

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMERICAN HONDA MOTOR CO., INC.

Petitioner,

v.

INTELLECTUAL VENTURES II LLC

Patent Owner.

Case No. IPR2022-01338
U.S. Patent No 9,232,158

PATENT OWNER'S PRELIMINARY RESPONSE

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I. INTRODUCTION

The Petition challenges claims 1-20 (“Challenged Claims”) of U.S. Patent No. 9,232,158 (“’158 Patent,” Ex. 1001) under six grounds of unpatentability. The Board should deny the institution for the following reasons.

The primary reference for Grounds 1-3 (U.S. Patent No. 6,943,837 to Booth (Ex.1004)(“Booth”)) and the primary reference for Grounds 4-7 (Japan Patent Application Publication No. JP 2003-101886 to Takehito (Ex.1005)(“Takehito”), each fail to disclose the following limitations:

- "wherein each optics component of the plurality of optics components is configured to pass light to a sensor" (independent claim 1), and
- "a plurality of channels" (independent claims 9 and 15)

The primary reference for Grounds 8-11 (U.S. Patent Application Publication No. 2002/0012071 to Sun (Ex.1007) fails to disclose:

“a processing component configured to control an integration time of each sensor” (independent claim 1),

“the processing component is configured to determine an integration time of each channel” (independent claim 9), and

“identifying an integration time for each of a plurality of channels” (independent claim 15).

The '158 Patent was the subject of a Decision Denying Institution of *Inter Partes* Review in IPR2022-00710 ("the '710 IPR"). *Toyota Motor Corp. v. Intellectual Ventures II LLC*, IPR2022-00710, Paper 13 (October 26, 2022).

II. THE '158 PATENT AND THE CHALLENGED CLAIMS

A. Overview of the '158 Patent

The '158 Patent is directed to a specific solution to the longstanding problem of how to overcome the dynamic range limitations of conventional digital cameras. Ex. 1001 at Col. 3 Ll. 65 – Col. 4 Ll. 17. As shown in FIG. 1, conventional cameras used a color filter layer (Reference Numeral 112) having an array of filters (green box) arranged in a Bayer pattern (e.g., a 2 by 2 matrix of colors with alternating red and green in one row and alternating green and blue in the other row), and an image sensor 116 (red box) containing a plurality of identical photodetectors. *Id.*, at Col. 6 Ll. 13 – 24. The conventional camera used a complex common lens assembly (blue box) (Reference Numeral 110) for passing light to all photodetectors.



follows:

elements arranged together to in any combination to form an integral optical component. Additional lenses can be used if necessary. The electromechanical device 163 portion of the lens assembly 110 and the mechanical frame 164 portion of the lens assembly 110 can include numerous components and/or complex assemblies. Ex. 1001 at Col. 6 Ll. 4-12. (Emphasis added).

the invention of the '158 Patent, color filter layer 112, image sensor 116, and

common lens assembly 110 are replaced with independent optical components specific to each of the camera channels. As stated in the '158 Patent:

The digital camera subsystem 210, also referred to herein as the "DCS" 210, includes one or more camera channels (e.g., four camera channels 260A-260D) and replaces (and/or fulfills one, some or all of the roles fulfilled by) the lens assembly 110, the color filter 112 and the image sensor 116 of the digital camera 100 described above. Ex. 1001 at Col. 6 Ll. 54-59. (Emphasis added)

These camera channels are the essence of the invention, and are featured prominently at the beginning of the Detailed Description as part of the overview of the disclosed embodiments. In this regard, the '158 Patent states:

Digital camera systems and methods are described below that provide an expanded effective single-frame dynamic exposure range. The digital camera systems and methods, collectively referred to herein as digital camera systems, generally include two or more camera channels. Each channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels).

* * *

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor Substrate. The multiple camera channels are configured to image the same field of view simultaneously, and each operates independently ...

* * *

A digital camera according to an embodiment includes multiple (e.g., two or more) closely spaced image sensor camera channels integrated on or in a common semiconductor substrate. Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control ... Ex. 1001 at Col. 3 Ll. 39-45; Col. 4 Ll 18-24; Col. 5, Ll. 12-15 (Emphasis added).

Figure 3 (reproduced below, with annotations) illustrates an example embodiment where the common (or shared) lens assembly (Reference Numeral 110 – in blue box), a color filter array layer (Reference Numeral 112 – in blue box), and an image sensor (Reference Numeral 116 - in blue box) of the conventional digital camera are depicted in Figure 1 (reproduced below, with annotations) are replaced by camera channels 260A-260D according to the claimed invention. As illustrated in Figure 3, each one of the camera channels 260A-260D includes respective independent optics (Reference Numeral 290A-D – in red box) and a respective independent sensor portion (Reference Numerals 292A-D - in green box). See Ex. 1001 at Col. 7. Ll. 17-39.

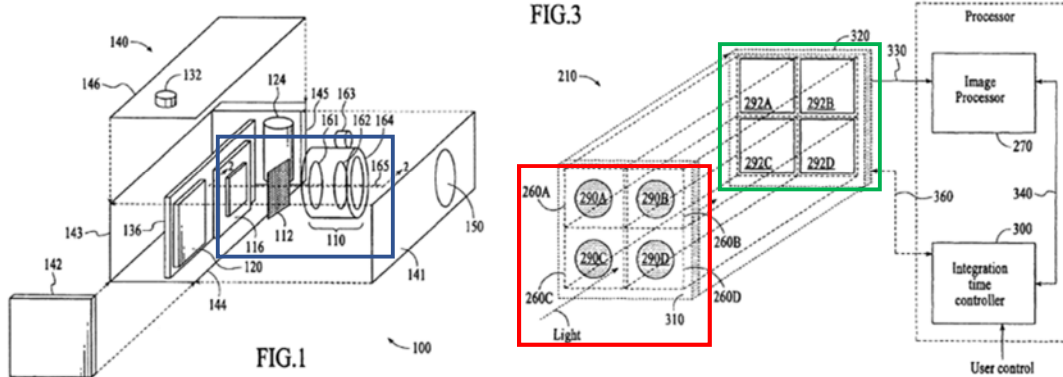


Figure 3 further illustrates a processor that includes an integration time controller (Reference Numeral 300) for independently controlling the integration time of each camera channel. As explained in the '158 Patent:

... The camera systems include a processing component coupled to the channels. The processing component is configured to separately and simultaneously control an integration time of each channel. The integration time of at least one channel is controlled relative to the integration time of at least one other channel so that an image formed by combining data of a frame received simultaneously from the channels has a relatively large dynamic range.

A digital camera according to an embodiment includes multiple (e.g., two or more) closely spaced image sensor camera channels integrated on or in a common semiconductor substrate. Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control. Id., Col. 5 Ll. 3-18 (emphasis added).

See also, Id., Col. 7, Ll. 36-39 ("[e]ach camera channel has a selectable integration, and the integration time setting between channels is selected to cover a range of incident light level onto the digital camera"; Col. 8, Ll. 32-38 ("The digital camera subsystem 210 further includes ... an integration time controller portion 300 (referred to as controller 300). The controller is a component of the variable integration time that provides integration time control for each of the camera channels.")) (emphasis added).

Accordingly, in the claimed invention, incident light independently passes through the optics specific to each channel and is received by a corresponding independently controlled sensor in the respective channel.

B. Challenged Claims of the ‘158 Patent

Petitioner challenges independent Claims 1, 9, and 15, and dependent claims 2-8, 10-14, and 16-20. Independent Claims 1 and 9 are representative, and recite:

1. An image capture device comprising:

a plurality of sensors;

a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors; and

a processing component configured to control an integration time of each sensor.

9. A system comprising:

a plurality of channels, wherein each channel of the plurality of channels includes a sensor; and

a processing component coupled to the plurality of channels, wherein the processing component is configured to determine an integration time of each channel of the plurality of channels, wherein the processing component is configured to combine data from the plurality of channels received to provide an image.

C. Claim Construction

The claim limitations at issue must be construed under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Claim language is not read in isolation. *Phillips*, 415 F.3d at 1315. Rather, the claim language, when read in light of the specification, elucidates the meaning of the claim language.

The law is clear and well-settled that claims should not be read so broadly as to encompass a prior art structure distinguished in the specification. *SciMed Life Sys. v. Advanced Cardiovascular Sys.*, 242 F.3d 1337 (Fed. Cir. 2001), *citing*, *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998) (specification distinguished prior art as inferior and touted advantages of a conical shaped cup for use in an artificial hip device; "such statements make clear that the '589 patent discloses *only* conical shaped cups and nothing further"); *Ekchian v. Home Depot, Inc.*, 104 F.3d 1299, 1304, 41 U.S.P.Q.2D (BNA) 1364, 1368 (Fed. Cir. 1997) ("Since, by distinguishing the claimed invention over the prior art, an applicant is indicating what the claims do not cover, he is by implication surrendering such protection.").

As recognized by the Federal Circuit, even where the language of the claims, read without reference to the specification, might be considered broad enough to encompass a feature, that feature is deemed to be outside the reach of the claims where the specification makes clear that the invention does not include the particular feature. *Chi. Bd. Options Exch., Inc. v. Int'l Sec. Exch., LLC*, 677 F.3d 1361 (Fed.

Cir. 2012) (citing, *Honeywell Int'l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1319 (Fed. Cir. 2006) (quoting *SciMed Life Sys.*, 242 F.3d at 1341 (Fed. Cir. 2001))).

Similarly, in the present case, the claims must be read in light of the specification, where the common lens assembly 110 of the conventional (prior art) digital camera is replaced with independent optical components specific to each of the camera channels, and the image sensor 116 from the conventional digital camera is replaced with an independently controlled image sensor for each camera channel. In stark contrast to the common lens 110 in the conventional camera of FIG. 1, every figure illustrating the invention of the '158 Patent includes optics specific to a channel.

1. “wherein each optics component of the plurality of optics components is configured to pass light to a sensor” (claim 1)

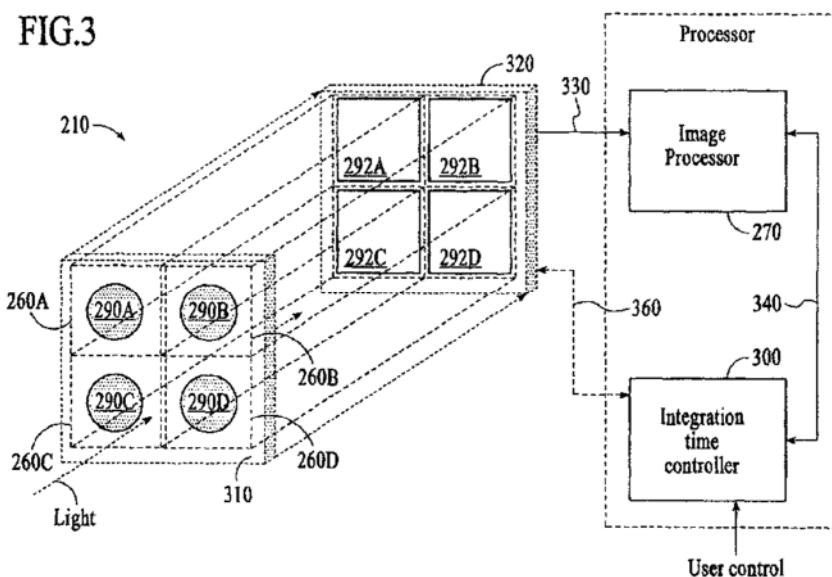
Claim 1 of the '158 Patent recites “a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors.” In view of the specification, this claim element should be construed as limiting the device optics to independent optical components specific to each sensor, thus excluding devices with optics that are common to multiple channels.

“The terms used in patent claims are not construed in the abstract, but in the context in which the term was presented and used by the patentee, as it would have

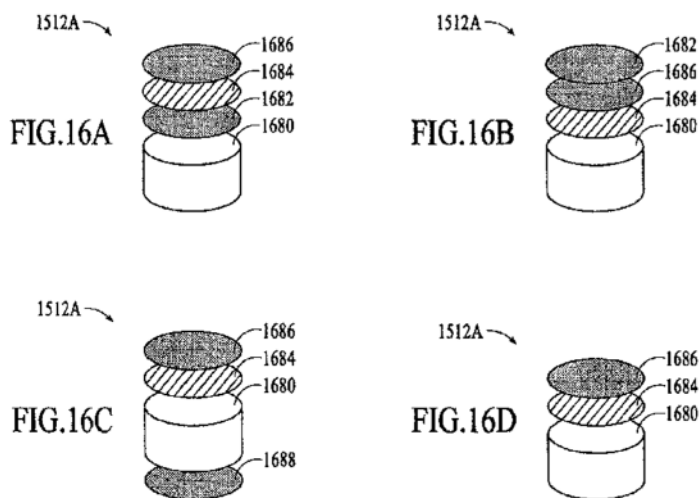
been understood by a person of ordinary skill in the field of the invention on reading the patent documents.” *Fenner Invs., Ltd. v. Celco P'ship*, 778 F.3d 1320, 1322-23 (Fed. Cir. 2015). Accordingly, “[c]laims are construed with reference to the specification and prosecution history, for these are the resources by which persons in the field of the invention understand what has been invented.” *Tf3 Ltd. v. Tre Milano, LLC*, 894 F.3d 1366, 1373 (Fed. Cir. 2018). In the present case, the specification teaches a person of ordinary skill in the art that the claimed invention is limited to independent optics components that are configured and arranged to provide the incident light to a respective sensor.

For example, the specification teaches a person of ordinary skill in the art that the claimed invention is able to overcome the limitations of conventional digital cameras “through the use of multiple camera channels, including multiple optics and image sensor.” Ex. 1001, Col. 4 Ll. 19-20) (emphasis added). Further, the specification states that “[e]ach sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control.” Ex. 1001, Col. 5 Ll. 15-18. The patent further teaches that “[e]ach of the camera channels 260A-260D includes an optics component or portion and a sensor component or portion.” Ex. 1001, Col. 7 Ll. 23-25. For example, “camera channel 260A includes an optics portion 290A and a sensor portion 292A,” and similarly, “Camera channel B

includes an optics portion 290B and a sensor portion 292B.” (Ex. 1001, Col. 7 Ll. 27-30) As shown in Figure 3 (reproduced below), each sensor (Reference Numerals 292A-D) has its own respective optics (Reference Numeral 290A-D).



Figures 16A-D (reproduced below) further show that each sensor (Reference Numeral 1680) receives the incident light via respective optical components (Reference Numerals 1686, 1684, and 1682) that form each camera channel. See, for example, Ex. 1001, Col. 17 ll. 41-47.



Accordingly, a person skilled in the art would understand that in order to improve the resolution of conventional digital cameras, the claimed invention uses optics components arranged and configured to provide the incident light to a respective sensor, thereby forming an independent camera channel. Therefore, when the patent claims are construed in the context in which the terms were used in the specification, a person having ordinary skills would understand “a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors,” as limiting the device optics to independent optical components specific to each sensor, and excluding devices with optics that are common to multiple channels.

In the '710 IPR, the Board construed the “a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors,” and adopted Patent Owner's proposed construction. There, the Board reasoned as follows:

Turning first to the claim language itself, the plain meaning of the phrase “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors” requires each optics component to pass light separately to a distinct sensor of the plurality of sensors. This is so because the phrase expressly singles out “each optics component” from “the plurality of optics components” and associates it with passing light to “a sensor” that is distinguished from “the plurality of sensors.” As a result, claim 1 requires each optics component to have a configuration that allows it to pass light separately to an individual sensor distinct from the other sensor(s) in the plurality of sensors.

.... Although, “[a]s a general rule,” the word “a” in a patent claim carries the meaning of “one or more,” “the question whether ‘a’ or ‘an’ is treated as singular or plural depends heavily on the context of its use” and “[t]he general rule does not apply when the context clearly evidences that the usage is limited to the singular.”

Here, the context clearly evidences that the usage of “a” in “a sensor” is limited to a singular one of the “plurality of sensors.” In the context of the disputed phrase “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors,” the article “a” before “sensor” is used to distinguish the configuration of “each optics component” as being able “to pass light to” to an individual sensor distinct from the other sensor(s) in the group.

The Specification is in accord with this interpretation. ... The Specification further explains that “a digital camera subsystem can have *multiple separate arrays* on a single image sensor, *each with its own lens*,” ...

The individual nature of the optics component is evidenced by its description as “each be[ing] the same or different relative to the other

optics.” The Specification states, “*each* sensor array and *the respective optics portion* may define an optical component.” Finally, as Patent Owner correctly notes, “every figure shown in the ‘158 Patent (except the conventional prior art system distinguished by Fig. 1) includes optics specific to a channel, and *none* include optics that are *common* to more than one channel.”

* * *

When viewed in context of the intrinsic record from the perspective of a skilled artisan, the plain meaning of the phrase “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors” is properly interpreted to mean that each of the plurality of optics components is configured to pass light separately to a distinct sensor of the plurality of sensors. Therefore, we also agree with Patent Owner that the plain meaning of this claim element excludes from the scope of claim 1 devices that rely on a common optics component to pass light to multiple camera channels.

Toyota Motor Corp. v. Intellectual Ventures II LLC, IPR2022-00710, Paper 13, at 11-15 (October 26, 2022). (emphasis added; citations omitted).

Petitioner chose not to propose a formal construction of the term “a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors,” as recited in independent Claim 1. See Petition at 5. However, in its mappings to Booth and Takehito, the Petitioner proceeds as if this term includes optics like those shown in the conventional (prior art) camera of Fig. 1 which are common to multiple channels. Petitioner’s interpretation of this claim element fails to acknowledge that by distinguishing the invention over the conventional camera of Fig. 1, the applicant

indicated what the claims did not cover. *Ekchian*, 104 F.3d 1299, 1304 1997 ("[B]y distinguishing the claimed invention over the prior art, an applicant is indicating what the claims do not cover. ...")

2. “*a plurality of channels*” (claims 9 and 15)

Claims 9 and 15 of the ‘158 Patent recite “a plurality of channels.” In view of the specification, this claim element should be construed as limiting the device optics to independent optical components specific to each channel, thus excluding devices with optics that are common to multiple channels.

The Federal Circuit has expressly held that “[t]he inventor's words that are used to describe the invention--the inventor's lexicography--must be understood and interpreted by the court as they would be understood and interpreted by a person in that field” where the person in the field is “[s]uch person is deemed to read the words used in the patent documents with an understanding of their meaning in the field, and to have knowledge of any special meaning and usage in the field.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (internal citation omitted).

The ‘158 specification expressly teaches that “[e]ach channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels).” Ex. 1001, Col. 3 ll. 43-45. The ‘158 Patent further explains that “[t]he multiple camera channels are configured to image the same field of view simultaneously, and each operates independently ...,” Ex. 1001 at Col. 4, Ll

18-24, and that “[e]ach sensor camera channel has its own optics ...” Ex. 1001 at Col. 5, Ll. 12-15. The specification further provides that “[e]ach sensor array and the respective optics portion may define an optical channel” and “[e]ach of the optics portions 1504A-1504D may include a lens, and may be associated with a respective one of the sensor arrays sensor arrays 1504A-1504D.” Ex. 1001, Col. 15 Ll. 50-52.

The requirement that the channel includes an optical component is depicted throughout the specification of the ‘158 Patent. For example, Figure 11 (reproduced below) specifically shows individual lenses (Reference Numeral 1112A-D) that receive the incident light (Reference Numeral 1106) and pass a respective color (Reference Numeral 1106A-1106D) to the respective image sensors (Reference Numerals 1104A-D).

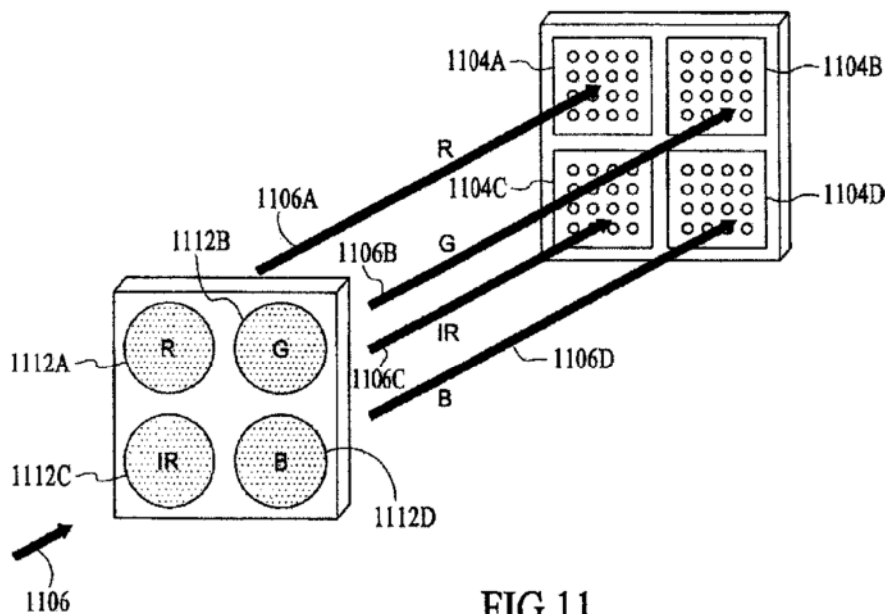


FIG.11

Accordingly, a person of ordinary skill in the art, after reading the specification of the '158 Patent, would appreciate that each "channel" requires a respective lens and sensor that allow the incident light to be independently processed and controlled. Moreover, in view of the specification, the optical components in each channel should be construed as limiting the device optics to independent optical components specific to each channel, thus excluding devices with optics that are common to multiple channels.

In the '710 IPR, the Board construed the "a plurality of channels," and adopted Patent Owner's proposed construction. There, the Board reasoned as follows:

Again, first looking within the context of the claim language itself, the plain meaning of "a plurality of channels" requires two or more distinct structures that each direct light to a specific sensor. Claims 9 and 15 further limit the respective channel structures to ones that also *include* a sensor. *Id.* at 26:6–7 ("wherein each channel of the plurality of channels includes a sensor"), 26:33–34 ("wherein the plurality of channels includes a plurality of sensors"). Because each claimed channel actually includes a sensor, it is clear that each channel structure is intended to have its own respective sensor that it passes light to. Thus, to a skilled artisan and within the context of claims 9 and 15 of the '158 patent, the recited "plurality of channels" limitation refers to multiple independent structures that separately pass light to a different respective sensor.

The Specification supports this construction. In various ways throughout the Specification, it states clearly that "[e]ach channel of the plurality of channels includes an optics component and a sensor that includes an array of photo-detectors." ... 3:43–45 ("Each channel includes an optics component and an image sensor having an active area including picture elements (pixels)"), 4:66–5:2 ("The digital camera systems include multiple channels. Each channel includes an optics component and a sensor comprising an array of photo-detectors"),

5:15–18 (“Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control”), 7:23–25 (“Each of the camera channels 260A-260D includes an optics component or portion and a sensor component or portion”), 14:45–47 (“a digital camera subsystem can have multiple separate arrays on a single image sensor, each with its own lens”), 15:1–3 (“The above-described devices can include any suitable number of combinations, including as few as two arrays/lenses, and many more than two arrays/lenses”), 15:50–56 (“Each of the optics portions 1504A-1504D may include a lens, and may be associated with a respective one of the sensor arrays 1504A-1504D . . . Each sensor array and the respective optics portion may define an optical channel”).

In each example the Specification discloses to explain the invention, there are multiple independent structures (e.g., lens) that separately pass light to a different respective sensor. . . . Moreover, the Specification attributes several benefits to having multiple independent structures that separately pass light to a different respective sensor, such as (1) overcoming dynamic range limitations (*id.* at 4:18–21); and (2) allowing for smaller lenses, which allows for reduced stack height in the digital camera (*id.* at 14:45–50).

When viewed in context of the intrinsic record from the perspective of a skilled artisan, the plain meaning of the phrase “plurality of channels” is properly interpreted as multiple independent structures that separately pass light to a different respective sensor. Therefore, we also agree with Patent Owner that the plain meaning of this claim element excludes from the scope of claims 9 and 15 devices that rely on a common optics component to pass light to multiple camera channels.

Toyota Motor Corp. v. Intellectual Ventures II LLC, IPR2022-00710, Paper 13, at 16-18 (October 26, 2022). (emphasis added; citations omitted).

Petitioner chose not to propose a formal construction of the term “channels” as recited in independent Claims 9 and 15. *See*, Petition at 5. However, as discussed above, in its mappings to Booth and Takehito, the Petitioner proceeds as if this term

includes optics like those shown in the conventional (prior art) camera of Fig. 1 which are common to multiple channels.

3. *“a processing component configured to control an integration time of each sensor” (claim 1), “the processing component is configured to determine an integration time of each channel” (claim 9), and “identifying an integration time for each of a plurality of channels” (claim 15)*

Petitioner chose not to propose a formal construction of the term “a processing component configured to control an integration time of each sensor” as recited in independent Claim 1, the term “the processing component is configured to determine an integration time of each channel,” as recited in independent Claim 9, or the term “identifying an integration time for each of plurality of channels,” as recited in Claim 15. See Petition at 5. However, in its mapping of Sun, Petitioner has suggested that these limitations could be met by a processor that lacks independent control of the integration time of each sensor.

The specification expressly teaches that “[t]he processor ... provides integration time control for each of the camera channels.” Ex. 1001, Col. 8 ll. 33-37. The ‘158 Patent explains that by providing the integration times to each camera channel, the processor is able to “separately and simultaneously control an integration time of each channel” ... so that an image formed by combining data of a frame received simultaneously from the channels has a relatively large dynamic range.” Ex. 1001, Col. 5 ll. 5-11; see also Col. 5 Ll. 15-18 (“[e]ach sensor camera

channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control.")

In the '710 IPR, the Board interpreted the "processing component" of Claim 1 as follows:

... Consistent with this interpretation, claim 1 also recites "a processing component configured to control an integration time of *each* sensor," which similarly distinguishes the processing component's configuration as being able to control the integration time of an individual sensor distinct from the other sensor(s) in the group.

The specification is in accord with this interpretation. For example, the specification states,

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor Substrate. The multiple camera channels are configured to image the same field of view simultaneously, and each operates independently under a different integration time.

And the specification states,

Each channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels). Each sensor is controlled under or with an independent signal integration time . . .

Toyota Motor Corp. v. Intellectual Ventures II LLC, IPR2022-00710, Paper 13, at 12-13 (October 26, 2022). (emphasis added; citations omitted).

Accordingly, a person of ordinary skill in the art would understand “a processor configured to control an integration time of each sensor” as recited in independent Claim 1, “the processing component is configured to determine an integration time of each channel” recited in independent claim 9, and “identifying an integration time for each of plurality of channels,” as recited in Claim 15 to require independent control of the integration time of each sensor.

III. APPLICABLE LEGAL STANDARDS

The Board may only grant a petition for IPR where “the information presented in the petition ... shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(c). Accordingly, the Petitioner bears the burden of showing this statutory threshold has been met. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,756 (Aug. 14, 2012) (“The Board ... may institute a trial where the petitioner establishes that the standards for instituting the requested trial are met...”)

IV. A PERSON HAVING ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) as of the effective filing date of the ‘158 Patent would have had a bachelor’s degree in electrical engineering,

computer science, computer engineering, physics, or a related subject, and two to three years of work experience in digital imaging.

V. RESPONSE TO PETITION GROUNDS 1-3

A. Booth fails to teach or suggest every feature recited in the Challenged Claims (Grounds 1)

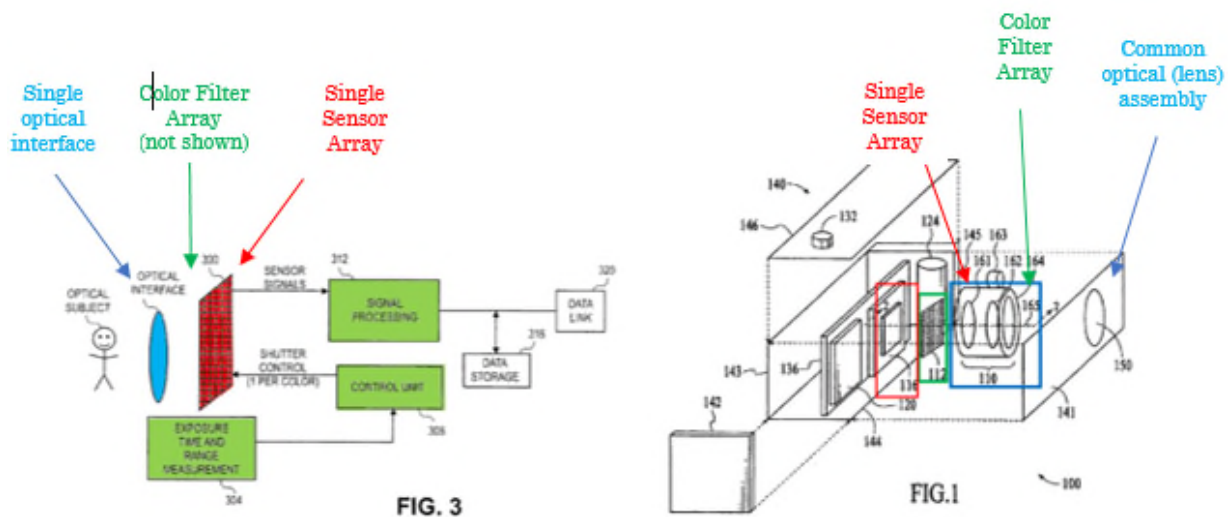
Petitioner asserts in Ground 1 of the Petition that Booth anticipates or renders obvious independent claims 1, 9, and 15. Petitioner’s arguments in Ground 1 do not establish a reasonable likelihood that any of the Challenged Claims are unpatentable because the Petitioner has failed to show that Booth discloses the limitation “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors (claim 1) or “a plurality of channels” (claims 9 and 15).

(1) Booth fails to disclose a system that includes the limitation “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors” as recited in claim 1 or “a plurality of optical channels” as recited in claims 9 and 15.

The Petition maps elements of independent claims 1, 9, and 15 to Booth’s color filter array (**green**),¹ which is “pasted or otherwise processed over” a color

¹ Booth discloses the color filter array (CFA), but does not show it in the figures. Ex. 1004, Col. 3 Ll. 10-14 (“A CFA (not shown) may be pasted or otherwise processed over the photo-detecting circuitry in the sensor array such that each photosite is in effect configured to detect incident light of a particular color.”) The

sensor array (red),” as shown in Fig. 3 below. See Petition, at 9-11. Like the conventional camera discussed in connection with Fig. 1 of the ‘158 patent, a single optical interface (blue) is used for all sensor elements. As shown below, Booth (left side) is practically the same as the conventional camera shown in Fig. 1 of the ‘158 Patent (right side).



Accordingly, Booth discloses a conventional digital camera (like FIG.1 of the ‘158 Patent) where the incident light passes through shared optics (blue) prior to being captured by an image sensor. As a result, Booth does not meet claims 1, 9 and 15 of the ‘158 Patent, each of which are limited to devices with independent optical components specific to each sensor, thus excluding devices like Booth with optics that are common to multiple channels.

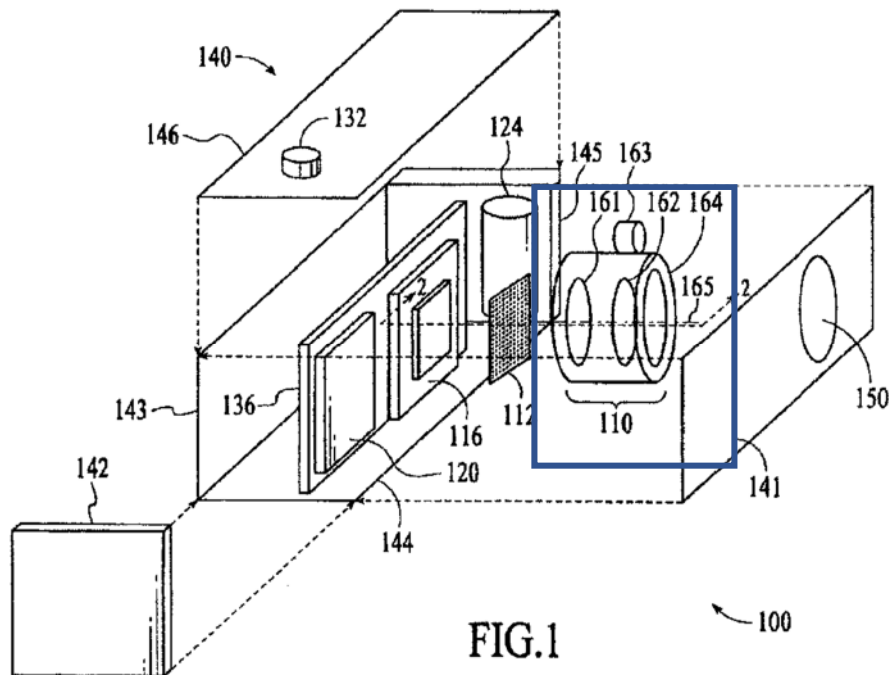
depiction of the location of the color filter array in Booth is provided by Patent Owner.

Further, the Board has already rejected the proposition that a color filter is an optical component. The board expressly held in the ‘710 IPR that “the color filters do not evidence a structure that is configured to pass light to a particular sensor; instead, it alters to characteristics of the light that a lens passes to a sensor” and therefore a color filter is not a optics component is that “configured to pass light to a sensor of the plurality of sensors,” as independent claim 1.” *Toyota Motor Corp. v. Intellectual Ventures II LLC*, IPR2022-00710, Paper 13, at 12-13 (October 26, 2022).

(2) Devices like Booth with an optics common to multiple channels were disclaimed in the Specification

Booth teaches a conventional digital camera that is remarkably similar to the conventional digital camera discussed in the ‘158 Patent and depicted in Figure 1. Specifically, the ‘158 Patent explains that a conventional digital camera “includes a lens assembly 110, a color filter array layer 112, an image sensor 116, and an electronic image storage media 120.” Ex. 1001, Col. 5 ll. 62. In addition, in conventional digital cameras, the incident light, once it passes through the lens assembly, the light then passes through “the color filter array 112 [that] is disposed above a respective one of the photo detectors in the image sensor 116, such that each photo detector in the image sensor receives a specific band of visible light (e.g., red, green or blue) and provides a signal indicative of the color intensity of the respective

band.” Ex. 1001, Col. 6 ll. 30-34. As depicted in Figure 1 (reproduced below), each photo detector shares the same optical lenses (blue box).



The Federal Circuit has expressly held that “[t]he patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (Internal Citation Omitted). In the situation where the inventor’s intention is to disavow the scope, “the inventor’s intention, as expressed in the specification, is regarded as dispositive.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005). In order “[t]o disavow claim

scope, the specification must contain 'expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.' *Cont'l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019) (internal citation omitted). As a result, for a Patentee to demonstrate intent to deviate from the ordinary meaning of a term, the specification must be "both so clear as to show reasonable clarity and deliberateness, and so unmistakable as to be unambiguous evidence of disclaimer." *Openwave Sys. v. Apple Inc.*, 808 F.3d 509, 513 (Fed. Cir. 2015) (internal citation omitted). For example, "an inventor may disavow claims lacking a particular feature when the specification distinguishes or disparages prior art based on the absence of that feature." *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136-37 (Fed. Cir. 2016) (relying upon *Openwave Sys*). In the present case, the specification deliberately and unambiguously conventional digital cameras (Fig. 1) like that shown in Booth.

For example, the '158 Patent expressly states that "FIG. 1 is a block diagram of a conventional digital camera 100." Ex. 1001, Col. 5 ll. 59-60. The '158 distinguishes the conventional camera by explaining that the claimed invention "replaces (and/or fulfills one, some or all of the roles fulfilled by) the lens assembly 110, the color filter 112 and the image sensor 116 of the [conventional] digital camera" with "one or more camera channels (e.g., four camera channels 260A-260D)." Ex. 1001, Col. 6 ll. 55-59. Accordingly, the inventor clearly disavowed a

digital camera that includes a set of shared optics. Instead, the inventor claimed an improvement over conventional digital cameras, where the improvement is obtained by, *inter alia*, each image sensor having its own lens assembly.

As a result, Booth fails to inherently or expressly teach, or render obvious, each and every element recited in the Challenged Claims.

B. The Art Used in Ground 2 Fails to Remedy The Deficiencies in Booth

In Ground 2, the Petition alleges that dependent claims 6, 12, 17-18 are obvious over Booth in combination with International Publication Number WO 02/098112 to Fraenkel et al. (Ex. 1008) (“Frankel”). Frankel is not offered to remedy the deficiencies of Booth with respect to independent claims 1, 9 and 15 discussed above. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Booth and Frankel discloses or renders obvious all of the features of the Challenged Claims.

C. The Art Used in Ground 3 Fails to Remedy The Deficiencies in Booth

In Ground 3, the Petition alleges that dependent claim 19 is obvious over Booth in combination with Japanese Patent Application Publication No. JP 2003-018617 to Takeo (Ex. 1009) (“Takeo”). Takeo is not offered to remedy the deficiencies of Booth with respect to independent claims 1, 9 and 15, nor does it

disclose the additional limitations of Claim 19. As discussed in detail in section VII (D) below, Takeo lacks the ability to independently control the "channels," as required by Claim 19. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Booth and Takeo discloses or renders obvious all of the features of the Claim 19.

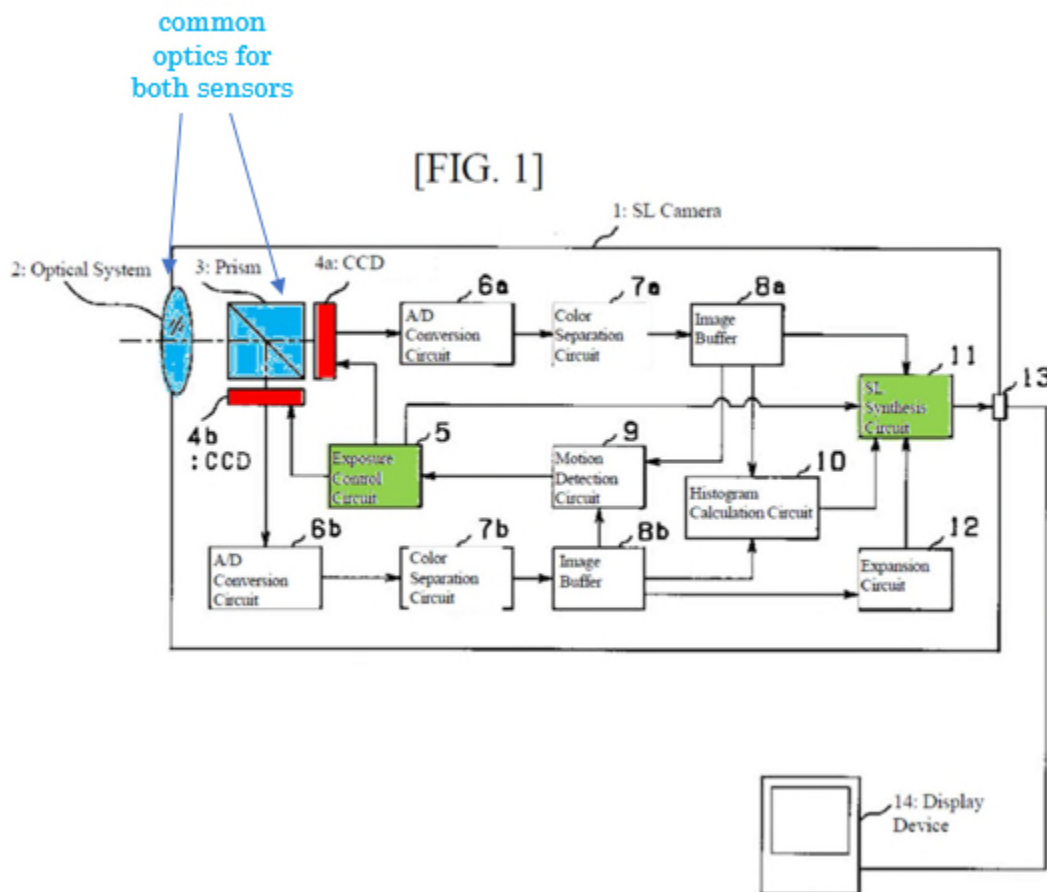
VI. RESPONSE TO PETITION GROUNDS 4-7

A. Takehito fails to teach or suggest each and every feature recited in the Challenged Claims (Ground 4)

Ground 4 alleges claims 1-5, 8-11, 13-16 and 20 of the '158 Patent are anticipated or rendered obvious by Japanese Patent Application Publication No. JP 2003-101886 to Takehito (Translated at Ex. 1006) ("Takehito"). Ground 4 of the Petition does not establish a reasonable likelihood that any of the Challenged Claims are unpatentable because Takehito does not teach or suggest the limitation "wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors" (claim 1) or "a plurality of channels" (claims 9 and 15).

Takehito teaches a digital camera where incident light from an image passes through a common optical system (Reference Numeral 2) and then through a beam splitting prism (Reference Numeral 3). The purpose of the prism in Takehito is "for splitting the optical path of the incident light ... into two." Ex. 1006, at [0031]. After

passing through the prism, the separated light be projected upon the image sensing devices (CCDs 4a and 4b). Id. Like the conventional camera discussed in connection with Fig. 1 of the '158 patent, Takehito uses common optics (blue) (i.e., a single optical interface followed by a prism) for both sensors (red).



Like Booth, Takehito uses shared optics to provide light to multiple sensors. Takehito is therefore also like the disavowed “conventional digital camera” depicted in Figure 1 of the '158 Patent. As a result, Takehito does meet claims 1, 9 and 15 of the '158 Patent, each of which are limited to devices with independent optical

components specific to each sensor, thus excluding devices like Takehito with optics that are common to multiple channels.

B. The Art Relied on in Grounds 5-7 Does Not Remedy the Deficiencies in Takehito

In Ground 5, the Petition alleges that dependent claims 6, 12 and 17-18 are obvious over Takehito in combination with Frankel. Frankel is not offered to remedy the deficiencies of Takehito with respect to independent claims 1, 9 and 15 discussed above. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Takehito and Frankel discloses or renders obvious all of the features of the Claims 6, 12 and 17-18.

In Ground 6, the Petition alleges that dependent claims 3 and 7 are obvious over Takehito in combination with Booth. Booth does not remedy the deficiencies of Takehito with respect to independent claims 1, 9 and 15. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Takehito and Booth discloses or renders obvious all of the features of Claims 3 and 7.

In Ground 7, the Petition alleges that dependent claim 19 is obvious over Takehito in combination with Takeo. Takeo is not offered to remedy the deficiencies of Takehito with respect to independent claims 1, 9 and 15, nor does it disclose the additional limitations of Claim 19. Accordingly, the Petitioner has not met its burden

to show that the proposed combination of Takehito and Takeo discloses or renders obvious all of the features of the Claim 19.

VII. RESPONSE TO PETITION GROUNDS 8-11

A. Sun fails to teach or suggest each and every feature recited in the Challenged Claims (Ground 8)

Ground 8 alleges claims 1-5, 7-10, 13-15, and 19-20 of the ‘158 Patent are anticipated or rendered obvious by U.S. Patent Application Publication No. 2002/0012071 to Sun (Ex. 1007) (“Sun”). Ground 8 of the Petition does not establish a reasonable likelihood that any of the Challenged Claims are unpatentable because Sun does not teach or suggest “a processing component configured to control an integration time of each sensor” as recited in independent Claim 1, “the processing component is configured to determine an integration time of each channel,” as recited in independent Claim 9, or “identifying an integration time for each of plurality of channels,” as recited in Claim 15. As explained above, these limitations require independent control of the integration time of each sensor.

The Petition maps the sensors in independent claim 1 of the ‘158 Patent to imager (NIR) (12), imager (R) (13), imager (G) (14), and imager (B) (15) of Sun. Pet., at 60. As shown in Fig. 10 of Sun, the exposure time for all four of Sun’s sensors is controlled using a single (common) control signal.

Single control line for exposure control of all four sensors.

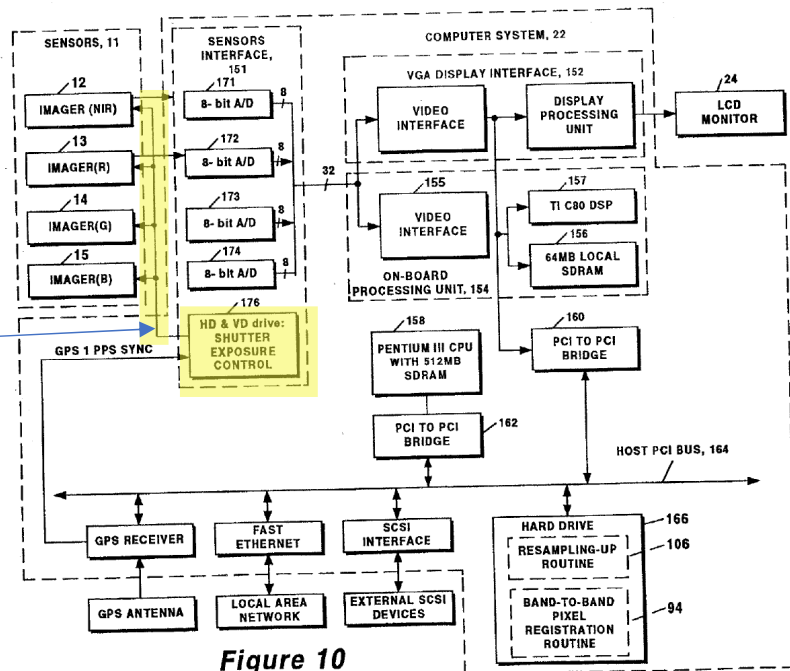


Figure 10

As explained in Sun, its system uses “full-frame electronic shutter operation synchronized for all its four cameras 12-15.” Ex. 1007, [0044] (emphasis added). In Sun, all four sensors use a shared exposure control setting to simultaneously take a first snapshot, after which all four sensors use a second shared exposure control setting to simultaneously take a second snapshot, and so on:

... a single capture has certain limitations when trying to accommodate simultaneously very weak and very strong signals. The dynamic range of signal intensity distribution in a single image can be much larger than 256 discernable levels ... A solution is to use bracketed multiple exposures to extend the dynamic range. It is desirable to retain no saturations on bright field when imaging faint sources by taking a sequence of exposures.

CAMIS 10 is enhanced with the capacity of acquiring a bracket of computer-controlled exposures, each of which freezes all the four-band spatial and spectral information simultaneously and

instantaneously with a designated exposure setting. ... For example, the first exposure is set by a pre-shooting computer-assisted histogram analysis, the second and the third snapshots are set with 50% (or other) increment and 50% (or other) decrement exposures for exposure compensations or dynamic range extending. Thus, *for every trigger, the CAMIS 10 will automatically bracket the image with three snapshots*, one having more exposure, one having less, and one in the middle. All the three bracketed snapshots are buffered in a memory ... The bracketed exposure series compose an integrated data set that contains improved radiometric details for all the bright and dark fields in a scene. Id., [0068] – [0069] (emphasis added).

Thus, rather than controlling the exposure of its four sensors independently, Sun synchronizes the exposure control for all four sensors for a given snapshot, and then takes multiple snapshots to facilitate dynamic range extension.

Simply put, Sun does not teach or suggest “a processing component configured to control an integration time of each sensor” (Claim 1), “the processing component is configured to determine an integration time of each channel,” (Claim 9), or “identifying an integration time for each of plurality of channels,” (Claim 15) -- which require *independent control of the integration time* of *each* sensor. For this reason, the Petition fails to establish a reasonable likelihood of success with respect to Ground 8.

B. The Art Relied on in Grounds 9 Does Not Remedy the Deficiencies in Sun

In Ground 9, the Petition alleges that dependent claims 6, 12, and 17-18 are obvious over Sun in combination with Frankel. Frankel is not offered to remedy the

deficiencies of Sun with respect to independent claims 1, 9, and 15 discussed above. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Sun and Frankel discloses or renders obvious all of the features of Claims 6, 12, and 17-18.

C. The Art Relied on in Grounds 10 Does Not Remedy the Deficiencies in Sun

In Ground 10, the Petition alleges that dependent claims 11 and 16 are obvious over Sun in combination with Booth. Booth is not offered to remedy the deficiencies of Sun with respect to independent claims 1, 9, and 15. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Sun and Booth discloses or renders obvious all of the features of Claims 11 and 16.

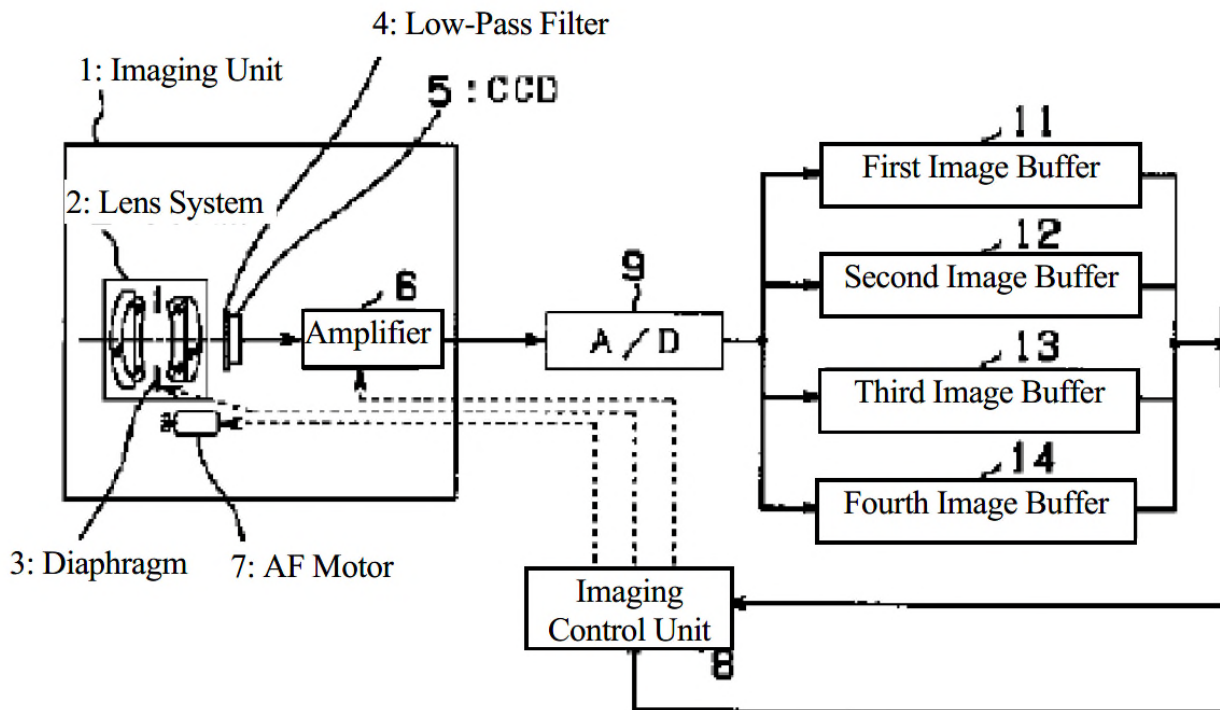
D. The Art Relied on in Grounds 11 Does Not Remedy the Deficiencies in Sun

In Ground 11, the Petition alleges that dependent claim 19 is obvious over Sun in combination with Takeo. Takeo is not offered to remedy the deficiencies of Sun with respect to independent claims 1, 9, and 15, nor does it disclose the additional limitations of Claim 19.

Instead, the primary embodiment of Takeo includes an imaging unit 1 having a lens system 2, a low-pass filter 4, a CCD 5, and an amplifier 6. The system also includes a diaphragm 3 for controlling light flux through the lens and an AF motor.

The amplifier 6, diaphragm 3, and AF motor 7 are controlled by the imaging control unit 8. These components are shown in Fig. 1 of Takeo, shown (in part) below:

[FIG. 1]



Takeo explains the operation of the embodiment of Fig. 1 as follows:

When the imaging operation is started, *the amplification factor of the amplifier 6 is set to achieve a prescribed exposure ratio with respect to exposure conditions found in the imaging control unit 8, for example, an exposure ratio of 1/8, and a single image (right short term exposure image) is imaged. This right short term exposure image is converted to a digital signal by the A/D converter 9, then transferred to the first image buffer 11 and stored.*

Then, *a second image (right long term exposure image) is imaged* in accordance with the exposure conditions found in the imaging control unit 8. This right long term exposure image is converted to a digital signal by the A/D converter 9, then transferred to the second image buffer 12 and stored.

Next, the user moves the imaging device horizontally to the left a prescribed amount to a position having parallax, for example, a distance of around 6 cm to be equivalent to the distance of both eyes of a human, *and performs imaging again in the same manner as described above.*

In this case, *the exposure conditions are the same as the first image for a third image (left short term exposure image), and the same as the second image for a fourth image (left long term exposure image).*

The left short term exposure image imaged in this manner is transferred to the third image buffer 13 and stored, and the left long term exposure image is transferred to the fourth image buffer 14 and stored.

The interpolation unit 15 sequentially reads single panel video signals stored in the respective image buffers 11, 12, 13, and 14 Ex. 1010, ¶¶ [0035] – [0040] (emphasis added).

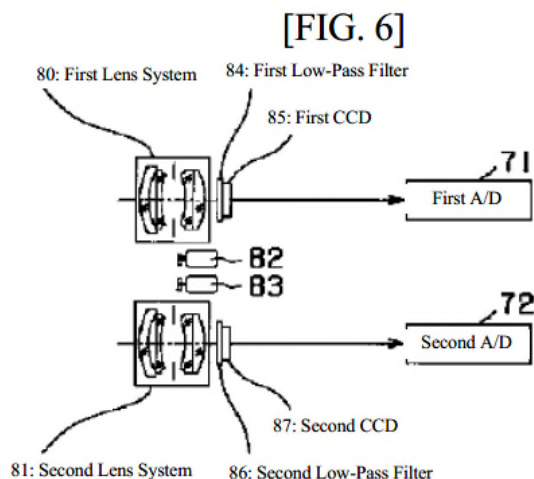
As set forth above, in the Fig. 1 of Takeo, the following images are taken sequentially:

1. a right short-term exposure image using first exposure conditions;
2. a right long-term exposure image using second exposure conditions;
3. a left short-term exposure image using the first exposure conditions; and

4. a left long-term exposure image using the second exposure conditions.

Thus, in Takeo, both the right and left short-term images use the same exposure conditions, and similarly, both the right and left long-term images use the same exposure conditions.

Takeo discloses another embodiment in Fig. 6 (shown below), which uses the same approach as the embodiment of Fig. 1. As was the case in Fig. 1, in Takeo's Fig. 6 embodiment, both the right and left short-term images use the same exposure conditions, and similarly, the right and left long-term images are captured at the same time use the same exposure conditions. However, in contrast to Fig. 1, in Fig. 6 the right and left short-term images are captured at the same time while still using the same exposure conditions; and then the right and left short-term images are captured at the same time while still using the same exposure conditions.



In describing Fig. 6, Takeo states:

FIGS. 5 and 6 illustrate a second embodiment of the present invention ... In the second embodiment, descriptions will be omitted for portions that are the same as the first embodiment described above, and only major differences will be described.

* * *

The imaging unit of the imaging device illustrated in FIG. 6 is configured having a pair of left and right optical systems.

First, the first optical system corresponds to, for example, the right eye side, and is configured having a first lens system 80 as an optical system having a diaphragm installed therein, an AF motor 82 for driving to adjust the focus of the first lens system 80, a low-pass filter 84 ...

Similarly, the second optical system corresponds to, for example, the left eye side, and is configured having a second lens system 81 as an optical system having a diaphragm installed therein, an AF motor 83 for driving to adjust the focus of the second lens system 81, a low-pass filter 86 ...

The operation of such a configuration is as follows.

Imaging via the first lens system 80 and imaging via the second lens system 81 are performed simultaneously, and for example, short term exposure relating to the left and right is performed first, then long term exposure relating to the left and right is performed.

That is, the right short term exposure image is imaged by the first CCD 85 using the first lens system 80 and the left short term exposure image is imaged by the second CCD 87 using the second lens system 81 simultaneously, and the right short term exposure image is transferred to the first

image buffer 11 and the left short term exposure image is transferred to the third image buffer 13.

Next, the right long term exposure image is imaged by the first CCD 85 using the first lens system 80 and the left long term exposure image is imaged by the second CCD 87 using the second lens system 81 simultaneously, and the right long term exposure image is transferred to the second image buffer 12 and the left long term exposure image is transferred to the fourth image buffer 14. Ex. 1010, ¶¶ [0099], [0136] – [0144] (emphasis added).

As set forth above, in the Fig. 6 of Takeo, the following images are taken sequentially:

1. right and left short-term exposure images are taken simultaneously using the same first exposure conditions; and
2. right and left long-term exposure image are taken next simultaneously using the same second exposure conditions.

Since in Takeo, systems 80 and 81 each use the same setting at any given time, Takeo lacks the ability to independently control the integration time of its sensors. Accordingly, the Petitioner has not met its burden to show that the proposed combination of Sun and Takeo discloses or renders obvious all of the features of the Claim 19.

VIII. CONCLUSION

Petitioner has not met its burden of showing that the cited references, alone or in combination with the other references, disclose, teach or suggest all of the limitations of the Challenged Claims of the '158 Patent. The Board should therefore deny institution of the Petition.

Respectfully submitted,

Dated: November 3, 2022

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Response complies with the type-volume limits of 37 C.F.R. § 42.24(b)(1) because it contains 8,408 words, excluding the parts of this Patent Owner's Preliminary Response that are exempted by 37 C.F.R. § 42.24(a), according to the word processing system used to prepare this Patent Owner's Preliminary Response.

Respectfully submitted,

Dated: November 3, 2022

By: /Daniel H. Golub/
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CERTIFICATE OF SERVICE

The undersigned certifies that pursuant to 37 C.F.R. § 42.6(e), a copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE** was served via email (as consented to by counsel) on November 3, 2022 to lead and backup counsel of record for Petitioner as follows:

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