Trials@uspto.gov
571-272-7822

Paper 15
Date: August 18, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

CELLECT, LLC,
Patent Owner.

IPR2020-00475
Patent 9,186,052 B1

Before JAMESON LEE, PATRICK M. BOUCHER, and JOHN R. KENNY, *Administrative Patent Judges.*

KENNY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314; 37 C.F.R. § 42.4

I. INTRODUCTION

Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. ("Petitioner") filed a Petition to institute an *inter partes* review of claims 1, 3, and 7 (the "challenged claims") of U.S. Patent No. 9,186,052 B1 (Ex. 1001, the "'052 patent") pursuant to 35 U.S.C. § 311 *et seq*. Paper 2 ("Pet."). Cellect, LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). With our authorization, Petitioner filed a Reply (Paper 10 ("Reply")) and Patent Owner filed a Sur-Reply (Paper 13 ("Sur-Reply")).

We have authority under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and the Preliminary Response shows that "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). After considering the briefing and the evidence of record, we institute an *inter partes* review of all challenged claims on all asserted grounds of unpatentability.

A. Related Matters

The parties identify the following related district court litigation: *Cellect, LLC v. Samsung Electronics Co., Ltd. et al.*, 1-19-cv-00438 (D. Colo.). Pet. 5; Paper 5, 1.

The parties note that the challenged patent is also the subject of IPR2020-00512. Pet. 6; Paper 5, 1. Petitioner further identifies the following related patents and respective proceedings:

Patent	**Proceeding(s)**
6,043,839	IPR2020-00472

Patent	**Proceeding(s)**
6,275,255 B1	IPR2020-00473
6,982,740 B2	IPR2020-00474 ex parte reexamination
9,198,565 B2	IPR2020-00476
9,667,896 B2	IPR2020-00477
6,982,742 B2	IPR2020-00559 IPR2020-00560 IPR2020-00561 ex parte reexamination
6,424,369 B1	IPR2020-00562 IPR2020-00563 IPR2020-00564 ex parte reexamination
6,452,626 B1	IPR2020-00565 IPR2020-0566 IPR2020-00567 ex parte reexamination
6,862,036 B2	IPR2020-00568 IPR2020-00569
7,002,621 B2	IPR2020-00571 IPR2020-00572 ex parte reexamination

Pet. 6–7.

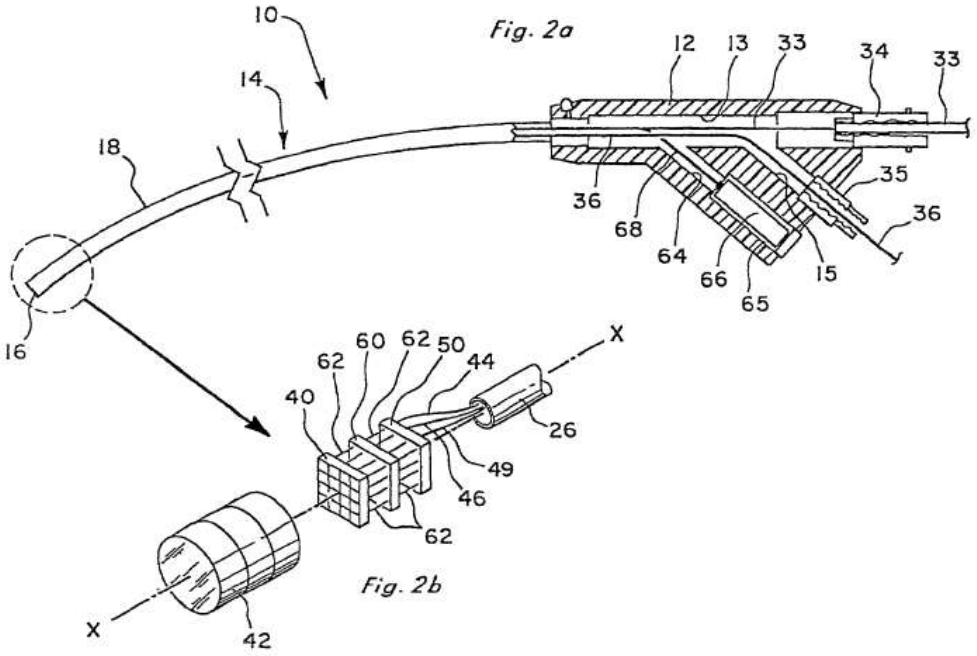
B. The '052 Patent

The '052 patent is titled "Reduced Area Imaging Device Incorporated Within Endoscopic Devices." Ex. 1001, code (54). By way of background, the '052 patent explains that "endoscopic surgery has become the accepted standard for conducting many types of surgical procedures." *Id.* at 1:40–42. Solid state imaging technology is increasingly replacing the rod lens endoscope, due to "its cost of manufacture, failure rate, and requirement to be housed within a rigid and straight housing." *Id.* at 1:52–57. Solid state

imaging technology "enables the image sensor to be placed at the distal tip of the investigating device." *Id*.

Complementary metal oxide semiconductor (CMOS) imaging devices are solid state imaging devices that "offer improved functionality and simplified system interfacing" and "can be manufactured at a fraction of the cost of other solid state imaging technologies." Ex. 1001, 1:61–65. However, despite improved CMOS imaging devices that permit a "camera on a chip" concept (*see id.* at 2:1–3:21), the '052 patent reports that "a need still exists for a reduced area imaging device which can be used in even the smallest type of endoscopic instruments." *Id.* at 3:25–31.

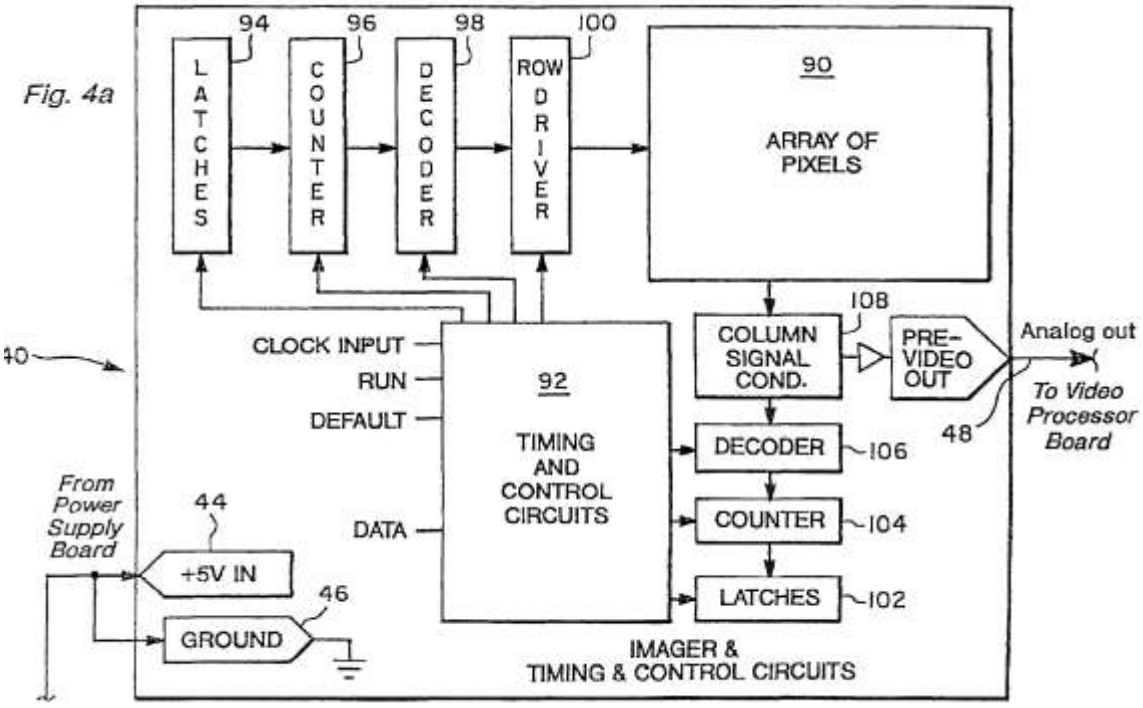
The '052 patent purports to improve "camera on a chip" technology by "rearrang[ing] the circuitry in a stacked relationship so that there is a minimum profile presented when used within a surgical instrument or other investigative device." Ex. 1001, 3:31–37. In an embodiment, an imaging device may be entirely self-contained in the distal end of an endoscope. *Id.* at 9:53–57. Figure 2a shows a cross-sectional view of an endoscope with an imaging device incorporated into the distal tip of the endoscope, and Figure 2b shows a partially exploded perspective view of the distal end of the endoscope shown in Figure 2a, both of which are reproduced below (Ex. 1001, 6:55–61):



As shown in Figure 2b above, an imaging device in distal end 16 of endoscope 10 may include image sensor 40 electrically coupled, via pin connectors 62, to video processing board 50 and optional supplementary board 60. Ex. 1001, 9:58–10:8. Image sensor 40 may be bonded to lens system 42. *Id.* at 10:16–19.

Figure 4a, reproduced below, shows a detailed schematic diagram of image sensor 40 (Ex. 1001, 12:26–28):

Fig. 4a



As shown in Figure 4a above, image sensor 40 contains array of pixels 90 and timing and control circuits 92. Ex. 1001, 12:40–42. Array of pixels 90 is an active pixel group, and "[e]ach pixel circuit has its own amplifier which is controlled by the timing and control circuitry." *Id.* at 12:45–64.

C. Challenged Claims

Petitioner challenges claims 1, 3, and 7. Pet. 1. Claims 1 and 3 are independent, and claim 7 depends from claim 3. Ex. 1001, 21:23–63, 22:38–23:19; 23:29–31. Claim 1 recites:

> 1. An imaging device comprising:
>
> a housing;
>
> an image sensor mounted in said housing, said image sensor including a first circuit board having a length and a width thereto, wherein said length and width of said first circuit board define a first plane, said first circuit board including an array of CMOS pixels thereon, wherein a plurality of CMOS pixels within said array of CMOS pixels each include an amplifier, said first circuit

> board further including timing and control circuitry thereon, said timing and control circuitry being coupled to said array of CMOS pixels, said image sensor producing a pre-video signal;
>
> a second circuit board mounted in said housing, said second circuit board being electrically coupled to said first circuit board, said second circuit board having a length and a width thereto, wherein said length and width of said second circuit board define a second plane, said second circuit board including circuitry thereon to convert said pre-video signal to a post-video signal, said second circuit board being offset from said first circuit board, said second plane of said second circuit board being substantially parallel to said first plane of said first circuit board;
>
> a lens mounted in said housing, said lens being integral with said imaging device, said lens focusing images on said array of CMOS pixels of said image sensor;
>
> a video screen, said video screen being electrically coupled to said second circuit board, said video screen receiving said post-video signal and displaying images from said post-video signal; and
>
> a power supply mounted in said housing, said power supply being electrically coupled to said first circuit board to provide power to said array of CMOS pixels and said timing and control circuitry, said power supply also being electrically coupled to said second circuit board to provide power thereto;
>
> wherein said image sensor has a generally square shape along said first plane;
>
> and wherein a largest dimension of said image sensor along said first plane is between 2 and 12 millimeters.

Id. at 21:23–63.

D. Asserted Grounds

Petitioner challenges claims 1, 3, and 7 based on the grounds set forth in the table below.

Claims Challenged	35 U.S.C. §	References
1	103	Wakabayashi,[1] Ackland[2]
1	103	Wakabayashi, Ackland, Suzuki[3]
3, 7	103	Wakabayashi, Ricquier,[4] Dierickx[5]

Pet. 11. Petitioner relies on the Declaration of Dr. Dean P. Neikirk (Ex. 1004). Patent Owner has not submitted a declaration from a proffered expert in this proceeding. Prelim. Resp. 69–70.

[1] U.S. Patent 5,903,706, filed Aug. 22, 1995, issued May 11, 1999 (Ex. 1027).
[2] U.S. Patent 5,835,141, filed July 3, 1996, issued Nov. 10, 1998 (Ex. 1006).
[3] U.S. Patent 5,233,426, filed December 12, 1991, issued August 3, 1993 (Ex. 1015).
[4] Ricquier, N., et al. "*CIVIS Sensor: A Flexible Smart Imager with Programmable Resolution*," Charge-Coupled Devices and Solid State Optical Sensors IV. Vol. 2172. International Society for Optics and Photonics, 1994. Petitioner submitted two copies of this article, each with an accompanying declaration, as Exhibits 1033 and 1038. According to the accompanying declarations, Exhibits 1033 and 1038 are copies of the article obtained from SPIE and from the University of Wisconsin, respectively. Ex. 1033, 1; Ex. 1038, 1–2. In this decision, we cite to Exhibit 1038, which Petitioner identifies as "Ricquier," using Petitioner's added page numbers, which encompass both Exhibit 1038's accompanying declaration and the Ricquier article. Pet. iv.
[5] US Application Publication 2001/0010551 A1, filed October 31, 1996, published August 2, 2001. (Ex. 1041)

II. EXERCISE OF DISCRETION UNDER 35 U.S.C. § 325(D)[6]

Patent Owner argues "[t]he Board should exercise its discretion to deny institution of the *inter partes* review of the Challenged Claims of the '052 Patent under 35 U.S.C. § 325(d)." Prelim. Resp. 5 et seq. Section 325(d) provides that the Director may elect not to institute[7] a proceeding if the challenge to the patent is based on matters previously presented to the Office. *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 7 (PTAB Feb. 13, 2020) (precedential) ("*Advanced Bionics*"). In evaluating matters under § 325(d), the Board uses the following two-part framework: (1) determining whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office and (2) if either condition of the first part of the framework is satisfied, determining whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Id.* at 8.

We consider several non-exclusive factors set forth in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (Dec. 15, 2017) (precedential as to section III.C.5, first paragraph). These factors

[6] In its Preliminary Response, Patent Owner also argues that we should exercise discretion under 35 U.S.C. § 314(a) to deny the Petition based on the advanced stage of related litigation, but Patent Owner subsequently withdrew that argument after the District Court stayed that litigation. Prelim. Resp. 43–51; Paper 12, 1.

[7] The Board institutes trial on behalf of the Director. 37 C.F.R. § 42.4(a); *Advanced Bionics*, Paper 6 at 7 n.7.

"provide useful insight into how to apply the framework" under § 325(d). *Advanced Bionics*, Paper 6 at 9. Those factors include:

> (a) the similarities and material differences between the asserted art and the prior art involved during examination;
>
> (b) the cumulative nature of the asserted art and the prior art evaluated during examination;
>
> (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;
>
> (d) the extent of the overlap between the arguments made during examination and the manner in which Petitioner relies on the prior art or Patent Owner distinguishes the prior art;
>
> (e) whether Petitioner has pointed out sufficiently how the Examiner erred in its evaluation of the asserted prior art; and
>
> (f) the extent to which additional evidence and facts presented in the Petition warrant reconsideration of the prior art or arguments.

Becton, Dickinson, Paper 8 at 17–18 (formatting added). "If, after review of factors (a), (b), and (d), it is determined that the same or substantially the same art or arguments previously were presented to the Office, then factors (c), (e), and (f) relate to whether the petitioner has demonstrated a material error by the Office." *Advanced Bionics*, Paper 6 at 10.

As discussed below, for at least two of three asserted grounds, the Petition does not rely on the same or substantially the same prior art or arguments as were previously presented to the Office. In particular, Petitioner argues, and Patent Owner does not dispute, that asserted prior art references Suzuki and Dierickx teach the limitation recited in independent claims 1 and 3 of: "wherein a largest dimension of said image sensor along

said first plane is between 2 and 12 millimeters" ("dimension limitation").[8] Pet. 56–58, 83; Prelim. Resp. 51–67; Pet. Reply 1; Sur-Reply, generally. Two of the three asserted grounds rely on either Suzuki or Dierickx, neither of which were cited during examination of the challenged patent. Pet. 9; Ex. 1001, code (56). Further, Petitioner argues, and Patent Owner does not dispute, that the prior art cited during examination does not teach or suggest the dimension limitation. Pet. Reply 1; Sur-Reply, generally. Thus, the prior art asserted in this proceeding is not the same or substantially the same as the prior art previously presented to the Office.

Nor are the arguments presented in this proceeding the same or substantially the same as the arguments previously presented to the Office. Petitioner details how specific disclosures in Suzuki and Dierickx teach the dimension limitation. Pet. 56–58, 83. Neither side asserts that the applicant made any arguments regarding any specific disclosures in the cited art teaching or not teaching the dimension limitation, nor does either side assert that the Examiner made any findings during prosecution about any specific disclosures that teach or would not teach that limitation. Thus, neither the asserted art nor the arguments presented in this proceeding are the same or substantially the same as those presented during prosecution, and we decline to exercise deny institution under 35 U.S.C. § 325(d). We expressly analyze

[8] Claims 1 and 3 recite the same dimension limitation, but in context that limitation slightly differs because of claim 1's recites a first circuit board whereas claim 3's recites a planar substrate. We refer to this limitation in both claims as the dimension limitation, and address the implicit recitations of a first circuit board or planar substrate when warranted. For our analysis under section 325(d), the difference between a first circuit board and a planar substrate is of no significance.

Becton, Dickinson factors (a), (b), and (d) below in our analysis of the first part of the *Applied Bionics* framework.

A. Factor (a): the similarities and material differences between the asserted art and the prior art involved during examination;

The asserted prior art is materially different than the prior art involved during examination for two of the three asserted grounds. The difference concerns the dimension limitation. The asserted prior art teaches it, whereas the art cited during prosecution does not.

Suzuki, an asserted reference that Petitioner relies on for one ground to challenge claim 1, was not cited during prosecution. Pet. 9; Ex. 1001, code (56). Suzuki teaches a "solid-state image pickup chip of 1/3 inch (8.5 mm)." Ex. 1015, 4:6–12. Suzuki's solid state image pickup chip is bonded to chip-connecting board 226. *Id.* at 3:21–24. Suzuki further teaches that the outer diameter of its camera head containing that chip "is about 10 mm." *Id.* Thus, the largest dimension of Suzuki's disclosed image sensor including its chip-connecting board 226 (which Dr. Neikirk maps the recited first circuit board to) is between 8.5 and 10 mm, which falls within the recited dimension range of 2 to 12 mm. Ex. 1004 ¶ 154.

Dierickx, an asserted reference that Petitioner relies on to challenge claim 3, also was not cited during prosecution of the '052 patent. Pet. 9; Ex. 1001, code (56). Dierickx teaches a "6.3 x 5.7 mm" image sensor. Ex. 1041 ¶ 32. Its maximum dimension is 6.3 mm, which is within the recited range of 2 to 12 mm.[9] Ex. 1004 ¶ 218.

[9] Dr. Neikirk does not expressly address what the planar substrate's dimensions would be, but does opine that the recited image sensor would be within the range of 2 to 12 mm. Ex. 1004 ¶ 218.

Nothing on this record indicates that any of the prior art cited during prosecution teaches or suggests the dimension limitation. Petitioner argues that the prior art cited during prosecution does not, and Patent Owner has not disputed that assertion. Pet. Reply 1; Sur-Reply, generally. Patent Owner also has not identified any cited prior art reference that purportedly has such a teaching or suggestion. Sur-Reply, generally. And nothing cited from the prosecution history of the '052 patent causes us to independently doubt the assertion that the cited prior art does not teach or suggest the dimension limitation. To the contrary, the prosecution history indicates neither the Examiner nor the applicant identified any cited art prior art as teaching or suggesting the dimension limitation, and, to the extent the applicant and the Examiner expressed any belief regarding whether any cited prior art reference taught or suggested that limitation, they indicated that no cited reference did.

In particular, to overcome an obviousness rejection, the applicant added new claims with the dimension limitation, and the Examiner allowed the new claims without ever rejecting them. Ex. 1002, 33–41, 113–116, 139–145, 154–156. Specifically, during examination of the '052 patent,[10] the only prior art rejection was an obviousness rejection over the combination of Yarush and Sonnenschein. Ex. 1002, 111–116. In response to that rejection, the applicant cancelled pending claims 1–24 and added new claims 25–31, of which claims 25–27 were independent. Ex. 1002, 138–

[10] Patent Owner argues about the examination of related patent applications, but none of those arguments concern the dimension limitation. Prelim. Resp. 7–39.

144. Each of independent claims 25–27 recited the dimension limitation. Ex. 1002, 139–143. None of the original claims (1–24) did. *Id.* at 33–41.

The applicant did not provide any substantive patentability argument for the new claims, but nevertheless emphasized their recitation of the dimension limitation (at least with respect to the pending double patenting objection):

> The applicant is canceling claims 1–24 in this application. The applicant is submitting new claims 25–31 which have different scope than the claims of the copending application. Also, the new claims have material added from the dependent claims that the examiner indicated would be allowable if written in independent form. Nevertheless, the new claims 25–32 have different scope than the claims indicated allowable if re-written (3, 4, 9, 10, 15, 16, 21 and 22). *In particular, the applicant is now claiming a range of 2 to 12 mm for the size of the largest dimension of the image sensor.* Thus the claims of the two co-pending applications have different scope from one another.

Ex. 1002, 145 (emphasis added and omitted).

The Examiner did not provide a substantive analysis when he allowed application claims 25–31. The Examiner, however, identified limitations in application claim 25 that were not anticipated or rendered obvious by Yarush, and the dimension limitation was one of those limitations. Ex. 1002, 156. The Examiner indicated that application claims 26 and 27 were allowed for analogous reasons. *Id.* (Application claims 25–27 issued as independent claims 1–3, respectively. *Id.* at 160.)

In sum, for the dimension limitation, the asserted prior art is materially different from the cited prior art.

The parties have alleged similarities and differences between the asserted prior art and the cited prior art regarding other limitations. Prelim.

Resp. 18–39; Reply 1–8; Sur-Reply 1–5. But because every limitation in a claim is material, the material difference for the dimension limitation establishes a material difference between the asserted art and the cited art for the challenged claims as a whole. *Cf. Warner–Jenkinson Co. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 29 (1997) ("Each element contained in a patent claim is deemed material to defining the scope of the patented invention."). Thus, we need not address the parties' arguments regarding other limitations.

Therefore, the material difference for the dimension limitation and Suzuki and Dierickx establishes a material difference for the challenged claims as a whole. Two of three asserted grounds involve either Suzuki or Dierickx. Therefore, for two asserted grounds in the Petition, there is a material difference between the asserted art and the prior art involved during examination.

B. Factor (b): the cumulative nature of the asserted art and the prior art evaluated during examination

Neither party has argued that Suzuki and Dierickx are cumulative to the prior art evaluated during examination. Prelim. Resp. 18–39; Reply 1–8; Sur-Reply 1–5. And we do not independently find those references to be cumulative. To the contrary, as discussed above, Suzuki and Dierickx teach the dimension limitation, and Patent Owner has not argued that that limitation was taught or suggested in any cited prior art reference. Thus, Suzuki and Dierickx are not cumulative of the cited prior art.

C. Factor (d): the extent of the overlap between the arguments made during examination and the manner in which Petitioner relies on the prior art or Patent Owner distinguishes the prior art

For the dimension limitation, there is no overlap between the arguments made during examination and the manner in which Petitioner relies on the prior art or Patent Owner distinguishes the prior art in this proceeding. As discussed above, the applicant did not make any arguments during prosecution concerning the dimension limitation, and the Examiner did not make any statements regarding any alleged teaching or suggestion of that limitation by the prior art.

Thus, *Becton Dickinson* factors (a), (b), and (d) all favor institution of grounds two and three of the Petition, and, combined, these grounds involve every challenged claim.

We note that the Wakabayashi-Ackland ground does not include Suzuki or Dierickx. Although Petitioner contends that another limitation makes the asserted art in the Wakabayashi-Ackland ground materially different than the prior art cited during prosecution (Reply 1), we do not need to address that argument. In assessing whether to exercise our discretion pursuant to 35 U.S.C. § 325(d), we "evaluate the challenges and determine whether § 325(d) is sufficiently implicated that its statutory purpose would be undermined by instituting on all challenges." SAS Q&A's, Part D, Effect of *SAS* on Future Challenges that Could Be Denied for Statutory Reasons, D1 (June 5, 2018) ("SAS Q&A's, Part D"), available at https://www.uspto.gov/sites/default/files/documents/sas_qas_20180605.pdf; *see* 35 U.S.C. § 325(d) (explaining that the Director may reject the *petition* because the same or substantially the same prior art or arguments previously were presented to the Office); *see also SAS*

Institute, Inc. v. Iancu, 138 S. Ct. 1348, 1355–56 (2018) (holding that a decision to institute under 35 U.S.C. § 314 may not institute review on less than all claims challenged in the petition).

In evaluating the Petition as a whole, we find that, in two of the three asserted grounds, the Petition relies on two references that were not previously before the Office and, on balance, and considering *Becton* factors (a), (b), and (d) and the particular circumstances of this case, we determine that the Petition does not raise the same or substantially the same prior art or arguments previously presented to the Office such that § 325(d) is sufficiently implicated. And having determined that the same or substantially the same art or arguments were not considered by the Office, we need not consider the second part of the *Advanced Bionics* framework. *Advanced Bionics* at 8 (second part of the framework only applies "*if* either condition of the first part of the framework is satisfied") (emphasis added).

For these reasons, we do not exercise our discretion to deny institution under 35 U.S.C. § 325(d) as requested by Patent Owner.

III. ANALYSIS OF ASSERTED GROUNDS OF UNPATENTABILITY

We analyze Petitioner's asserted ground of unpatentability and Patent Owner's arguments in its Preliminary Response to determine whether Petitioner has met the threshold standard of 35 U.S.C. § 314(a).

A. Claim Construction

In an *inter partes* review proceeding, a claim of a patent:

> shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b) (2019). In applying a district court-type claim construction, we are guided by the principle that the words of a claim "are generally given their ordinary and customary meaning," as would have been understood by a person of ordinary skill in the art at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc) (citation omitted). "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). There is a "heavy presumption," however, that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citation omitted).

We also are guided by the principle that we only construe claim terms if, and to the extent that, it is necessary for this proceeding. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy . . . .'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner does not argue that any claim term requires construction. Pet. 13. Petitioner "interprets the claim terms according to their plain and ordinary meaning consistent with the specification." *Id.* Patent Owner does not argue that any claim terms require construction, but contends that institution should be denied because Petitioner fails to propose constructions

for terms that Petitioner has argued require construction in the pending litigation. Prelim. Resp. 5–7.

For this proceeding, we do not need to construe any claim term. Neither party has requested that we do so, and we do need not to do so to determine whether to institute *inter partes* review.

Regarding Petitioner's proposed district court constructions, we do not agree with Patent Owner that Petitioner necessarily had to present those constructions in this proceeding. A district court litigation addresses issues that we do not (e.g., infringement), and Petitioner's district court constructions could be relevant only for such issues. Further, Patent Owner has not argued that adopting Petitioner's district court constructions would affect Petitioner's showing of unpatentability, nor does Patent Owner argue that we should adopt any of those constructions. Thus, without more, the fact that Petitioner proposed constructions to the district court that it did not propose here is of no significance.

B. Legal Standards

A patent claim is unpatentable as obvious if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

C. Level of Ordinary Skill in the Art

With regard to the level of ordinary skill in the art, Petitioner contends that a person of ordinary skill would have possessed the following:

> a minimum of a Bachelor's degree in Electrical Engineering, Physics, or a related field, and approximately two years of professional experience in the field of imaging devices. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.

Pet. 13 (citing Ex. 1004 ¶¶ 34–37). Patent Owner does not address the level of skill in the art. *See generally* Prelim. Resp.

We adopt Petitioner's articulation of the level of ordinary skill in the art, but delete the qualifier "a minimum of" for the level of education, to keep that level from being vague and possibly extending to a range that corresponds to the skill level of an expert. Thus, we regard the level of ordinary skill as being at the level of a person with "a Bachelor's degree in Electrical Engineering, Physics, or a related field, and approximately two years of professional experience in the field of imaging devices." *See* Pet. 13.

D. Secondary Considerations

In this proceeding, neither party has argued that secondary considerations or objective evidence of nonobviousness exist. Petitioner, however, notes that during prosecution of a priority application for the '052 patent (i.e., Serial No. 09/496,312, which issued as USP 6,275,255), the applicant argued, with respect to the then pending claims, there was an unexpected result of decreased interference when image processing is removed from the same board or plane as the pixel array. Pet. 84 (citing Ex. 1003, 83–95).

Petitioner makes the following arguments regarding the alleged unexpected results: The Examiner did not find applicant's argument persuasive. Pet. 84 (citing Ex. 1003, 110–118, 148, 157). Further, Wakabayashi teaches removing the processing circuitry from the image sensor and placing it on a separate circuit board adjacent the CMOS pixel array. *Id.* Thus, it was already known to remove the processing circuitry from the image sensor, and the results of doing so were known.[11] *Id.*

As of now, no party has argued that secondary considerations exist for the asserted grounds, and we see nothing on this record that causes us to independently reach such a conclusion. Thus, we do not address secondary considerations or objective evidence of nonobviousness in the analyses below.

[11] Petitioner also argues that it was known from Monroe (U.S. Patent No. 5,919,130, Ex. 1007) to remove processing circuitry from an image sensor and place it in a remote control box. Pet. 84. The relevance of this argument is unclear, however, because none of claims 1, 3, or 7 recite a remote control box.

E. Asserted Obviousness of Claim 1 over Wakabayashi and Ackland

Petitioner asserts that claim 1 would have been obvious over Wakabayashi and Ackland. Pet. 15–56. We have questions regarding the sufficiency of Petitioner's showing for this assertion.

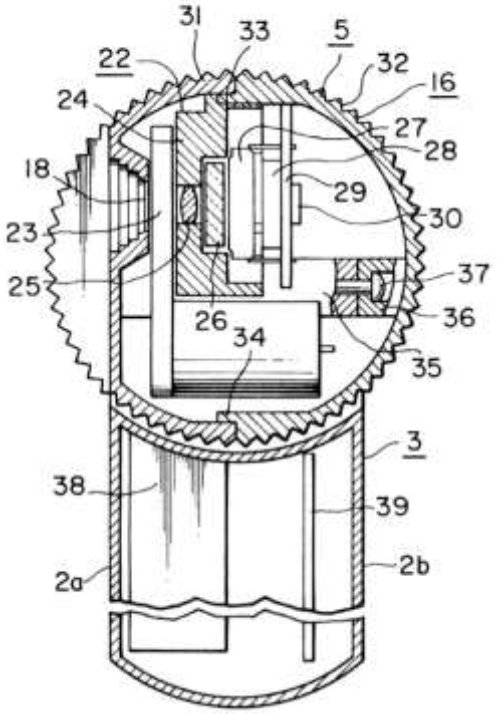
1. Wakabayashi

Wakabayashi was filed on August 22, 1995, and issued on May 11, 1999. Ex. 1027, codes (22), (45). The earliest priority date claimed for the '052 patent is based on the filing date of parent U.S. Patent Application No. 08/944,322, which is October 6, 1997. Ex. 1001, code (63). Thus, Wakabayashi is prior art to the '052 patent under 35 U.S.C. § 102(e). Patent Owner does not contest the prior art status of Wakabayashi. *See generally* Prelim. Resp.

Wakabayashi is titled "Imager Apparatus with Rotatable Camera Head." Ex. 1027, code (54). Wakabayashi is directed to "a portable imager apparatus which includes a video camera as an imager unit, a direct-view type flat display as an electronic view finder or display, and a semiconductor memory or video tape recorder (VTR) as a storage or recording unit." *Id.* at 1:5–9.

Figure 3, showing a cross-sectional view of an imager apparatus, is reproduced below (Ex. 1027, 3:49–57):

FIG. 3



As shown in Figure 3 above, camera case 16, formed with imaging hole 18, contains video camera 22, which includes shutter 23, lens case 24, lens 25, quartz filter 26, imager device 27, mounting plate 28, and camera circuit board 29. Ex. 1027, 5:49–58.

2. Ackland

Ackland was filed on July 3, 1996, and issued on November 10, 1998. Ex. 1006, codes (22), (45). Thus, Ackland is prior art to the ’052 patent under 35 U.S.C. § 102(e). Ex. 1001, code (63). Patent Owner does not contest the prior art status of Ackland. *See generally* Prelim. Resp.

Ackland is titled “Single-Polysilicon CMOS Active Pixel Image Sensor” and is directed to a “[a] CMOS active pixel characterized by a single layer of polysilicon for forming the photo gate and the transfer gate . . . , a method for operating the pixel, and pixel arrays based on such a

pixel." *Id.* at 2:19–22. Ex. 1006, code (54). Ackland describes an array of pixels arranged in first and second groups representing a row and column, respectively. *Id.* at 2:46–50. A first common conductor conducts control signals for the first group, while a second common conductor selectively transmits, to output nodes, electronic data signals that correspond to portions of an image to be converted. *Id.* at 2:50–55.

Figure 6, showing an active pixel image sensor (Ex. 1006, 3:6–7), is reproduced below.

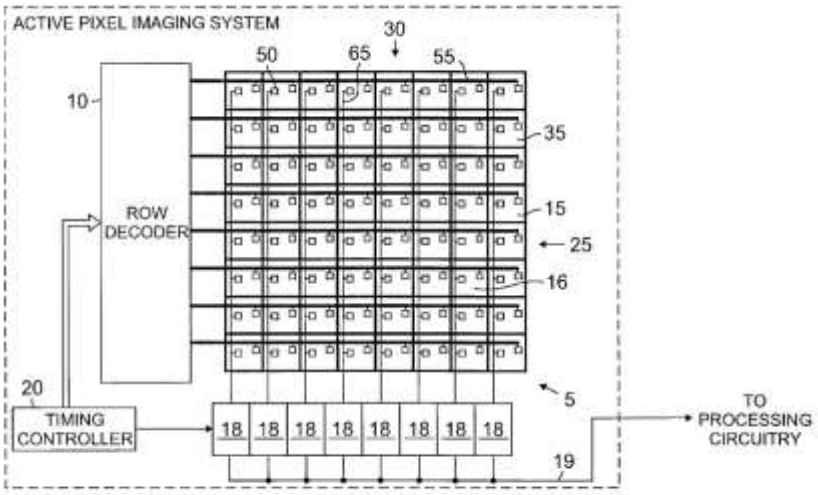


FIG. 6

As shown above, the Figure 6 embodiment, which may be used as a solid-state camera, includes "array 5 of active pixels, a row decoder 10 and a plurality of output amplifiers 18." Ex. 1006, 7:62–65. Common conductor 55 serves as a control line for each row 25 of pixels. *Id.* at 8:10–11. Common conductor 65 serves as an output line to a particular amplifier 18 for each column 30 of pixels. *Id.* at 8:18–20. "[A] timing controller 20 provides timing signals to the row decoder 10." *Id.* at 8:24–25. In response to the timing signals, "the decoder 10 sequentially activates each row 25 of active pixels 35 via the control lines 55 to detect light intensity and to

generate corresponding output voltage signals during each frame interval." *Id.* at 8:25–29. Further, "[t]he output voltage signals generated by the activated row 35 are simultaneously provided to the corresponding amplifiers 18 via the column output line 65." *Id.* at 8:45–48.

3. Claim 1

As discussed above, claim 1 recites the dimension limitation (i.e., "wherein a largest dimension of said image sensor along said first plane is between 2 and 12 millimeters."). Petitioner does not argue that either Wakabayashi or Ackland teaches this dimension limitation. Instead, Petitioner makes the following arguments: (i) an ordinarily skilled artisan would have found it an obvious implementation choice for circuit board 29 in Wakabayashi, and (ii) boards of the recited size were well-known at the time for mounting to an image sensor and using the recited size would further Wakabayashi's desire that the video camera unit is made small. Pet. 55 (citing Ex. 1004 ¶¶ 146–148).

Although Patent Owner has not challenged this showing by Petitioner, we have questions about its sufficiency. Prelim. Resp. 51–63. Petitioner's arguments for the dimension limitation are conclusory. Pet. 55. And the persuasiveness of the cited testimony from Dr. Neikirk is not clear. Ex. 1004 ¶¶ 146–148. Dr. Neikirk cites extensively to Suzuki's teaching of a solid state image pickup chip with an 8.5 mm dimension, but at least arguably Dr. Neikirk does not persuasively explain how that disclosure in Suzuki evidences general knowledge of an ordinarily skilled artisan, rather than the details of a specific embodiment in the art. *Id.* ¶ 148. Similarly, Dr. Neikirk cites Wakabayshi's disclosure that its video camera can be manipulated with a thumb or index finger, but at least arguably does not

explain why that would lead to an image sensor with the recited dimensions (e.g., does an image sensor have to be smaller than 12 mm for its video camera to be manipulated with a thumb or index finger). *Id.*

Further, claim 1 requires the largest dimension of the sensor to be between 2 and 12 millimeters. Dr. Neikirk testifies that "boards of such a size were well known at the time for mounting to an image sensor," not that image sensors of that size were well known to one with ordinary skill in the art.[12] Ex. 1004 ¶ 148. Thus, the sufficiency of Petitioner's showing for the dimension limitation is at issue. In light of our findings regarding Petitioner's other asserted grounds, however, we do not need to resolve in this Decision the issue of whether Petitioner's showing for this limitation was sufficient, nor do we need to determine whether Petitioner has demonstrated a reasonable likelihood of success in prevailing on this ground. *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018).

F. Asserted Obviousness of Claim 1 over Wakabayashi, Ackland, and Suzuki

Petitioner asserts that claim 1 would have been obvious over Wakabayashi, Ackland, and Suzuki. Pet. 56–58. We determine that Petitioner has demonstrated a reasonable likelihood of prevailing on this assertion.

1. Suzuki

Suzuki issued on August 3, 1993. Ex. 1015, code (45). Thus, Suzuki is prior art to the '052 patent under 35 U.S.C. § 102(b). Ex. 1001, code (63).

[12] The recited image sensor includes a first circuit board/planar substrate, but also can include other elements. Ex. 1001, 21:25–35, 22:40–57.

Suzuki is directed to a "Reduced Diameter Camera Head for [a] Solid-State Image Pickup Device." Ex. 1015, code (54). Figure 2, reproduced below, is a cross-sectional view of camera head 2:

FIG. 2

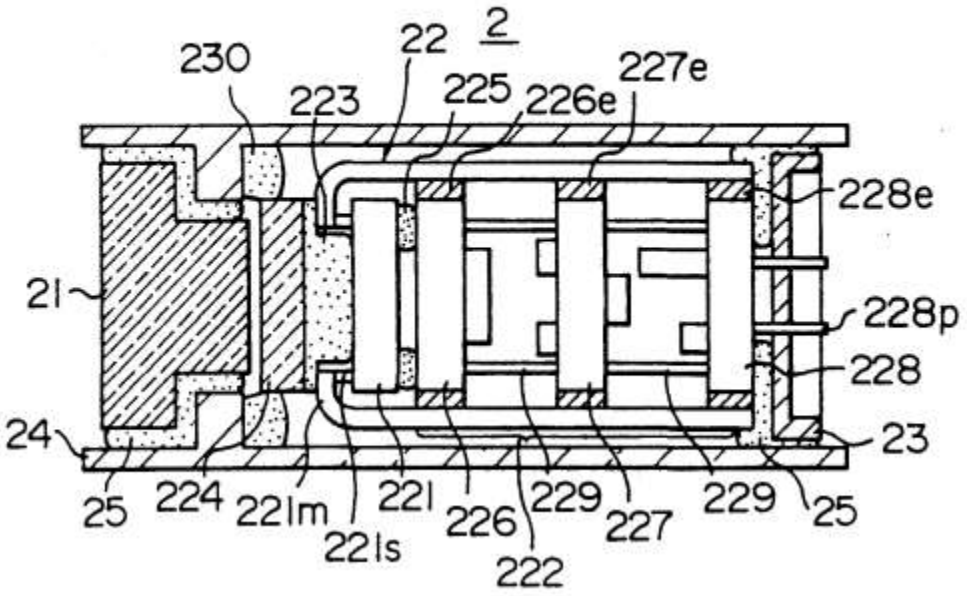


Figure 2 above shows camera head 2 with image pickup unit 22, the latter of which comprises solid-state image pickup chip 221 and circuit module 222. Ex. 1015, 2:38–41. Suzuki discloses the use of an 8.5 mm solid-state image pickup chip with an outer camera head diameter of about 10 mm. *Id.* at 4:6–12.

2. Combination of Wakabayashi and Ackland

Petitioner argues that an ordinarily skilled artisan would have combined Wakabayashi's teachings of a solid state imager device and driving circuit with Ackland's teachings of: a CMOS pixel array, pixels with amplifiers, and a timing control circuit. Pet. 27.

Petitioner makes the following arguments: The '052 patent acknowledges that the CMOS active pixel sensors were well-known in the

art. Pet. 29 (citing Ex. 1001, 2:9–15, 2:25–36). Further, the '052 admits that it was known that CMOS active pixel sensor imagers result in lower noise than CCD or other solid state imagers, can be mass produced on standard semiconductor productions lines, can incorporate a number of other different electronic controls that are usually found on multiple circuit boards of much larger size, and require less power than CCD imagers. *Id.* at 29–30. Thus, an ordinarily skilled artisan would have been motivated to apply Ackland's CMOS teachings when implementing Wakabayashi's imager apparatus. *Id.* at 30. An ordinarily skilled artisan would also have been motivated to combine these teachings because Ackland discloses that its array of single-polysilicon active CMOS pixels: requires no active drive signal for charge transfer, which allows the image sensor to operate with less power; can be fabricated through a simpler process, reducing costs; and reduces image lag. *Id.* Further, Ackland's amplification would be desirable because of the relatively large load offered by common output conductor 65.[13] *Id.*

Patent Owner disagrees, making the following arguments: An ordinarily skilled artisan would understand Wakabayashi to be a CCD sensor because Wakabayashi's circuit board includes signal processing for video camera unit 5 that is separate from the imager pixel array. Prelim. Resp. 54. Expert evidence presented during prosecution of the '475 patent demonstrates there were high obstacles facing any combination of CMOS and CCD circuitry. *Id.* at 54–55. Further, an ordinarily skilled artisan would not have wanted to use the multiple circuit boards of Wakabayashi with

[13] It is not apparent why a large load at output conductor 65 in Ackland Figure 1 would have motivated an ordinarily skilled artisan to add amplification to Wakabayashi.

Ackland's CMOS sensor because those circuit boards would nullify the benefits of Ackland's "camera on a chip." *Id.* at 56.

Petitioner has provided a sufficient showing regarding a motivation to combine Wakabayashi's and Ackland's teachings. Dr. Neikirk has set forth a number of reasons that would have motivated an ordinarily skilled artisan to add Ackland's CMOS teachings to Wakabayashi's image sensor: CMOS active pixel sensor imagers result in lower noise than CCD or other solid state imagers, can be mass produced on standard semiconductor productions lines, can incorporate a number of other different electronic controls that are usually found on multiple circuit boards of much larger size, and require less power than CCD imagers. Ex. 1004 ¶ 90. Further, Dr. Neikirk has identified advantages for using Ackland's silicon single-polysilicon active CMOS pixels. *Id.* ¶ 95.

We are not persuaded by Patent Owner's contrary arguments. First, the mere fact that, during prosecution of the '052 patent, a declarant indicated that a combination of CMOS and CCD circuitry at the relevant time faced high obstacles is of little significance. Ex. 1003, 91–92. Patent Owner has not provided any reason why the cited statements by the declarant are not inadmissible hearsay when offered to prove that combining CMOS and CCD circuitry was difficult at the pertinent time. Prelim. Resp. 54–55. Further, even if we were to consider such statements, we would accord them little weight because the involved declaration does not address the asserted references and is conclusory on the issue for which it is being cited. Ex. 1003, 92 ¶ 12.

We find that Petitioner has provided a sufficient showing regarding a motivation to combine Wakabayashi's and Ackland's teachings.

3. Combination of Suzuki with Wakabayashi and Ackland

Petitioner argues that an ordinarily skilled artisan would have combined Wakabayashi's imager apparatus (as modified by Ackland) with Suzuki's teachings of a solid-state image pickup chip of 8.5 mm and a 10 mm chassis. Pet. 57. Petitioner makes the following arguments: An ordinarily skilled artisan would have been motivated to make this combination because Suzuki discloses its arrangement of a sensor and circuit board allows a "camera head [to have] an outer diameter closer to a diagonal length of a solid-state image pickup chip" and Wakabayashi's objectives are to have a compact camera unit. *Id.* (quoting Ex. 1015, 1:53–56; citing 4:6-11, 4:58–65). And this combination would improve camera stability and reliability. *Id.* at 57–58.

Patent Owner argues that "there is no reason to add Suzuki's CCD imager arrangement to the flawed combination of Wakabayashi's CCD imager and Ackland's CMOS imager." Prelim. Resp. 64 (emphasis omitted). But Patent Owner does not address the specific reasons provided by Petitioner. *Id.* Instead, Patent Owner appears to rely on its argument, discussed in Section III.F.2., that an ordinarily skilled artisan would not combine the teachings from CCD and CMOS references. *Id.* As discussed in Section III.F.2., we are not persuaded by that argument. We determine that Petitioner has provided a sufficient showing for combining Wakabayashi, Ackland, and Suzuki.

4. Claim 1

a. An imaging device comprising:

Petitioner contends that Wakabayashi teaches an imaging device. Pet. 32 ("To the extent the preamble is limiting, Wakabayashi discloses an

imaging device (e.g., 'a portable imager apparatus').''). Patent Owner does not dispute this assertion. *See generally* Prelim. Resp.

We find the Petitioner has made a sufficient showing for the preamble recitation of claim 1.[14] We note that Wakabayashi states: "[t]he present invention relates to a *portable imager apparatus* which includes a video camera as an imager unit." Ex. 1027, 1:6–7 (emphasis added).

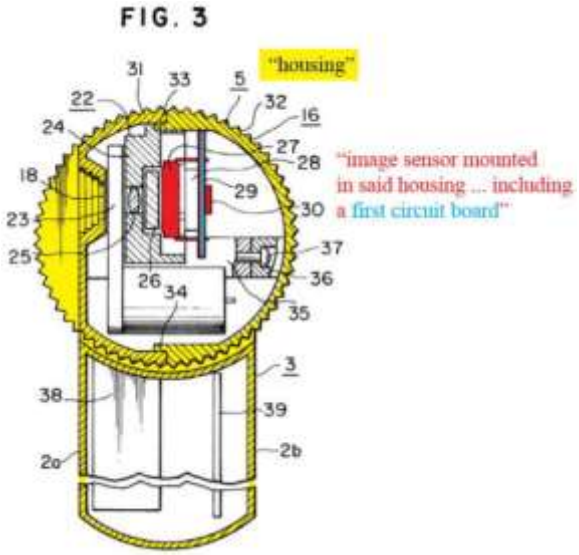
b. a housing

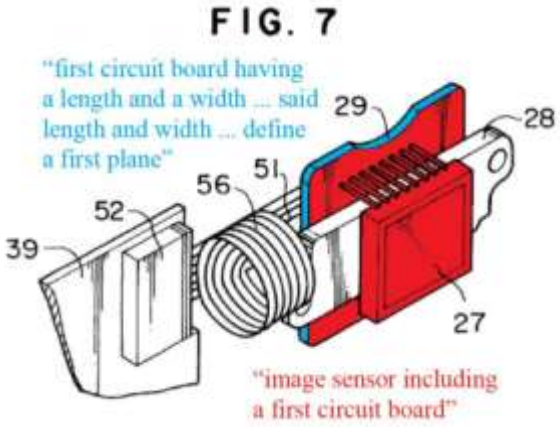
Petitioner relies on Wakabayashi for teaching a housing. Pet. 33–35. Petitioner argues that Wakabayashi discloses the imager apparatus's housing formed by the housing 3 (including the front panel 2a and rear panel 2b), camera case 16, and battery-cover 11. *Id.* at 33. According to Petitioner, these components collectively form the housing, as depicted in Figs. 1, 2, and 5. Pet. 33. Patent Owner does not dispute that Wakabayashi discloses a housing (even though, as discussed in Section III.F.4.h., the parties dispute what is included in Wakabayashi's housing). Prelim. Resp. 51–63. We find the Petitioner has made a sufficient showing for the housing limitation.

c. an image sensor mounted in said housing, said image sensor including a first circuit board having a length and a width thereto, wherein said length and width of said first circuit board define a first plane,

Petitioner relies on Wakabayashi as teaching this mounting limitation. Pet. 39–44. Petitioner provides annotated versions of Figures 3 and 7 of Wakabayashi (reproduced below) that illustrate its mapping of this limitation:

[14] Because Petitioner has made a sufficient showing for this preamble recitation, we do not need to determine whether the preamble is limiting.





Pet. 37–38. Figures 3 and 7 above are cross-sectional views of an imager apparatus. Ex. 1027, 5:48–49, 6:20–21. Petitioner makes the following arguments about the structures shown in those figures: Imager device 27 is soldered to circuit board 29, which is the recited first circuit board. Pet. 35. The combination of imager device 27 and circuit board 29 is the recited image sensor. *Id.* Circuit board 29 is fixed on mounting plate 28, which is fixed to camera case 16. *Id.* Thus, the recited image sensor is mounted inside the housing. *Id.* Circuit board 29 has a length and width that define a first plane as depicted in Figure 7. *Id.*

Patent Owner does not dispute that Wakabayashi teaches this mounting limitation. Prelim. Resp. 51–64. Petitioner has made a sufficient showing for this limitation.

d. said first circuit board including an array of CMOS pixels thereon

Petitioner relies on Wakabayashi and Ackland for this array limitation. Pet. 38–40. As discussed above, Petitioner relies on Wakabayashi as teaching "said first circuit board." Petitioner relies on

Ackland as teaching an "imaging system" includes a "CMOS . . . pixel array" for receiving images thereon. *Id.* at 43; *see also* Ex. 1006, 1:35–38). Petitioner provides an annotated version of Figure 6 of Ackland (reproduced below), which depicts array 5 of CMOS pixels:

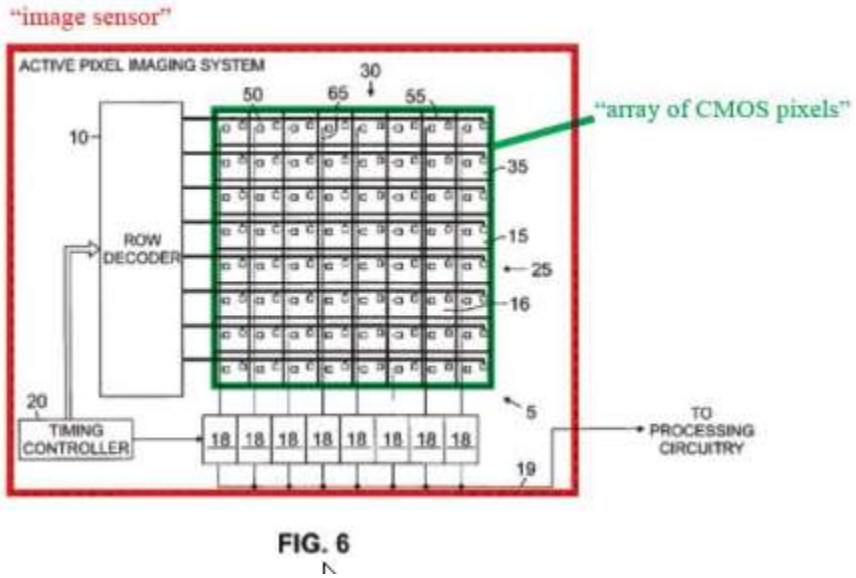


FIG. 6

Id. at 40; Ex. 1006, 7:59–8:8. As shown above, array 5 includes columns 30 and rows 25 of active pixels 35, which are CMOS pixels.[15] *Id.* at 3:15–17, 7:65–67. Petitioner argues that the combined disclosures of Wakabayashi's circuit board and Suzuki's CMOS array teach the above array limitation. Pet. 38–40.

Patent Owner does not dispute that Ackland teaches an array of CMOS pixels. Prelim. Resp. 51–64. Patent Owner also does not dispute that if an ordinarily skilled artisan were to combine Wakabayashi's circuit board with Suzuki's CMOS array, the combination would teach the array

[15] The reference to active pixels 35 in array 5 may be a typographical error. Ackland refers to the pixels in that array as "single polysilicon active pixels 36," whereas pixels 35 are double polysilicon pixels. *Id.* at 3:15–17, 7:59–62, 8:5–8. Active pixels 36, however, are also CMOS pixels, so the typographical error, if it exists, is of no significance. *Id.* at 3:11–14.

limitation. *Id.* As discussed above, however, Patent Owner disputes that an ordinarily skilled artisan would combine Ackland's teaching of a CMOS array with Wakabayashi's imager apparatus. Prelim. Resp. 64. As explained in Section III.F.2, however, we are not persuaded by that argument by Patent Owner.

Petitioner has made a sufficient showing for the above array limitation.

e. wherein a plurality of CMOS pixels within said array of CMOS pixels each include an amplifier

Petitioner relies on Ackland as teaching this amplifier limitation. Pet. 40–42. Petitioner cites to portions of the statements in Ackland that "active pixel 35 further includes . . . an amplifier formed by a voltage follower-transistor 125 . . . Typically, the active pixel 35 will be one of a plurality of such active pixels forming an array." Pet. 40; Ex. 1006, 3:22–29. Patent Owner does not dispute that Ackland teaches this limitation. Prelim. Resp. 63–64. We determine Petitioner has made a sufficient showing for the array limitation.

f. said first circuit board further including timing and control circuitry thereon, said timing and control circuitry being coupled to said array of CMOS pixels

Petitioner relies on a combination of Wakabayashi and Ackland for teaching this timing-and-control-circuitry limitation. Pet. 46–48 (citing Ex. 1004 ¶¶ 114–118). Petitioner relies on Wakabayashi for the recited first circuit board. Pet 46; *see also* annotated Figs. 3 and 7 (reproduced above).

Petitioner relies on Ackland for the recited timing and control circuitry. Pet. 42. Petitioner argues the following: Ackland discloses an active pixel imaging system with timing controller 20. *Id.* Timing

controller 20 provides timing signals that control Ackland's imaging system so it will achieve a desired frame rate. *Id.* (citing Ex. 1004, 8:24–35). Timing controller 20 is coupled to Ackland's "CMOS . . . pixel array" through row decoder 10 in the exemplary active pixel image sensor shown in Ackland Fig. 6. *Id.*

Patent Owner does not dispute that, if Wakabayashi and Ackland were combined, their combination would teach the timing-and-control circuitry limitation. Prelim. Resp. 63–64. As discussed in Section III.E.2., however, Patent Owner argues that an ordinarily skilled artisan would not have combined the teachings of those references, but we are not persuaded by those arguments by Patent Owner. Petitioner has provided a sufficient showing for the timing-and-control limitation.

g. said image sensor producing a pre-video signal

Petitioner relies on Ackland for teaching this pre-video limitation. Pet. 44 (citing Ex. 1004 ¶¶ 120–122). Petitioner makes the following arguments: The output signal of Ackland's active pixel imaging system is a pre-video signal. *Id.* In describing the embodiment of its Figure 6, Ackland states: "Output signals from the amplifiers 18 are provided to the common output line 19 in serial fashion . . . ." *Id.* (quoting Ex. 1006, 8:44–51). Ackland continues that "[t]he output signals are routed to suitable processing circuitry." *Id.* (quoting Ex. 1006, 8:44–51). As a result, these output signals are pre-video signals. *Id.*

Patent Owner does not dispute that Ackland teaches this pre-video limitation (Prelim. Resp. 51–64). Petitioner has provided a sufficient showing for this limitation.

> *h. a second circuit board mounted in said housing, said second circuit board being electrically coupled to said first circuit board, said second circuit board having a length and a width thereto, wherein said length and width of said second circuit board define a second plane, said second circuit board including circuitry thereon to convert said pre-video signal to a post-video signal, said second circuit board being offset from said first circuit board, said second plane of said second circuit board being substantially parallel to said first plane of said first circuit board*

Petitioner relies on Wakabayashi for teaching this second-circuit-board limitation. Pet. 45–49 (citing Ex. 1004 ¶¶ 120–126). To support its position, Petitioner provides annotated versions of Figures 3, 5, and 7 of Wakabayashi (reproduced below):

FIG. 3

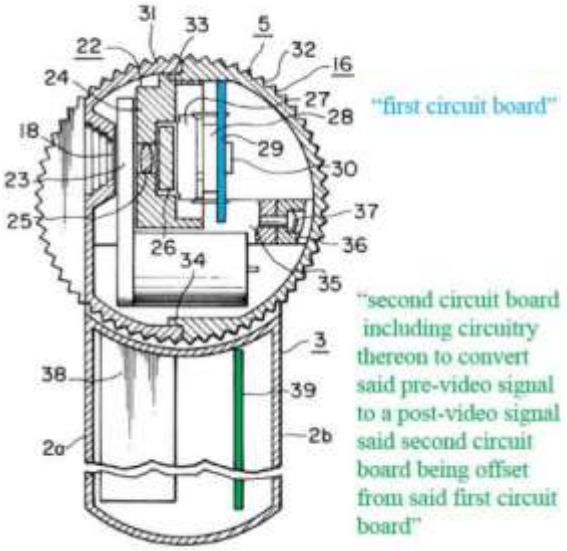


FIG. 5

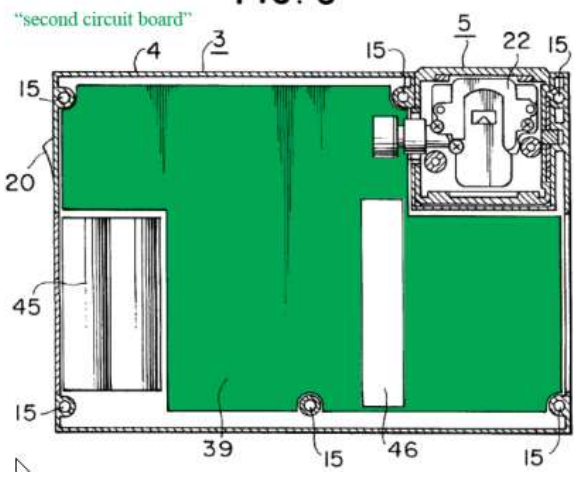
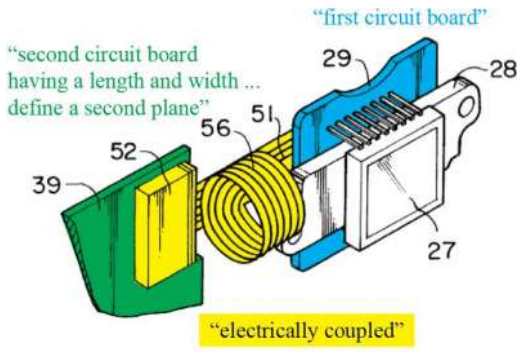


FIG. 7



Id. at 47–49. Annotated Figures 3, 5, and 7 above depict circuit board 39 and its relation to flexible board 51 and circuit board 29.

For the recited "second circuit board mounted in said housing," Petitioner points to circuit board 39, quoting Wakabayashi's disclosure that "circuit board 39 is disposed in the housing 3." Pet. 45 (quoting Ex. 1027, 6:21–22). For the "second circuit board being electrically coupled to said first circuit board," Petitioner points to the electrical connection made by "flexible board 51," quoting in part Wakabayashi's disclosure that "flexible board 51 has one end connected to the camera circuit board 29 by soldering and the other end connected to a connector 52 on the circuit board 39." *Id.*

(quoting Ex. 1027, 6:34–37). For the recitations of length, width, and a second plane, Petitioner argues that circuit board 39, as illustrated in Figure 5, has a length and a width that define a second plane. *Id.*

For the circuitry "to convert said pre-video signal to a post-video signal," Petitioner points to the camera signal processing circuit in camera circuit 102. Pet. 50–55, *see also* Ex. 1027, 9:14–18 ("The camera circuit 102, which includes a camera signal processing circuit, a synchronization signal generator circuit, and so on, generates a video signal 103 in a television signal format from the opto-electrically converted signal 101."). Petitioner argues that Figures 3 and 7 illustrate that the plane of circuit board 39 is substantially parallel to the first plane defined by the length and width of circuit board 29. *Id.* Further, Petitioner asserts that, as illustrated, circuit board 39 is offset from circuit board 29. *Id.*

Patent Owner disputes that Wakabayashi teaches "a second circuit board mounted in said housing." Prelim. Resp. 56. Patent Owner argues the following: "Said housing" is the housing in which the image sensor and first circuit board are mounted in. *Id.* Thus, the recited first and second circuit boards must be mounted in the same housing. *Id.* Wakabayashi's element 3 is its housing and is labeled as such. *Id.* Circuit board 39, which Petitioner identifies as the recited second circuit board, is within housing 3, but circuit board 29, which Petitioner identifies as the first recited circuit board, is not. *Id.* Thus, circuit boards 29 and 39 are not mounted in the same housing. *Id.*

The parties' dispute regarding Wakabayashi's housing concerns camera case 16, in which circuit board 29 is mounted. Ex. 1027, Fig. 3. For Petitioner, camera case 16 is part of Wakabayashi's housing. Pet. 33. For Patent Owner, it is not. Prelim. Resp. 57.

Camera case 16 is a part of video camera unit 5, which rotatably pivots, enabling imager apparatus 1 to take an image in front of the front face of the camera and behind the front face of the camera by rotating the video camera unit. Ex. 1027, Figs. 1–2. (Video camera unit 5 includes imaging hole 18. *Id.* at 4:54–55.)

Wakabayashi teaches that camera case 16 is mounted to Wakabayashi's housing 3. Ex, 1027, 6:20–25, 6:28–34, Figs. 3, 5. As illustrated, housing 3 and camera case 16 constitute the stationary and rotatable portions, respectively, of one housing. *Id.* at Figs. 3, 5. Thus, we agree with Petitioner that camera case 16 is part of Wakabayashi's housing and circuit boards 29 and 39 are in the same housing.

Petitioner has provided a sufficient showing for the second-circuit board limitation.

> *i. a lens mounted in said housing, said lens being integral with said imaging device, said lens focusing images on said array of CMOS pixels of said image sensor*

Petitioner relies on Wakabayashi and Ackland for teaching the above lens-mounted limitation. Pet. 56–57. Petitioner relies on Wakabayashi for teaching the recited lens and on Ackland for teaching an array of CMOS pixels. *Id.*

Petitioner argues the following: In Wakabayashi, lens 25, the recited lens, is in lens case 24, which is secured via a screw to mounting plate 28, which is fixed to camera case 16. *Id.* (citing Ex. 1027, 5:62–65, 6:11–19). Lens 25 focuses an image on the imager device 27. *Id.* (citing Ex. 1027, 5:56–61). Ackland teaches an array of CMOS pixels. *Id.* at 51.

As discussed in Section III.F.4.i., Patent Owner disputes that an ordinarily skilled artisan would have combined Wakabayashi and Ackland.

Prelim. Resp. 54–56. (As discussed in Section III.F.4.i., we are not persuaded by the argument.) Patent Owner, however, does not dispute that, if the references were combined, Wakabayashi and Ackland would teach this lens-mounted limitation. *Id.* at 51–63.

Petitioner has provided a sufficient showing for the lens-mounted limitation.

> *j. a video screen, said video screen being electrically coupled to said second circuit board, said video screen receiving said post-video signal and displaying images from said post-video signal*

Petitioner relies on Wakabayashi for teaching the above video-screen limitation. Pet. 51–53. Petitioner argues as follows: Liquid crystal panel 38 of liquid crystal display 6 is the recited video screen. *Id.* at 51. Liquid crystal panel 38 is coupled to circuit board 39. *Id.* at 51–52 (citing Ex. 1027, 4:44–46, 6:6–10). Circuit board 39 includes a driver circuit for the liquid crystal panel 38. *Id.* at 52 (citing Ex. 1027, 6:6–10). The liquid crystal display serves as a display unit to display images from the video signal 111 outputted from circuit board 39 and allows a user to monitor an image. *Id.* at 52 (citing Ex. 1027, code (57), 1:6–15, 10:15–17).

Patent Owner does not dispute that Wakabayashi teaches this video-screen limitation. Prelim. Resp. 51–64.

Petitioner has provided a sufficient showing for the video-screen limitation.

> *k. a power supply mounted in said housing, said power supply being electrically coupled to said first circuit board to provide power to said array of CMOS pixels and said timing and control circuitry, said power supply*

also being electrically coupled to said second circuit board to provide power thereto

Petitioner relies on Wakabayashi for teaching the above power-supply limitation. Pet. 53–54. Petitioner argues the following: Wakabayashi's portable imager apparatus is powered by "battery 45 [] disposed in . . . housing 3." *Id.* at 53 (quoting Ex. 1027, 6:21–27). An ordinarily skilled artisan would have understood that, as a standalone device with a battery as the only disclosed source of power, the battery provides power to the circuit board 29 to provide power to circuitry thereon, including imager device 27. *Id.* (citing Ex. 1004 ¶ 141). Additionally, this battery provides power to the second circuit 39 board, which includes a power supply circuit. *Id.* at 53–54 (citing Ex. 1027, 4:44–49, 6:7–10, 6:21–27, Fig. 5).

Patent Owner does not dispute that Wakabayashi teaches the above power-supply limitation. Prelim. Resp. 51–63.

Petitioner has provided a sufficient showing for the power-supply limitation.

l. wherein said image sensor has a generally square shape along said first plane;

Petitioner relies on Wakabayashi for teaching the above generally-square limitation. Pet. 54. Petitioner argues that Figure 7 of Wakabayashi illustrates that circuit board 29 is generally square along the plane defined by the circuit board's length and width. *Id.* at 35, 54. Patent Owner does not dispute that Wakabayashi teaches the above limitation. Prelim. Resp. 51–63. Petitioner has provided a sufficient showing for this generally-square limitation.

m. wherein a largest dimension of said image sensor along said first plane is between 2 and 12 millimeters.

Petitioner relies on Wakabayashi and Suzuki for this dimension limitation. Pet. 55–58. In particular, Petitioner relies on Wakabayashi as disclosing an image sensor along a first plane. *Id.* at 55. Petitioner relies on Suzuki for "a largest dimension of" an "image sensor . . . between 2 and 12 millimeters." *Id.* at 56.

Petitioner argues the following: Suzuki teaches an image pickup chip 221 bonded to chip connecting board 226, circuit board 227, and connector board 228. Pet. 56. These elements are all aligned with each other and inserted into chassis 24. *Id.* Suzuki teaches that with this configuration an image pickup chip of 8.5 mm can be used when the outer diameter of the chassis is about 10 mm. *Id.* Thus, with the 8.5 mm chip and 10 mm chassis, the greatest dimension of the image sensor's chip-connecting board 226 is between 8.5 and 10 millimeters. *Id.* at 58 (citing Ex. 1004 ¶¶ 149–153).

Patent Owner does not dispute that, if Wakabayashi, Ackland, and Suzuki were combined, their combination would teach the dimension limitation. Prelim. Resp. 63–64. As discussed in Section III.E.2., however, Patent Owner argues that an ordinarily skilled artisan would not have combined CCD and CMOS references, an argument we addressed in Section III.E.2. Petitioner has provided a sufficient showing for the dimension limitation.

n. Summary

We determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 1 would have been obvious over Wakabayashi, Ackland, and Suzuki.

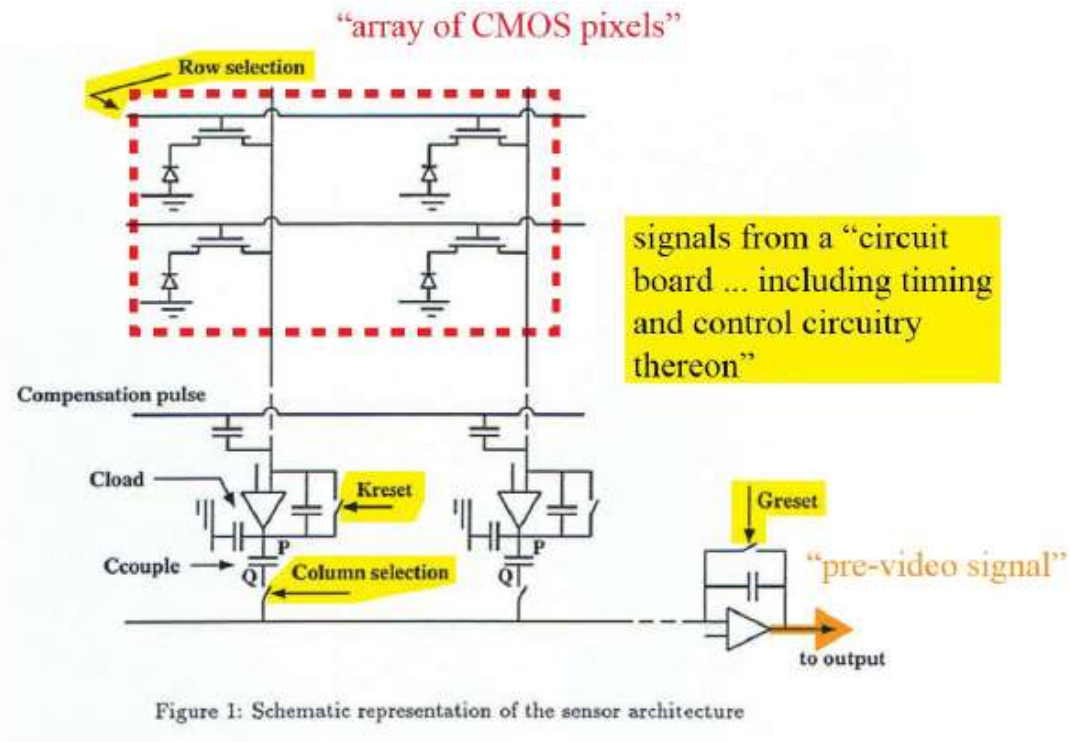
G. Asserted Obviousness of Claims 3 and 7 Over Wakabayashi, Ricquier, and Dierickx

Petitioner asserts that claims 3 and 7 would have been obvious over Wakabayashi, Ricquier, and Dierickx. Pet. 58–84.

1. Ricquier

Ricquier is a conference paper. Exs. 1033, 1038. According to declarations submitted by Petitioner, Ricquier was disseminated and available in a library by May 1994. Ex. 1004 ¶¶ 302–308; Ex. 1033, 1; Ex. 1038, 1. Ricquier, thus, is prior art to the '052 patent under 35 U.S.C. § 102(b). Ex. 1001, code (63). Patent Owner does not contest the prior art status of Ricquier. *See generally* Prelim. Resp.

Ricquier describes a dedicated imager for a camera operating in several resolutions. Ex. 1038, 8. The imager includes a CMOS array of 256 x 256 pixels addressable by column and row using a timing controller on an off-chip driving unit. *Id.* at 8–10. Petitioner submitted an annotated copy of Figure 1 of Ricquier, reproduced below:



Pet. 59. Figure 1 above is a schematic representation of Ricquier's sensor architecture. Ex. 1038, 9. As illustrated, Petitioner maps the recited pre-video signal of claim 3 to the image data output of this sensor architecture. Pet. 59–60. Petitioner argues that readout in this sensor architecture is done by controlling the clock scheme using a timing controller on an off-chip driving unit for driving the row slection, column selection, and reset signal inputs. *Id.* at 60. Those inputs are identified via annotations in the figure above. *Id.* at 59.

2. Dierickx

Dierickx is a publication of a continued prosecution application that was filed in October 1996. Ex. 1041, codes (21–22). Thus, Dierickx is prior art to the '052 patent under 35 U.S.C. § 102(e). Patent Owner does not contest the prior art status of Dierickx. *See generally* Prelim. Resp.

Dierickx teaches CMOS image sensors with active pixels, where each active pixel includes a photo detector and an amplifying part of the pixel. Petitioner submitted an annotated copy of Figure 6 of Dierickx, reproduced below:

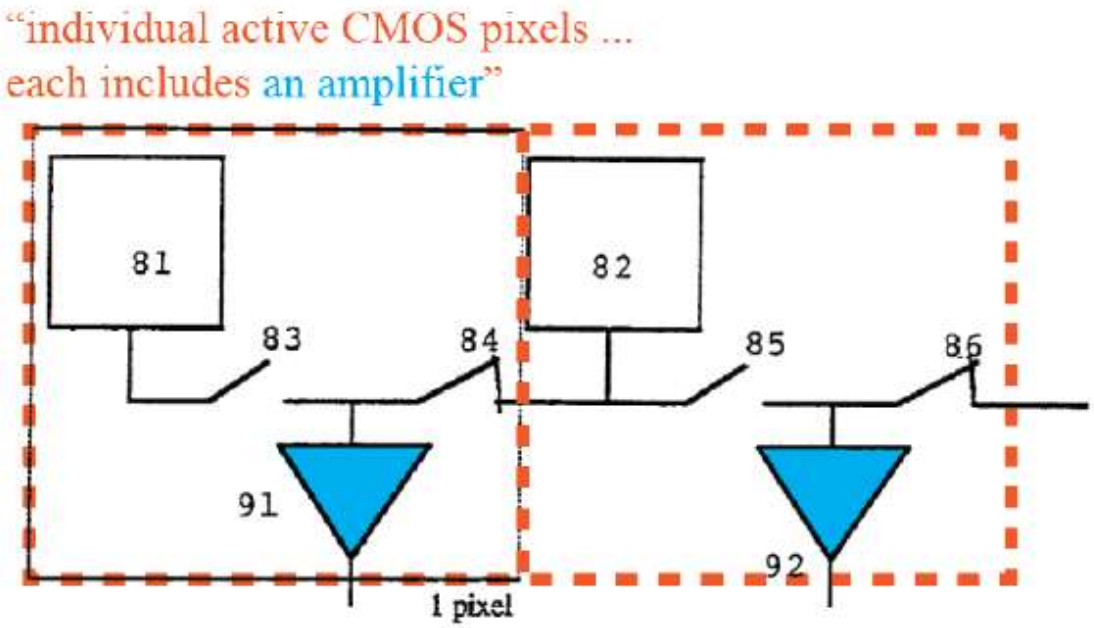


Fig. 6

Pet. 63. Figure 6 above illustrates an array of two pixels with photodiodes 81 and 82 and amplifying parts 91 and 92. Ex. 1041 ¶ 53.

3. Combination of Wakabayashi and Ricquier

Petitioner asserts that an ordinarily skilled artisan would have combined the teachings of Wakabayashi's image sensor with Ricquier's teachings of CMOS pixel array driven by a timing controller. Pet. 60. Petitioner argues that an ordinarily skilled would have been motivated to apply Ricquier's teachings to Wakabayashi because Ricquier discloses the

advantages of selective addressability and multiple resolutions. *Id.* at 61 (citing Ex. 1038, 2; Ex. 1004 ¶ 170).

Patent Owner does not expressly dispute that an ordinarily skilled artisan would combine Wakabayashi and Ricquier. Prelim. Resp. 64–67. Patent Owner, however, refers to the argument it made in Section VI(A)(1) of its Preliminary Response. *Id.* at 64–65. In that referenced section, Patent Owner argues that an ordinarily skilled artisan would not combine the teachings of a device with a CCD sensor with the circuitry of a CMOS sensor. *Id.* at 55. As set forth in Section III.E.2. of this Decision, we are not persuaded by that argument by Patent Owner.

Petitioner has set forth a sufficient basis for combining Wakabayashi and Ricquier.

4. Combination of Dierickx with Wakabayashi and Ricquier

Petitioner asserts that an ordinarily skilled artisan would have been motivated to combine Dierickx's teaching of active CMOS pixel array, where each pixel has an amplifier, with Wakabayashi's imager apparatus. Pet. 63–64. Petitioner argues the following: Dierickx indicates such an application would result in high image quality and would improve the functionality of Wakabayashi's video camera without increasing size or weight. *Id.* at 64. Further, Dierickx teaches that by using a CMOS image sensor with active pixels, instead of the passive pixels taught by Ricquier, the sensor is less sensitive to noise fluctuations. *Id.* In addition, Dierickx teaches that its active pixels can include additional electronics that permit

the image sensor to execute more sophisticated functions and operate at a higher speed or in more extreme illumination conditions. *Id.*

Patent Owner does not dispute that an ordinarily skilled artisan would combine Wakabayashi, Ricquier, and Dierickx. Prelim. Resp. 64–67. Petitioner has set forth a sufficient basis for combining Wakabayashi, Ricquier, and Dierickx.

5. Claim 3

Petitioner sets forth how it contends the combination of Wakabayashi, Ricquier, and Dierickx teaches or suggests every limitation of claim 3. Pet. 65–83.[16] Patent Owner disputes that the combination teaches two limitations addressed below. Prelim. Resp. 64–67.

a. Disputed Limitations

i. a second circuit board mounted in said housing

Petitioner relies on Wakabayashi for this mounting limitation and presents the same argument for this limitation and this ground as it did for the Wakabayashi and the Wakabayashi-and-Ackland grounds. Pet. 77. Patent Owner also presents the same argument for this limitation for this ground as it presented for the Wakabayashi and the Wakabayashi-and-Ackland grounds. Prelim. Resp. 65. As set forth in Section II.E.4.h., for this Decision, we resolved that disputed issue in favor of Petitioner.

[16] The heading for the second column of the claim chart for Wakabayashi in view of Ricquier and Dierickx is titled as "Ground 3: Wakabayashi in view of Ackland," which appears to be a mistake. Pet. 65. The heading for the section in which the claim chart is presented is "Claim Chart—Wakabayashi in view of Ricquier and Dierickx." *Id.* Further, the claim chart cites Ricquier and Dierickx. *See, e.g.*, *id.* at 68. And the Petition identifies the asserted ground as Wakabayashi in view of Ricquier and Dierickx. *Id.* at 9.

Petitioner has made a sufficient showing that Wakabayashi teaches or suggests this mounting limitation.

> *ii. said planar substrate including an array of CMOS pixels thereon, wherein a plurality of CMOS pixels within said array of CMOS pixels each include an amplifier . . . said first circuit board including timing and control circuitry thereon*

Patent Owner argues that claim 3 recites: "said first circuit board including an array of CMOS pixels thereon, wherein a plurality of CMOS pixels within said array of CMOS pixels each include an amplifier, said first circuit board further including timing and control circuitry thereon." Prelim. Resp. 65. And Patent Owner argues that the combination of Wakabayashi, Ricquier, and Dierickx does not teach or suggest this limitation. *Id.*

Claim 3 does not actually recite the limitation identified by Patent Owner. The closest limitation claim 3 has to the one indicated by Patent Owner is in the heading above, namely: "said planar substrate including an array of CMOS pixels thereon, wherein a plurality of CMOS pixels within said array of CMOS pixels each include an amplifier . . . said first circuit board including timing and control circuitry thereon."

For this planar substrate limitation of claim 3, Petitioner argues the following: Wakabayashi discloses a planar substrate (imager device 27). Pet. 65. Ricquier also discloses a planar substrate (a substrate for fabricating in a standard 1.5 μm CMOS technology, which includes a CMOS pixel array. *Id.* at 66. Dierickx discloses CMOS pixels that each include an amplifier. *Id.* at 68. Ricquier discloses circuitry (an off-chip driving unit) that includes timing and control circuitry. *Id.* at 70. An ordinarily skilled artisan would apply Ricquier's teachings to Wakabayashi's apparatus by

placing the timing controller on Wakabayashi's camera circuit board 29 (which Petitioner identifies as the first circuit board) so that the timing controller would be off-chip from imager device 27. *Id.* at 71.

Patent Owner argues the following: Ricquier describes a proof-of-concept prototype using an external drive unit so researchers could experiment with it. Prelim. Resp. 66. The expectation, however, was that the driving unit would be integrated on-chip with any actual CMOS imager having this feature. *Id.* Ricquier, in fact, discusses "further cointegration of processing electronics on the same chip." *Id.* In light of that teaching, an ordinarily skilled artisan would not have used Ricquier's off-chip driving unit as a timing and control circuit for developed products, such as Wakabayashi's CCD camera. *Id.*

We find that Petitioner has made a sufficient showing for the planar substrate limitation. Petitioner has explained how Ricquier teaches an off-chip driving unit and how the application of that teaching to Wakabayashi would result in the timing controller on camera circuit board 29. Pet. 65–71. Patent Owner's contrary argument that Ricquier essentially teaches not to use an off-chip driving unit is not evident from the disclosure cited in Ricquier. The sentence at issue reads: "A CMOS technology was chosen because it offers the selective addressability together with the possibility of further cointegration of processing electronics on the same chip." Ex. 1038, 8. This sentence merely indicates that further cointegration was possible, not required, and does not specifically address the off-chip driving unit. Further, Patent Owner's more narrow interpretation of that disclosure rests on mere attorney argument, which is not persuasive. Prelim. Resp. 66.

Petitioner has made a sufficient showing for the planar substrate limitation.

b. Remaining Limitations

We have reviewed Petitioner's showings for the preamble recitation and the remaining limitations of claim 3 and find that Petitioner provided a sufficient showing for the preamble recitation[17] and for the remaining limitations of claim 3. Pet. 65–83.

c. Summary

In sum, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 3 would have been obvious over Wakabayashi, Ricquier, and Dierickx.

6. Claim 7

Claim 7 recites an imaging device of claim 3 wherein "said image sensor has a generally square shape along said first plane." For the limitation claim 7 adds to claim 3, Petitioner argues the following: Figure 7 of Wakabayashi shows imager device 27 and circuit board as having generally square shapes. Pet. 53–54, 83. Dierickx discloses an image sensor that is 6.3 x 5.7 mm, and thus, that sensor also has a generally square shape. *Id.* at 83–84. Further, it would have been obvious to change the number of pixels in Dierickx from 384 x 288 to 256 x 256 as taught by Ricquier, thus producing a square shape. *Id.*

For claim 7, Patent Owner relies on the arguments it presented for claim 3. Prelim. Resp. 66–67.

[17] For this reason, we do not need to determine whether the preamble of claim 3 is a limitation.

We determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 7 would have been obvious over Wakabayashi, Ricquier, and Dierickx.

IV. CONCLUSION

For the foregoing reasons, we determine that Petitioner has established a reasonable likelihood of prevailing on assertions that one or more of the challenged claims of the '052 patent are unpatentable.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314, an *inter partes* review of claims 1, 3, and 7 of the '052 patent is instituted on all grounds raised in the Petition for the respective claims.

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, *inter partes* review of the challenged patent shall commence on the entry date of this Decision, and notice is given of the institution of a trial.

FOR PETITIONER:

Scott A. McKeown
James L. Davis, Jr.
Carolyn Redding
ROPES & GRAY LLP
scott.mckeown@ropesgray.com
james.l.davis@ropesgray.com
carolyn.redding@ropesgray.com

FOR PATENT OWNER:

Jonathan S. Caplan
James Hannah
Jeffrey H. Price
KRAMER LEVIN NAFTALIS & FRANKEL LLP
jcaplan@kramerlevin.com
jhannah@kramerlevin.com
jprice@kramerlevin.com