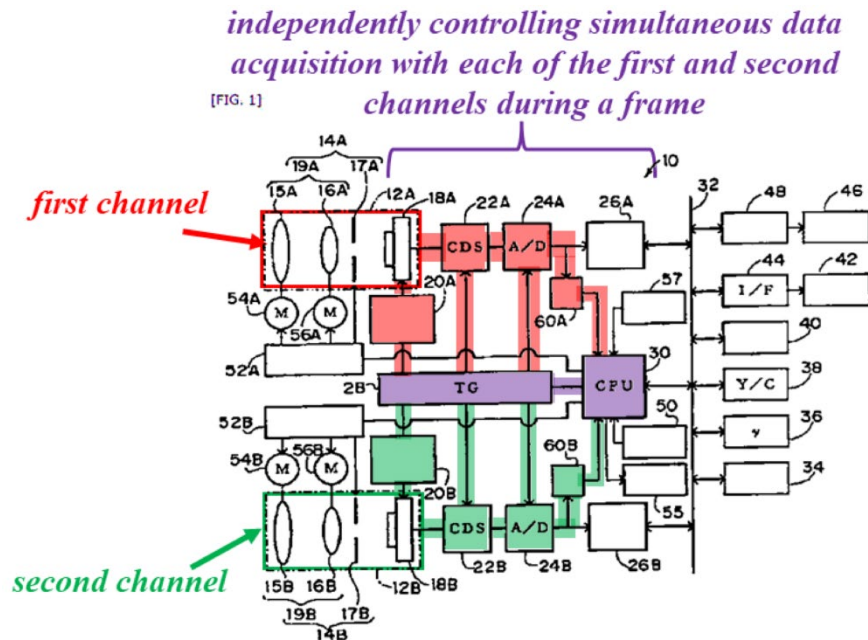
Mr. Guidash:

53. The claim language of limitation [22.3] does **not** require that every circuit performing “independently controlling simultaneous data acquisition” be physically located within the channels themselves. A POSITA would understand that the claim term “**with each of the first and second channels**” does not impose a physical inclusion requirement; rather, it encompasses control of data acquisition related to or associated with each channel. Readout and conversion steps, performed by CDS circuits, A/D converters, and integration circuits are associated with each channel and therefore within the scope of limitation [22.3].

Ex.1069, ¶ 53

Matsushima renders obvious “*simultaneous data acquisition...during a frame*” under IV’s construction

Matsushima describes independently controlling integration times (accumulation time) using electronic shutters.



[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

Ex.1007, [0024]

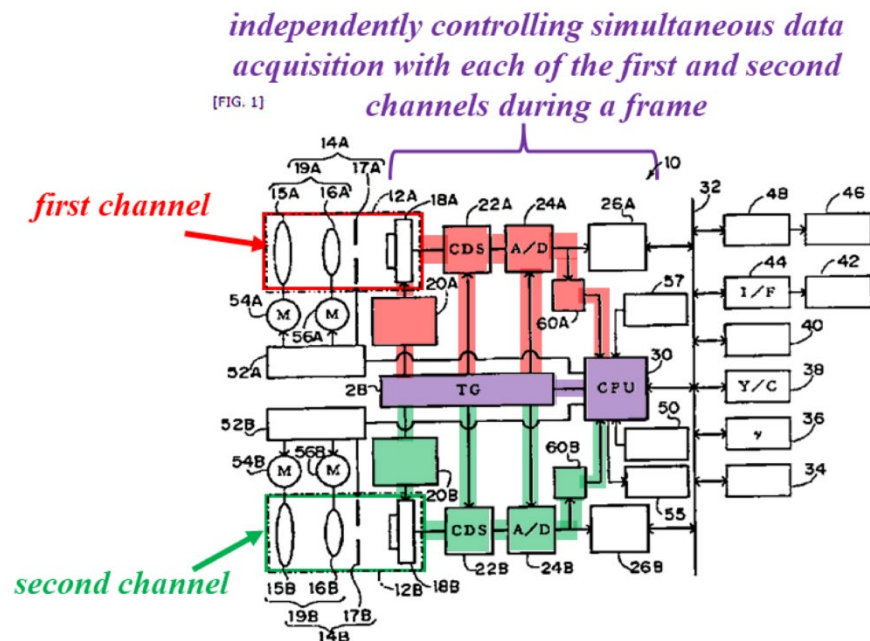
Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.

Discussion Roadmap

- Claim Construction:
 - “*during a frame*” Slides 8-16
- Ground 1: Matsushima renders obvious “*simultaneous data acquisition...during a frame*” Slides 18-25
- Ground 1: Matsushima renders obvious “*independently controlling...*” Slides 27-32
- Ground 1: Matsushima and Yu render obvious “*independently controlling...*” Slides 34-36
- Ground 3: Choi, Labaziewicz, and Yu render the challenged claims obvious Slides 38-45

Matsushima discloses “*independently controlling...*”

Matsushima teaches two independent imaging systems and independent control paths for each imaging system.



[0017] FIG. 1 is a block diagram showing the configuration of a digital camera. This digital camera 10 has two independent imaging systems (a first imaging system 12A and a second imaging system 12B), and subject images are formed on the light-receiving surfaces of CCD 18A and 18B via imaging optics 14A and 14B, respectively.

Ex.1007, [0017]

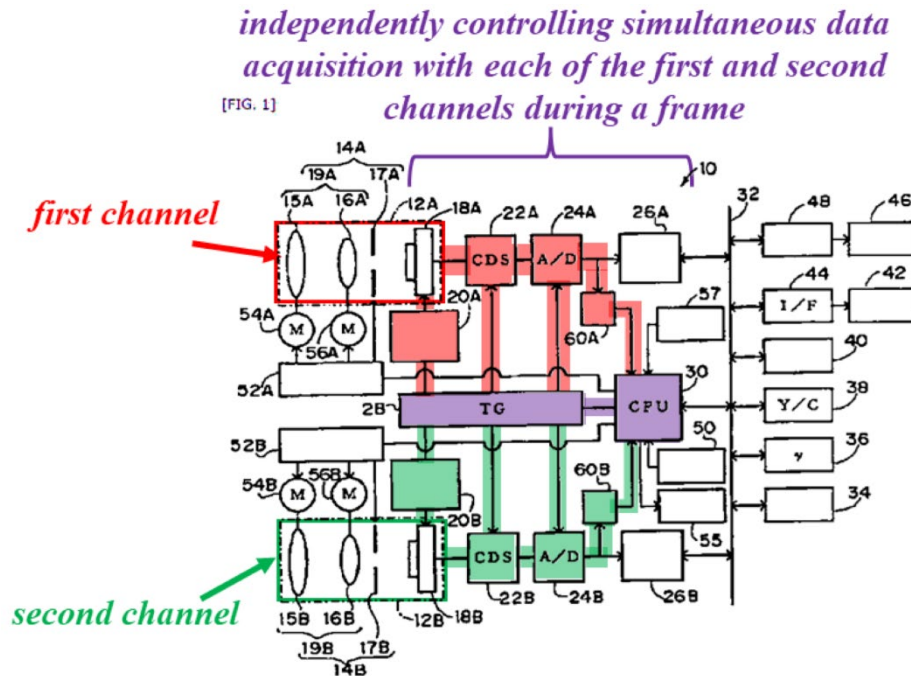
IV's incorrect argument that Matsushima does not teach “*independently controlling...*” during the “exposure interval”

B. Matsushima's Timing Signals Do Not Control Data Acquisition “During A Frame”

The Petition also maps the “timing signals” disclosed in [0027] of Matsushima to the limitation requiring application of independent control “during a frame.” Petition, 24. For multiple reasons, this passage fails to disclose independent control of *data acquisition* “*during a frame*.” First, Matsushima discloses that these timing signals are used to control the timing of the *retrieval* of data from the CCDs, not the *acquisition of data* by each CCD. See Ex. 1007, [0023]; Ex. 2020, ¶106. Second, the Petition provides no evidence that these timing signals apply control “during a frame,” i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures an image. See Section II(B), *supra*. On the contrary, a POSITA would have understood that Matsushima's timing signals for retrieving data from the CCDs could occur after the exposure interval during which the image sensor captures a single image. Ex. 2020, ¶107.

Matsushima discloses “*independently controlling*” the exposure period of the sensors

Matsushima discloses controlling the sensors (CCDs) during the “exposure interval.”



Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.

[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

[0034] For AE control, the subject luminance (imaging EV value) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and the aperture value and shutter speed are determined based on this imaging EV value. The apertures 17A and 17B are driven via the drive circuits 52A and 52B, and the CCD 18A and CCD 18B charge accumulation time is controlled using an electronic shutter to reach the determined shutter speed. As a result, optimal exposure adjustment and focusing are performed simply by pointing the imaging lenses 15A and 15B of the digital camera 10 at the subject.

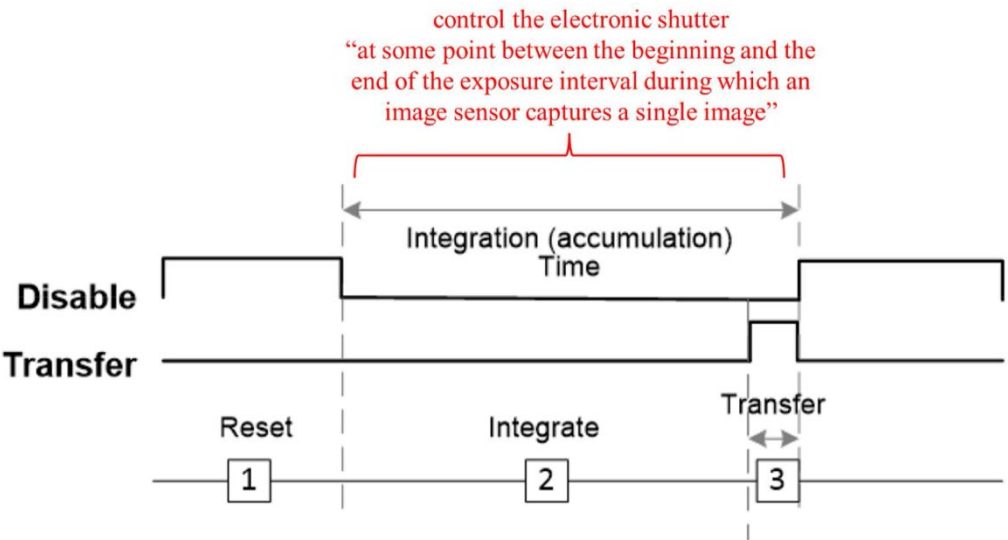
Ex.1007, [0024], [0034]

Pet., 26; Reply, 16-17; Ex.1003, ¶ 98; Ex.1069, ¶¶ 57-61

Matsushima’s shutter gate control renders obvious “independently controlling...during a frame” under IV’s construction

Mr. Guidash:

59. As shown in the illustration below, in Matsushima’s electronic shutter control, at least (i) keeping the shutter gate off (shown by the Disable signal); and (ii) controlling the transfer of the accumulated charges (shown by the Transfer signal) are performed “at some point between the beginning and the end of the exposure interval” as required by IV. Ex.1003, ¶53.

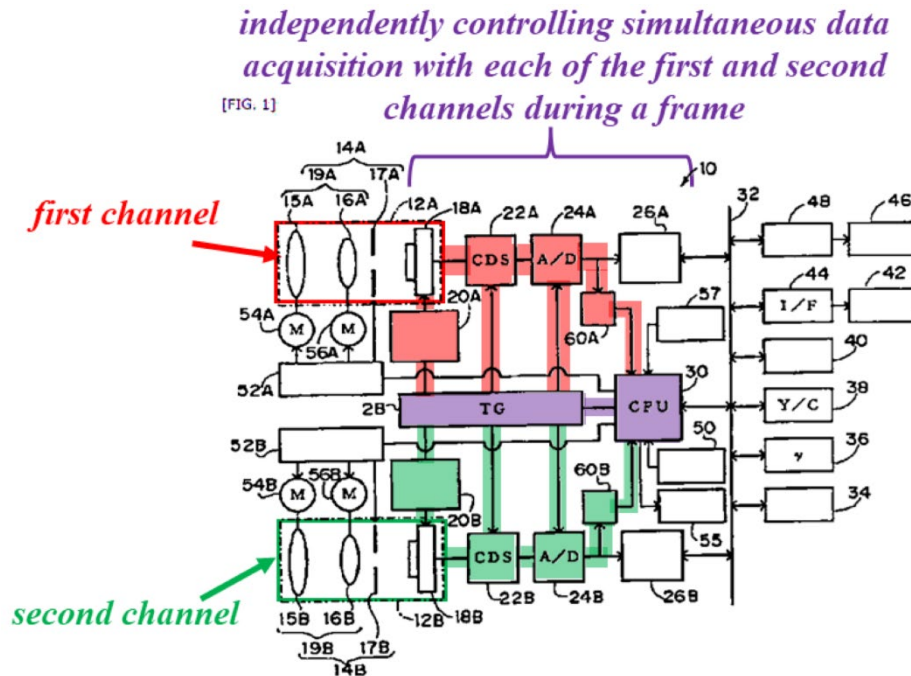


Ex.1003, ¶53 (annotated).

Ex.1069, ¶ 59

Matsushima discloses “*independently controlling*” in the readout period

Matsushima discloses controlling processing of the signals received from the sensors (CCDs).



Ex.1007, FIG. 1, annotated; Ex.1003, ¶96.

[0025] The signals retrieved from CCD 18A and CCD 18B are processed by correlated double sampling (CDS) in CDS circuits 22A and 22B, and by color separation into R, G, and B color signals, and the signal level of each color signal is adjusted (for example, by prewhite balance processing).

[0026] Image signals that have undergone the prescribed analog signal processing are applied to A/D converters 24A and 24B, converted to R, G, and B digital signals by A/D converters 24A and 24B, and then stored in memories 26A and 26B. The memories 26A and 26B may be a single memory, or a separate memory for each imaging system. Data other than image data is also stored in memories 26A and 26B.

Ex.1007, [0025]-[0026]

Pet., 25-26; Reply, 16-17; Ex.1003, ¶ 98; Ex.1069, ¶¶ 39, 55

Matsushima discloses “*independently controlling...*” during the “exposure interval” and readout period

“Exposure interval”

[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

Readout period

[0025] The signals retrieved from CCD 18A and CCD 18B are processed by correlated double sampling (CDS) in CDS circuits 22A and 22B, and by color separation into R, G, and B color signals, and the signal level of each color signal is adjusted (for example, by prewhite balance processing).

[0026] Image signals that have undergone the prescribed analog signal processing are applied to A/D converters 24A and 24B, converted to R, G, and B digital signals by A/D converters 24A and 24B, and then stored in memories 26A and 26B. The memories 26A and 26B may be a single memory, or a separate memory for each imaging system. Data other than image data is also stored in memories 26A and 26B.

Ex.1007, [0024]-[0026]

Discussion Roadmap

- Claim Construction:
 - “*during a frame*” Slides 8-16
- Ground 1: Matsushima renders obvious
“*simultaneous data acquisition...during a frame*” Slides 18-25
- Ground 1: Matsushima renders obvious
“*independently controlling...*” Slides 27-30
- Ground 1: Matsushima and Yu render obvious
“*independently controlling...*” Slides 34-36
- Ground 3: Choi, Labaziewicz, and Yu render the
challenged claims obvious Slides 38-45

Matsushima and Yu render obvious “*independently controlling...*”

Undisputed: Yu teaches “*independently controlling*” each sensor.

Yu

filter. With the configuration, each of the image sensors is respectively and independently controlled to expose to the same imaging target. It can be appreciated by those skilled

Ex.1005, 9:66-10:1

control circuit acts accordingly. To be more specific, control circuits 342, 344, 346 and 348 receive respectively the control signals 332, each generated with respect to a corresponding histogram in digital image processing circuitry 338 and independently and respectively control image sensors 302, 304, 306 and 308. It is understood to those skilled in the

Ex.1005, 6:52-58

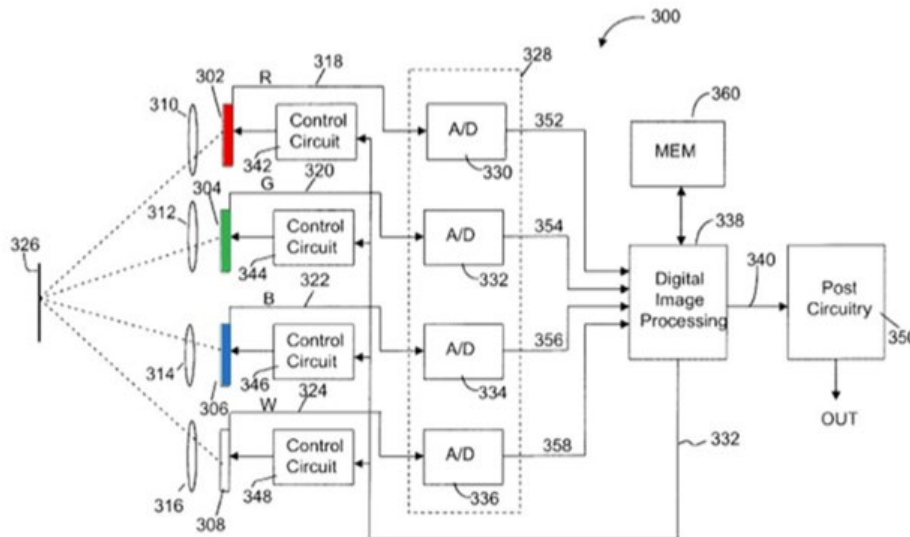


Fig. 3

IV's incorrect argument against the Matsushima-Yu combination

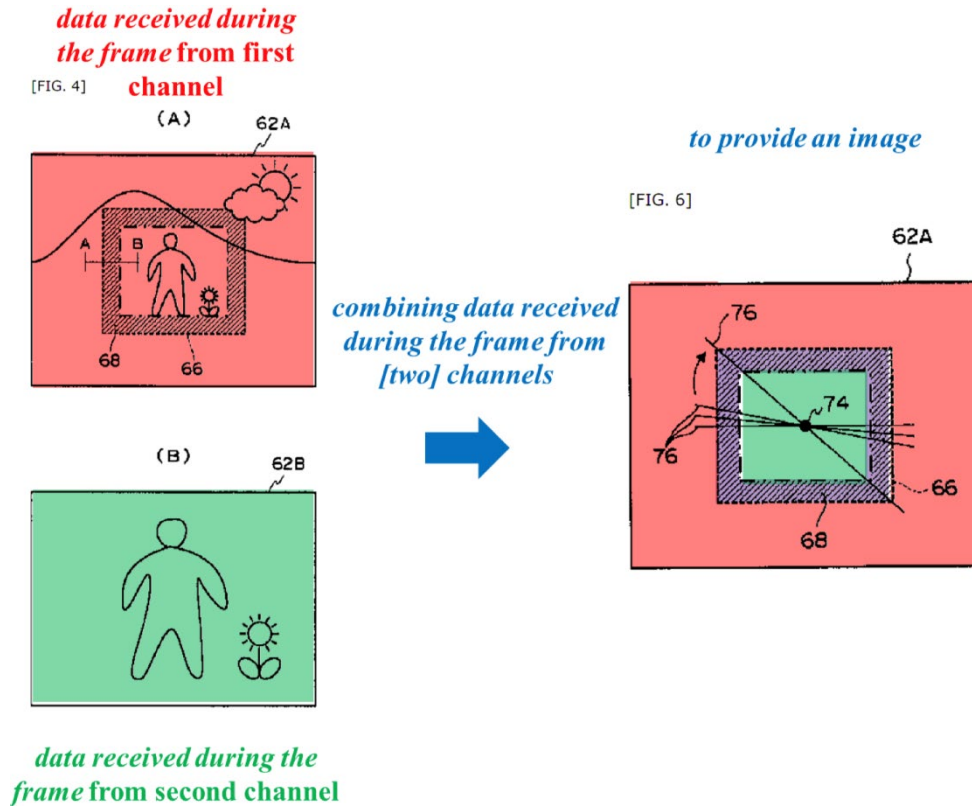
IV:

2. A POSITA Would Not Have Been Motivated To Combine Yu And Matsushima As Alleged Because Doing So Would Have Destroyed The Intended Purpose Of Matsushima

that can *prevent unnatural boundary regions ...*) (emphasis added). For the reasons explained in Section X(A)(2), *supra*, if images 62A, 62B have *different exposures*, an *unnatural boundary* will be introduced between the peripheral region of Matsushima's composite image formed from the wide-angle image taken at one exposure and the scaled-down version of narrow-angle image taken at another exposure. Ex. 2020, ¶148; Ex. 2012, 7. Introduction of such an unnatural boundary into Matsushima would defeat the primary purpose of Matsushima, which is to prevent unnatural boundaries. Even where references are combinable, obviousness

Matsushima's correction data method prevents an unnatural boundary when combining images of different exposures

Matsushima



Ex.1007, FIGS. 4 and 6, annotated.

[0051] Therefore, in the present embodiment, as shown in FIG. 4 (A), correction data is generated to correct the image in the peripheral regions 68 based on the image data in the peripheral region 68 (shaded region) of the scaled down image 66 and the image data in the peripheral region 68 of the captured image 62A. This correction data is then used as the image data for the peripheral regions 68. This prevents unnaturalness from occurring at the boundary between the captured image 62A and the scaled down image 66, preventing a deterioration in image quality.

Ex.1007, [0051]

[0057] In other words, correction data D_1 to D_n is determined so that the correction data approaches image data 72 from image data 70 from position X_1 , which is the left end of the peripheral region 68, to position X_n , which is the right end of the peripheral region 68. The correction data for the peripheral region 68 is represented by the correction curve indicated by the single-dot line in FIG. 5, and because the image data between A and B is almost continuous, the boundary between the captured image 62A and the scaled down image 66 can be kept from becoming unnatural.

Ex.1007, [0057]

Discussion Roadmap

- Claim Construction:
 - “*during a frame*” Slides 8-16
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- Ground 1: Matsushima renders obvious
“*independently controlling...*” Slides 27-30
- Ground 1: Matsushima and Yu render obvious
“*independently controlling...*” Slides 32-34
- Ground 3: Choi, Labaziewicz, and Yu render the challenged claims obvious Slides 38-45

Ground 3 Issue Summary

- Ground 3: Choi, Labaziewicz, and Yu
 - IV contests that Labaziewicz is prior art. IV is wrong.
 - The '854 provisional does not provide support for:
 - Configuring multiple optics components relative to multiple sensors to form multiple channels. There is only one sensor.
 - Multiple channels having different FOVs
 - IV contests that Yu does not teach “*during a frame.*” The Petition relies on Choi—not Yu—to teach “*during a frame.*”

The '854 provisional

The '854 provisional describes a single sensor 210 with different lenses 230A-D each tailored for a respective wavelength.

Image sensor 210 (Figure 3) generally includes a semiconductor chip having several higher order features including multiple arrays (210A – 210 D), and signal processing circuitries 212 and 214,

* * * *

A sensor having two or more different arrays could advantageously have a different lens over each of the different arrays. Preferred lenses can employ a die coating, defused dye in the

* * * *

Each of lenses 230A-D is advantageously tailored for the respective wavelength of the respective array. Lenses will generally be about the same size as the underlying array, and will therefore

Ex.1047, 4, 5, 8

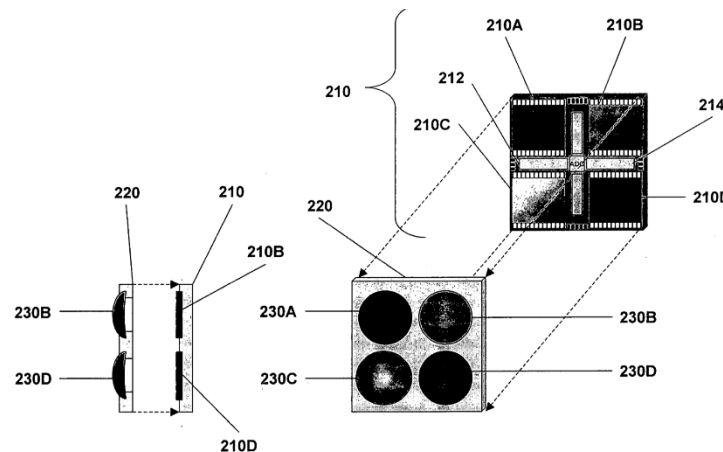


Figure 3

Ex.1047, Fig. 3

Pet., 4-5; Reply, 30-31; Ex.1003, ¶ 64; Ex.1069, ¶¶ 98-100

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The single sensor of Fig. 3 of the '854 provisional does not provide support for the claimed multiple sensors

'854 provisional

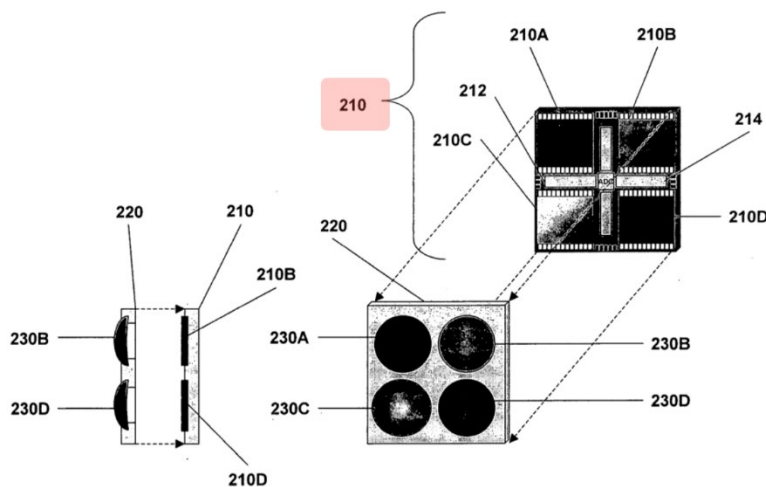


Figure 3

22. A method comprising:
configuring a first optics component relative to a **first image sensor** to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;
configuring a second optics component relative to a **second image sensor** to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;
independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
combining data received during the frame from one or more of the first and second channels to provide an image.

Ex.1001, claim 22

Image sensor 210 (Figure 3) generally includes a semiconductor chip having several higher order features including **multiple arrays (210A – 210 D)**, and signal processing circuitries 212 and 214,

Ex.1047, 4, Fig. 3

IV's argument that multiple arrays in a single sensor provides multiple sensors is inconsistent with the '180 patent

'180 patent

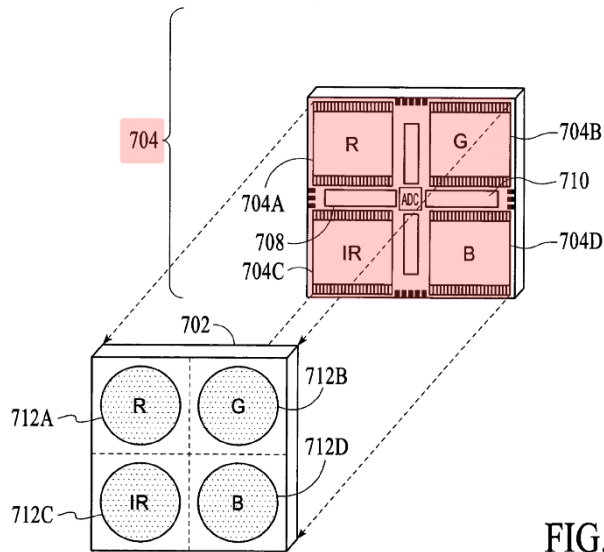


FIG. 7

FIG. 7 is an exploded view of the digital camera subsystem 602, under an embodiment. In this embodiment, the digital camera subsystem includes an image sensor 704, an optics frame (also referred to as a frame) 702, and lenses 712A-712D. The frame 702 is used to mount the lenses 712A-712D to the image sensor 704. The image sensor, or imager die 704 generally includes a semiconductor integrated circuit or “chip” having several higher order features including multiple arrays 704A-704D and signal processing circuits 708 and 710. Each of the arrays 704A-704D captures photons and outputs electronic signals. The signal processing circuit 708,

Ex.1001, 9:43-53

Dr. Saber:

Q. Is it correct that Figure 7 is not an example of the invention of claim 22?

A. Well, Figure 7 refers to an image sensor versus claim 22 claims a first image sensor and a second image sensor. So for you to practice claim 22, you would need to have a first image sensor and a second image sensor to practice that claim.

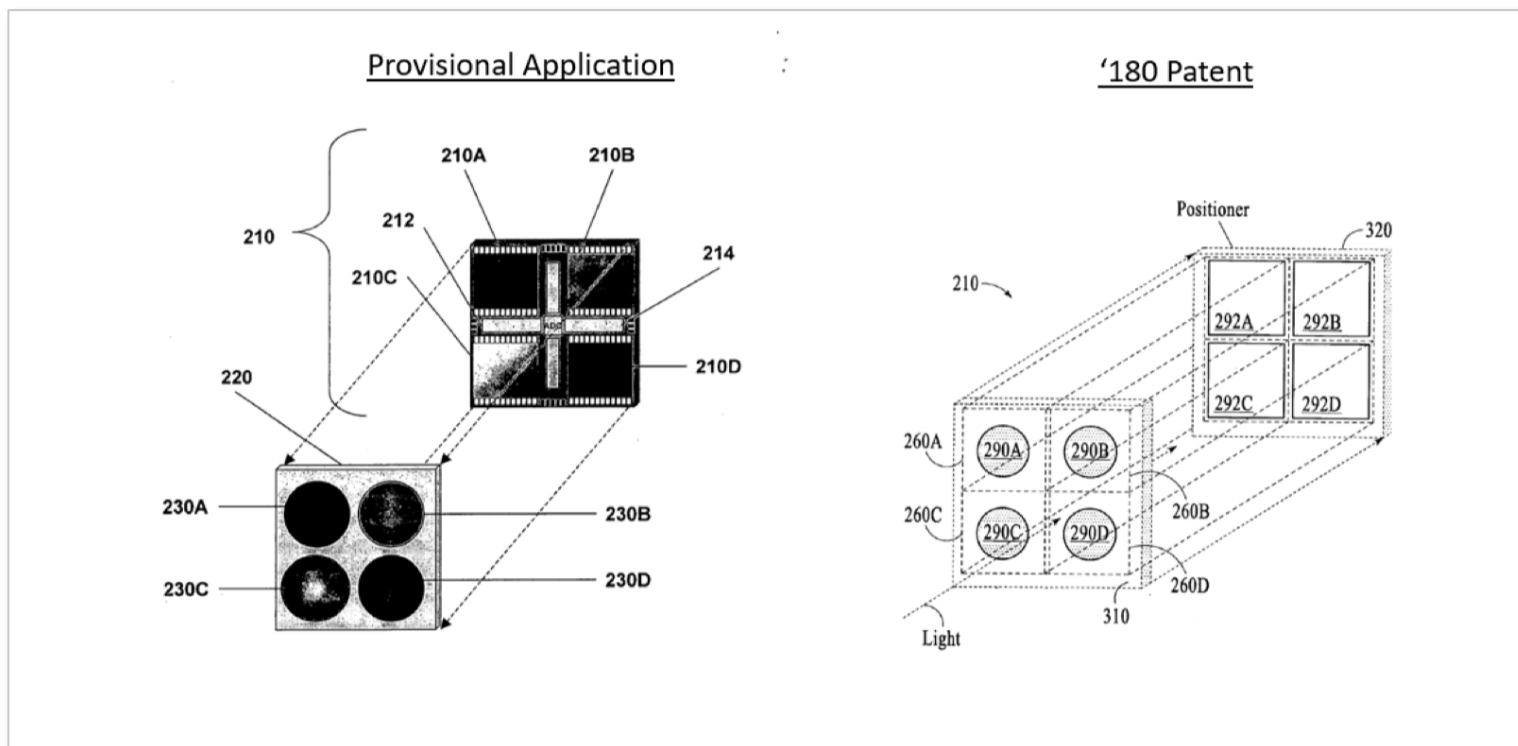
To practice claim 1, you -- doesn't say that. You just have to have an array of photo detectors integrated on a semiconductor substrate.

Ex.1070, 99:20-100:9

IV's incorrect comparison

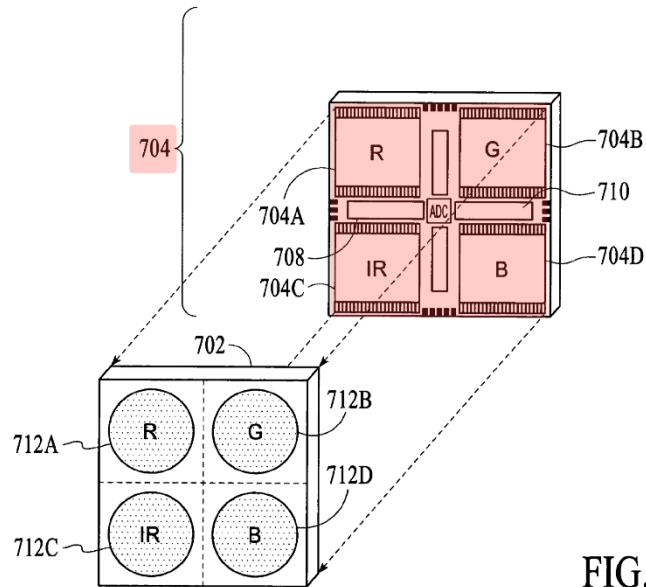
IV's comparison of the '854 provisional and '180 patent:

Set forth below is a diagram depicting aspects of Figure 3 of the Provisional Application (left side) (Ex. 1047, 22) and aspects of Figure 4 of the '180 Patent.



The '854 provisional corresponds to Fig. 7 of the '180 patent

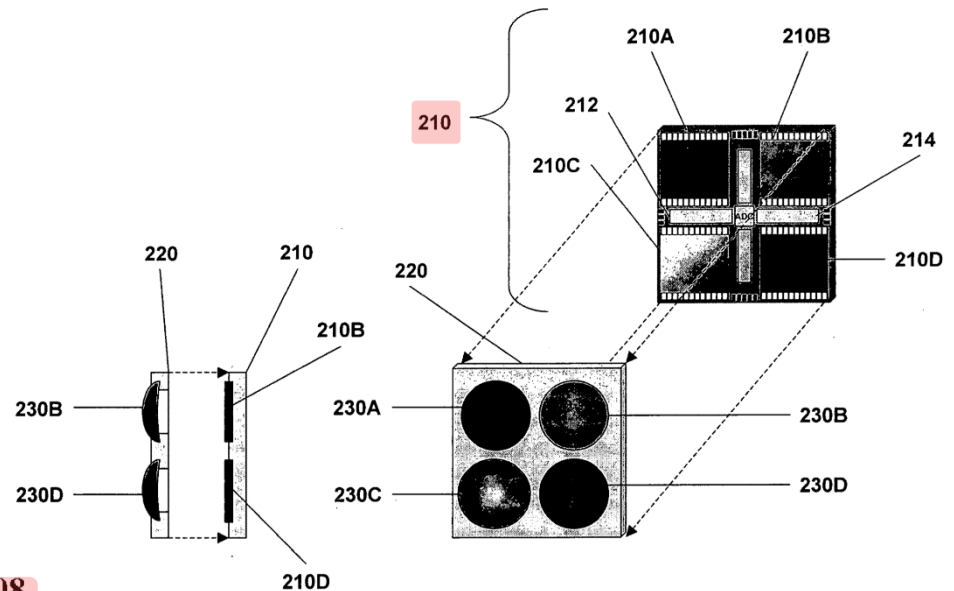
'180 patent



outputs electronic signals. The signal processing circuit 708, in certain embodiments, processes signals for each of the individual arrays 704. The signal processing circuit 710 may combine the output from signal processing 708 into output data (usually in the form of a recombined full color image).

Ex.1001, 9:53-57

'854 provisional



Signal processing circuitry 212 processes signals for each of the individual arrays. Signal processing circuitry 214 combines the output from signal processing 212 into output data (usually in the form of a recombined full color image). Further, although signal processing

Ex.1047, 8

The '854 provisional does not provide support for multiple channels having different FOVs

Mr. Guidash:

IV's inherency argument:

discloses multiple channels. In addition, the Provisional Application discloses that the lenses will “*differ from one another in size and shape*” and that the depth of the mounting hole (in the camera frame) “may be *different for each lens* and is a result of *the specific focal length for the particular lens tailored for each array.*” *Id.*, 7-8, 12 (emphasis added). The Provisional Application thus disclosed that each channel could have a lens with a *different focal length*. Focal length is directly related to field of view in that, as the focal length increases, the field of view narrows, and as focal length decreases, the field of view widens. Ex. 2020, ¶153. Thus, by disclosing that each channel could have a lens with a *different focal length*, the Provisional Application inherently disclosed multiple channels with *different fields of view*. *Id.*

POR, 62

93. As shown in my previous declaration and Jacobson's FIG. 4.13 (Ex.1040), FOV depends on both the focal length (f) and sensor size (K representing the diagonal of the sensor format). Ex.1003, ¶89.

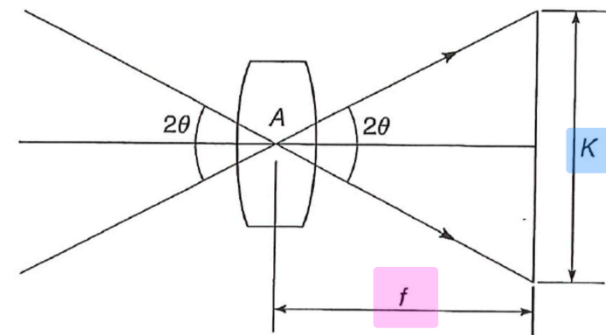


Figure 4.13 Field (angle) of view (FOV) of a lens related to format dimension

Ex.1040, FIG. 4.13.

95. Thus, the mere disclosure of different focal lengths in the '854 provisional does not “necessarily” result in different FOVs. This is confirmed by the specification of the '180 patent and IV's own expert's statement. Ex.1001, 3:49-51 (“The combination of the focal plane or image sensor size along with the optical focal length associated with each image sensor is chosen to provide a desired field of view.”); Ex.2020, ¶40 (Dr. Saber citing Ex.1001:3:49-51 in explaining the alleged invention of the '180 patent).

Ex.1069, ¶¶ 93, 95

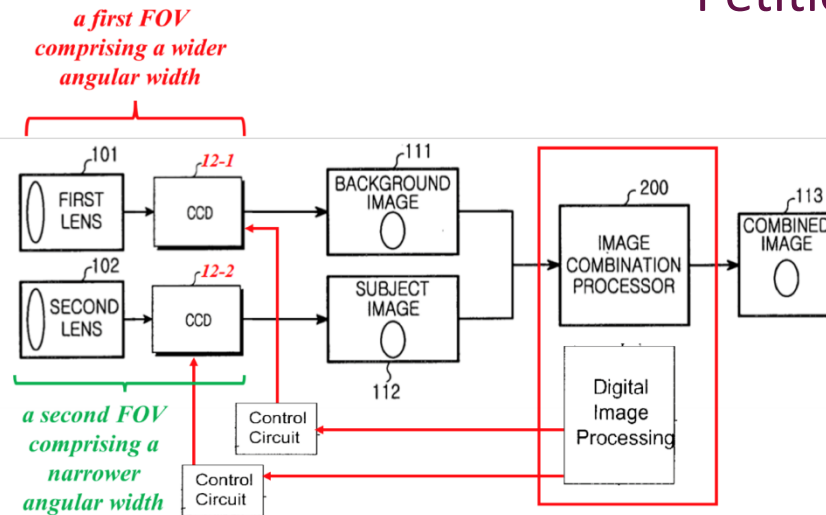
Reply, 29-30

IV argues against a combination not presented in the Petition

[22.3] “independently controlling simultaneous data acquisition with each of the first and second channels during a frame”

For [22.3], the Petition modified Choi’s Fig. 2 and relies on Choi for “during a frame.”

Petition



Example 3.2 of Choi-Labaziewicz-Yu; Ex.1003, ¶213.

As shown in Example 3.2 of Choi-Labaziewicz-Yu above, Choi-Labaziewicz-Yu renders obvious *independently controlling* (independent control of exposure, gain, and/or offset) *simultaneous* (no time difference between the background and subject images 111 and 112) *data acquisition with each of the first and second channels during a frame* (acquisition at the same time, background image 111 with the first channel, subject image 112 with the second channel, during a period of a time). See VI.A; Ex.1003, ¶233.

HAYNES BOONE

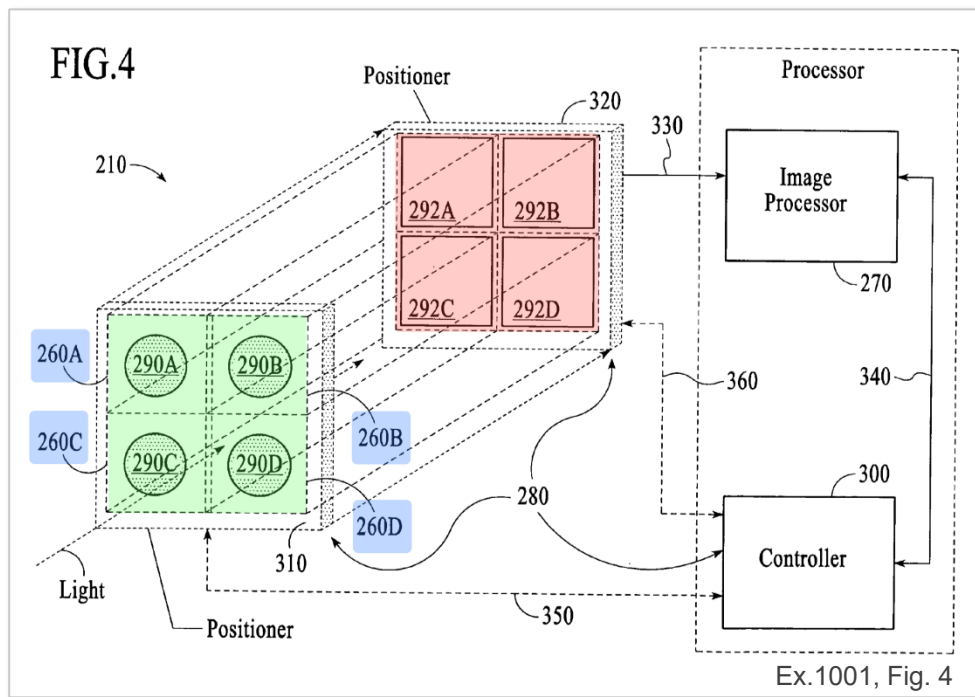
*TESLA, INC. V. INTELLECTUAL
VENTURES II LLC*

IPR2025-00339 (7,916,180)

Backup Slides



The '180 Patent



A digital camera system and methods are described below that provide a digital camera in which **multiple fields of view (FOV)** of an image are simultaneously acquired. The digital

Ex.1001, 3:21-23

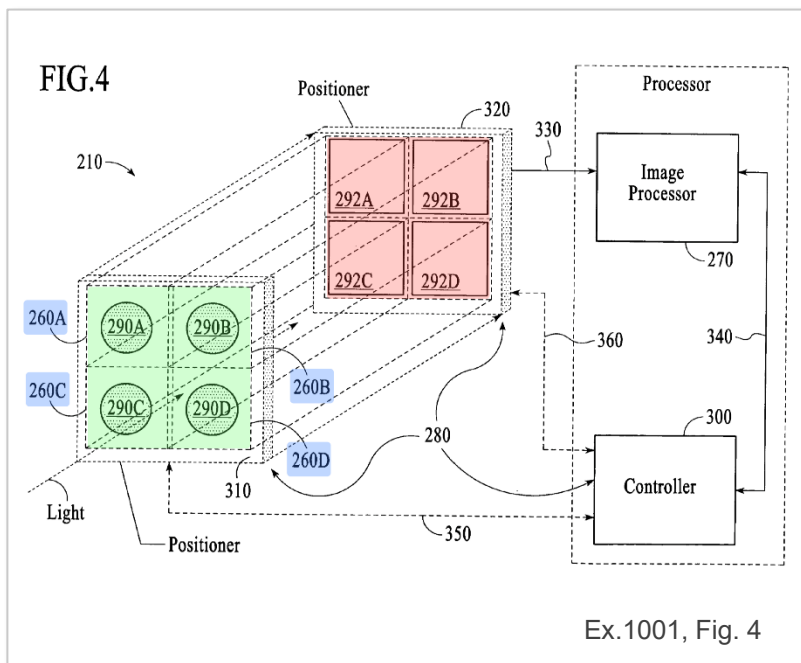
* * * *

FIG. 4 is a digital camera system 210 that includes **multiple camera channels**, under an embodiment. The digital camera system 210 of this example includes **four camera channels 260A-260D** but is not limited to four camera channels; alternative embodiments can have any number of camera channels. Each of the **camera channels 260A-260D** includes an **optics component or portion** and a **sensor component or portion**. For example, camera channel 260A includes an **optics portion 290A** and a **sensor portion 292A**. Camera channel B includes an **optics portion 290B** and a **sensor portion 292B**. Camera channel C includes an **optics portion 290C** and a **sensor portion 292C**. Camera channel D includes an **optics portion 290D** and a **sensor portion 292D**. The optics portions of the one or more camera channels are collectively referred to herein as an optics subsystem. The sensor portions of the one or more camera channels are collectively referred to herein as a sensor subsystem.

Each camera channel of the digital camera subsystem 210 of an embodiment provides **a different FOV** imaging capability relative to at least one other camera channel. For example,

Ex.1001, 6:14-33

The '180 Patent, Claim 1



1. A digital camera comprising:
a plurality of channels, wherein each channel includes an optics component and an array of photo-detectors integrated on a semiconductor substrate, the plurality of channels including a first channel having a first field of view (FOV) comprising a first angular width of a scene imaged by the camera and a second channel having a second FOV comprising a second angular width of the scene imaged by the camera, wherein the first and second angular widths are different; and
a processing component coupled to the plurality of channels, the processing component configured to independently control simultaneous data acquisition with each of the plurality of channels, the processing component configured to combine data of a frame from at least one of the plurality of channels to provide an image having a relatively high resolution.

Ex.1001, claim 1

IV's construction of "*during a frame*" incorrectly excludes embodiments

IV:

incorrect. *See*, ID, at 20. The '180 Patent explained that the integration time control for each sensor can be accomplished using a technique that was known as *rolling mode*. Ex. 1001, 20:48-50. As explained above, operation of an image sensor in a "rolling mode" involves control *during a frame* of the start and stop times of the integration period for individual rows of pixels in a sensor. *See*, Section II(B), *supra*; Ex. 2020, ¶71.

POR, 21, 8

The '180 patent is not limited to "rolling mode."

control for each sensor. The integration time control can be executed (depending on readout configuration) according to a number of techniques, for example, rolling mode and/or snap-shot mode to name a few.

Ex.1001, 20:48-51

Construction of “*simultaneous data acquisition*”

[22.3] “independently controlling **simultaneous data acquisition** with each of the first and second channels during a frame”

Petitioner’s construction	IV’s construction
Plain and ordinary meaning: data acquisition at the same time	Plain and ordinary meaning but excludes “nearly simultaneous”

- The Petition’s grounds show “*simultaneous data acquisition*” as data acquisition “at the same time.” Pet., 23, 86.
- There is no basis to exclude “nearly simultaneous.”

Reply, 1-3; POR, 15-16, 22

The '180 patent does not support IV's construction

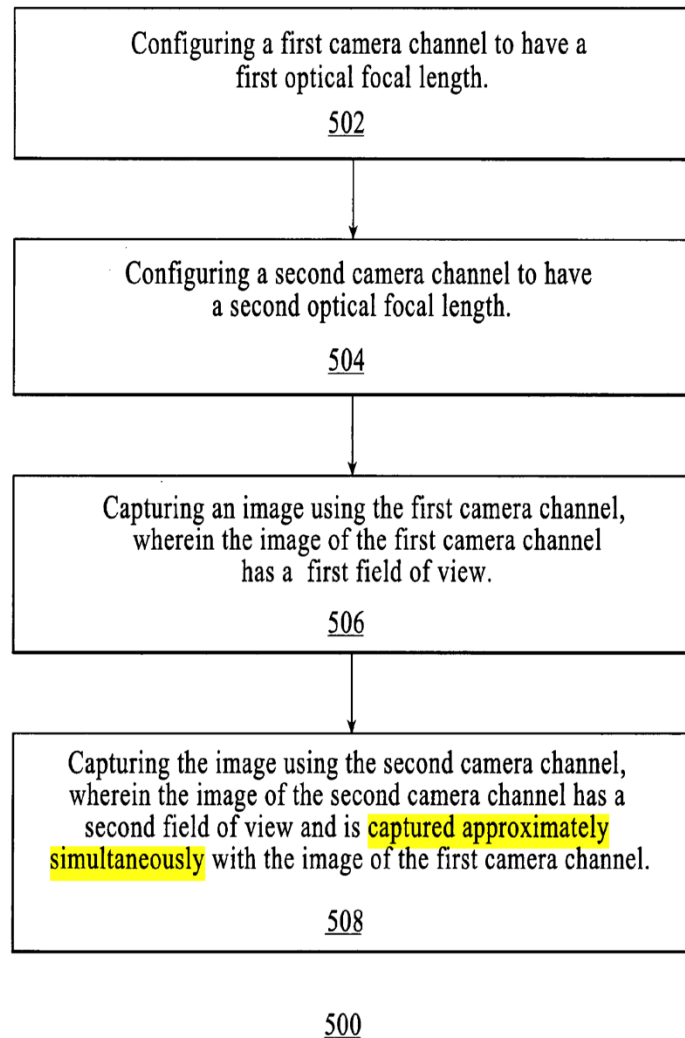


FIG.5

Ex.1001, Fig. 5

The '180 patent includes “approximately simultaneous” within the scope of an embodiment of “simultaneous acquisition.”

FIG. 5 is a flow diagram for simultaneous acquisition of multiple fields of view 500, under an embodiment. The simultaneous acquisition of images having multiple fields of view 500 includes configuring 502 a first camera channel to have a first optical focal length. The acquisition 500 includes configuring 504 a second camera channel to have a second optical focal length that is different from the first optical focal length. An image is captured 506 by the first camera channel, and the image of the first camera channel has a first field of view. Approximately simultaneous with the image capture 506 by the first camera channel, the image is captured 508 by the second camera channel. The image captured by the second camera channel has a second field of view that is different from the first field of view. Optionally, additional camera

Ex.1001, 9:13-26

IV concedes that “*simultaneous*” includes “some overlap”

The plain meaning of “simultaneous” in “simultaneous data acquisition with each of the plurality of channels” requires at least some data acquisition with each of the plurality of channels to occur at the same time. For example, the recitation of “simultaneous” in this phrase requires at least some overlap in the data acquisition windows in each of the plurality of channels. Ex. 2020, ¶62.

POR, 15

- IV’s “some overlap” concession confirms that “*simultaneous*” does not require perfect temporal identity.

Reply, 2; POR, 15

IV equates “nearly simultaneous” with “close in time,” the same concept its expert uses for “*simultaneous*”

To be clear, the subject claim language is not met where image capture with the plurality of channels is “nearly simultaneous” (i.e., close in time) but not actually simultaneous (i.e., at the same time). Ex. 2020, ¶63. While the specification of the

POR, 15

Dr. Saber’s deposition

Q. Does claim 1 require any specific configuration of the processing component for performing simultaneous data acquisition?

* * * *

[A.] And it's got to do that simultaneously, at the same time, you know, as close in time as engineeringly possible, you know, practical, for -- you know, for a product, et cetera.

Ex.1070, 25:2-26:7

The '180 patent does not support IV's construction

The '180 patent does not describe “simultaneous” and “nearly simultaneous” as mutually exclusive alternatives.

camera channels each with independent image sensors. The sensor of each camera channel has an active area that includes multiple picture elements (pixels), and image capture includes **simultaneous or nearly simultaneous** use of the multiple camera channels. Each camera channel and associated

* * * *

Ex.1001, 3:25-29

signal. The operations of the second camera channel are **simultaneous or nearly simultaneous** with the operations of the first camera channel. Operations of any additional camera channels are similar to operations of the first and/or second camera channels described above.

Ex.1001, 8:63-67

IV is wrong to limit “*during a frame*” to only the “exposure interval”

When used as a preposition, as in the case of claim 22, the term “during” imparts a temporal requirement⁴ and means “at some time between the beginning and the end of a period.” Ex. 2020, ¶66; Cambridge Dictionary, Ex. 2011, 1; Collins Dictionary, Ex. 2022, 1. Thus, “during a frame” as used in claim 22 means “at some point between the beginning and the end of the exposure interval during which an image sensor captures a single image.”

POR, 18

second image sensor. Thus, the language of claim 22 makes clear that the “data acquisition with each of the first and second channels” that is being controlled “during a frame,” is limited to data acquisition with the optics portion and sensor that form each channel, rather than downstream read-out and signal processing performed by components that are not part of each channel.

Sur-Reply, 3

The '180 specification describes a “frame rate,” not an “exposure interval”

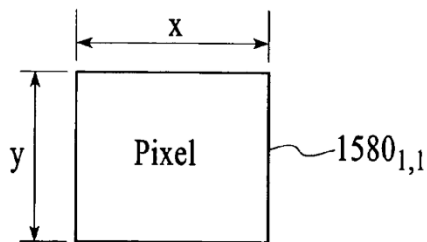
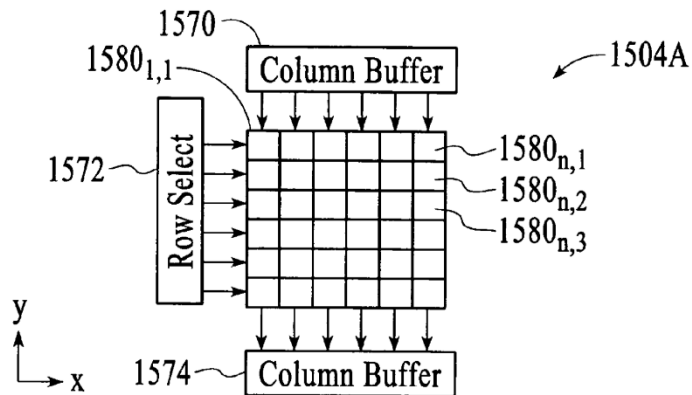
The '180 patent describes a “frame rate” (frame period) as a separate parameter from “integration time” (exposure).

FOV capability. The sensor array area change can be accomplished by changing the number of pixels and/or pixel size of the array. In addition to array area differences between the channels, parameters of the image sensor electrical operation (e.g., integration time, frame rate, etc.) can be configured differently in order to optimize system camera performance in the field of view of one or more specific camera channels. Ex.1001, 7:21-27

Mr. Guidash:

12. Further, a frame period is for acquiring digital data of a frame and thus includes the readout period for generating that digital data, and is not limited to merely exposure. Ex.1001, 20:19-20 (“The data from all sensors can be digitally combined to provide a much greater dynamic range within one frame of digital camera data”); *see also* limitation [22.4] (further confirming that the acquired data of the frame is digital data to be digitally combined by reciting “*combining data received during the frame*”). As I explained in my previous declaration, exposure only accumulates charges; it does not generate digital data that could be acquired, as required by the claim language. Ex.1003, ¶¶51-55. Ex.1069, ¶12

“during a frame” includes a read-out period



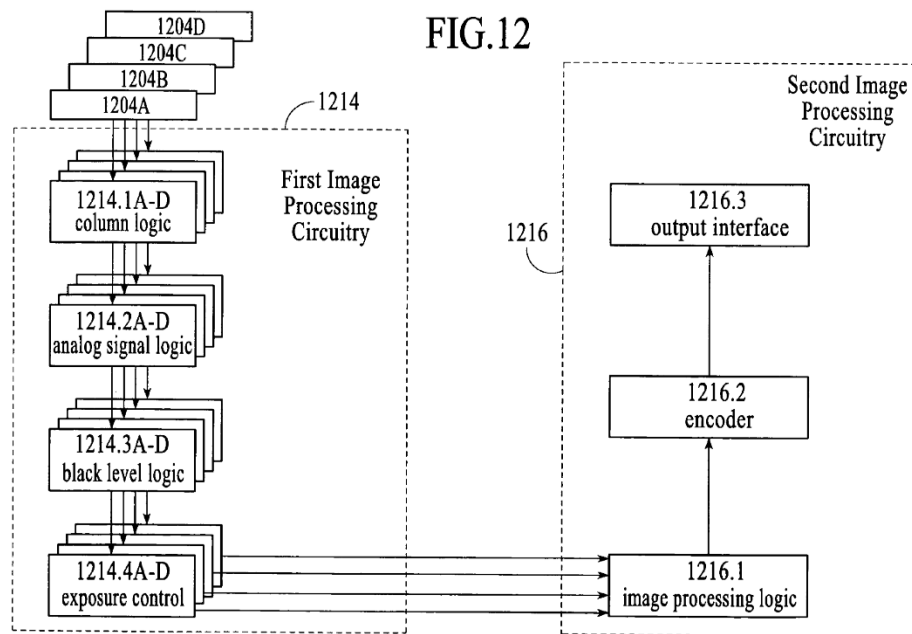
Ex.1001, Figs. 15A-15B

In operation, the sensor array **1504A**, is exposed to light on a sequential line per line basis (similar to a scanner, for example) or globally (similar to conventional film camera exposure, for example). After being exposed to light for certain period of time (exposure time), the pixels **1580_{1,1}-1580_{n,m}**, are read out, e.g., on a sequential line per line basis.

In some embodiments, circuitry **1570**, also referred to as column logic **1570**, is used to read the signals from the pixels **1580_{1,1}-1580_{n,m}**. FIG. 15C is a schematic representation of a

Ex.1001, 17:19-37

“during a frame” includes a read-out period



Ex.1001, Fig. 12

Column logic **1214.1A-1214.1D** is the portion of the signal processing circuitry that **reads the signals from the pixels**. For example, the column logic **1214.1A** **reads signals** from the pixels in array **1204A**. Column logic **1214.1B** **reads signals** from the pixels in array **1204B**. Column logic **1214.1C** **reads signals** from the pixels in array **1204C**. Column logic **1214.1D** **reads signals** from the pixels in array **1204D**.

Ex.1001, 11:8-14

The Petition presents numerous motivations to combine Matsushima and Yu

A POSITA would have been motivated to apply, in Matsushima's multichannel digital camera performing simultaneous data acquisition, Yu's teaching of independent control (e.g., of exposure time, gain control, and/or offset control) for each channel, because doing so would provide the benefits of an improved combined image from the independently captured images , with "increase[d] overall dynamic range" (Ex.1005, 9:19-27), and improved sharpness with "more scene objects are sharper than in any of the input images" (Ex.1014, 5:24-25). Ex.1003, ¶110.	Pet., 32
A POSITA would have looked to Yu's explicit teaching, suggestion, and motivation that "each of the image sensors is respectively and independently controlled to expose to the same imaging target" (Ex.1005, 9:66-10:2) as an implementation detail for Matsushima's control function , because Matsushima has a need to control the channels to expose to the same imaging target (Ex.1007, [0034]). Ex.1003, ¶111.	Pet., 32-33
Matsushima-Yu would have been a combination of prior art elements (Matsushima's digital camera with independent control of the exposure time of each of the multiple image sensors, as taught by Yu) according to known methods (controlling each electronic shutter of each image sensor to control the exposure time of the sensor) to yield the predictable result of varying sensor integration time for exposure control. Ex.1003, ¶112.	Pet., 33
Modifying Matsushima's multi-sensor multi-lens digital camera to implement, for each of the multiple sensors, independent control of exposure as taught by Yu would improve a similar device (Matsushima's multi-sensor multi-lens digital camera) in the same way . Ex.1003, ¶113.	Pet., 33-34

Undisputed: “integration time” is synonymous with “exposure time”

Mr. Guidash:

50. Shutter speed/exposure time in digital cameras is also referred to as integration time, which can be controlled “either by incorporating an external mechanical shutter in front of the image sensor or by incorporating an on-chip electronic shutter.” Ex.1034, 2; Ex.1013, [0024] (“It is to be noted that in a

* * * *

55. The terms “exposure time” and “integration time” are often used interchangeably in the context of an image sensor, and an image sensor with an on-chip electronic shutter controls its exposure time by controlling its integration time. Ex.1028, 1821n.1 (“we use *integration time and exposure time interchangeably*”); Ex.1022, 1:22-24 (“The *exposure or integration time* for the array of photodetectors can be controlled by well known mechanisms.”); Ex.1027, 3:10-12 (“Several images at different *exposures (charge-integration periods)* are acquired and then combined into a single image.”); Ex.1009, 9 (using “short

Ex.1003, ¶¶ 50, 55

IV mischaracterizes Matsushima as applying a common exposure time

IV incorrectly argues that “a single charge accumulation time” is used for both CCDs (sensors).

In Matsushima, “CPU 30 performs various calculations such as focus evaluation calculations and AE [automatic exposure] calculations.” Ex. 1007, [0031]. However, Matsushima makes clear that a single charge accumulation time is used for both CCD 18A and 18B in Matsushima’s two imaging systems. Ex. 2020,

¶121. From Matsushima:

For AE control, the subject luminance (imaging EV value) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and the aperture value and shutter speed are determined based on this imaging EV value. The apertures 17A and 17B are driven via the drive circuits 52A and 52B, and the CCD 18A and CCD 18B charge accumulation time is controlled using an electronic shutter to reach the determined shutter speed. ...

During imaging and recording, the AF operation is performed when the release button is “half-pressed,” and the metering operation is repeated several times to obtain the exact imaging EV. The final aperture value and shutter speed for imaging is then determined based on the imaging EV. The apertures 17A and 17B are then driven to the final aperture value when the release button is “fully press”, and the charge accumulation time is controlled by the electronic shutters at the determined shutter speed. *Id.*, [0034]-[0035] (emphasis added).

POR, 43-44 (citing Ex.1007, [0034]-[0035])

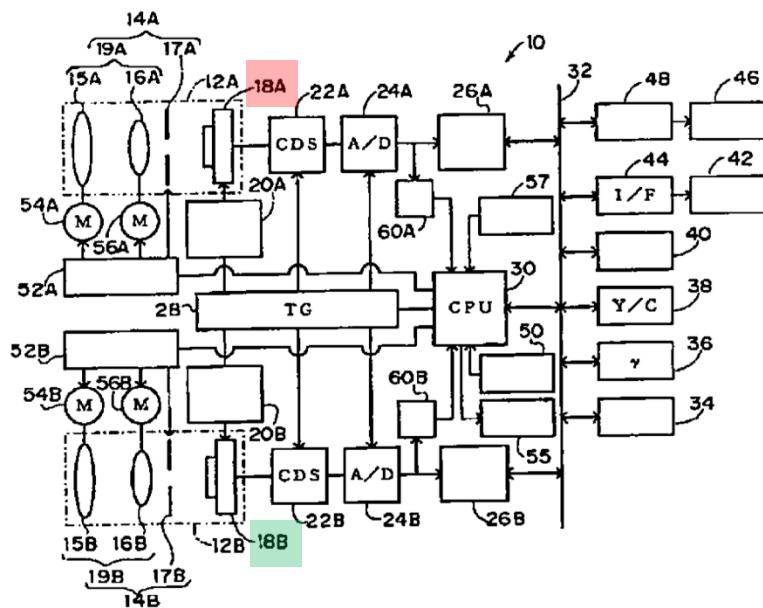
Reply, 21-22

IV mischaracterizes Matsushima as applying a common exposure time

Matsushima teaches different integration times for independent imaging systems.

- Each CCD (sensor) belongs to its own independent imaging system with a distinct control path.

[FIG. 1]



Ex.1007, FIG. 1.

[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

[0017] FIG. 1 is a block diagram showing the configuration of a digital camera. This digital camera 10 has two independent imaging systems (a first imaging system 12A and a second imaging system 12B), and subject images are formed on the light-receiving surfaces of CCD 18A and 18B via imaging optics 14A and 14B, respectively.

Ex.1007, [0024], [0017]

Reply, 21-22; Ex.1069, ¶¶ 68-73

Yu's independent control techniques are compatible with Matsushima

IV's argument that Matsushima lacks spatially aligned pixels is wrong.

- It was well known to combine images with different exposures, including the step to align pixels spatially.

Weldy (Ex.1014)

It will be further appreciated that the particular two lens/two sensor embodiment described above can be varied and modified to greater than two lens/two sensor systems wherein all the greater than two lens/sensor systems are used to simultaneously capture light information from the same scene. FIG. 1b shows a multi-lens camera with main body 50, four imaging lenses 51a, 51b, 51c and 51d, shutter switch 52 and focusing mechanism 16a. Similarly, FIG. 1c shows a multi-lens camera with main body 102, eight imaging lenses 103a-h, and shutter switch 105. As more than one representation of the scene is captured, it is possible to select scene exposure conditions in a way that provides for improving various characteristics.

Ex.1014, 5:13-20

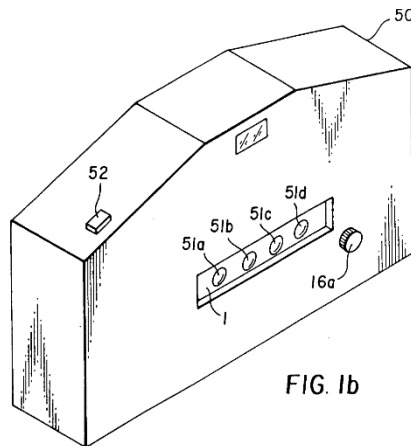


FIG. 1b

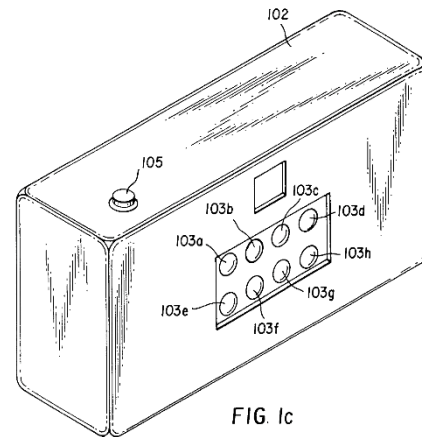


FIG. 1c

Pet., 29; Reply, 25; Ex.1003, ¶ 102; Ex.1069, ¶ 81

IV's own evidence rebuts its argument about synthesizing images of different exposures

Mr. Guidash:

87. **Third**, IV asserts that the challenge of unnatural boundaries for synthesizing images would have discouraged a POSITA from combining the teachings of Matsushima and Yu. POR, 58-59. However, **a POSITA knew how and would have eliminated exposure artifacts when combining images of different exposures.** IV's own supporting reference (Ex.2012, 1) confirms this. Ex.2012, 1 (describing established techniques for eliminating exposure artifacts when combining images of different exposures). The presence of potential artifacts does not "defeat the purpose," because standard processing steps to remove those artifacts were well-known.

Ex.1069, ¶ 87

Uyttendaele (Ex.2012)

Abstract

As panoramic photography becomes increasingly popular, there is a greater need for high-quality software to automatically create panoramic images. Existing algorithms either produce a rough "stitch" that cannot deal with common artifacts, or require user input. This paper presents methods for dealing with two artifacts that often occur in practice. Our first contribution is a method for dealing with objects that move between different views of a dynamic scene. If such moving objects are left in, they will appear blurry and "ghosted". Treating such regions as nodes in a graph, we use a vertex cover algorithm to selectively remove all but one instance of each object. Our second contribution is a method for continuously adjusting exposure across multiple images in order to eliminate visible shifts in brightness or hue. We compute exposure corrections on a block-by block basis, then smoothly interpolate the parameters using a spline to get spatially continuous exposure adjustment. Our enhancements, combined with previously published techniques for automatic image stitching, result in a high-quality automated stitcher that exhibits far fewer artifacts than existing software.

Ex.2012, 1 (Abstract)