

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners,

v.

**CELLECT, LLC,**

Patent Owner.

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Case IPR2020-00512

U.S. Patent No. 9,186,052

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**PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE**

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Ex. 1034	Reserved
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Ex. 1036	Mendis, S.K., <i>et al.</i> “Progress in CMOS active pixel image sensors,” in M.M. Blouke (Ed.), Charge-Coupled Devices and Solid State Optical Sensors IV, pp. 19-29, 1994; and Rachel Watters’ declaration (“Mendis”)
Ex. 1037	Dickinson, A., <i>et al.</i> , “Standard CMOS Active Pixel Image Sensors for Multimedia Applications,” Sixteenth Conference on Advanced Research in VLSI, Chapel Hill, North Carolina, March 27-29, pp. 214-224 (“Dickinson”)
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## **I. INTRODUCTION**

Unable to rebut the obviousness of challenged claim 2 of U.S. Patent 9,186,052 (“’052”) over Swift in view of Ricquier and Suzuki (Ground 1) and Larson in view of Swift, Ricquier, and Suzuki (Ground 2), Patent Owner (“PO”) instead repeats many of its failed arguments from its Preliminary Response (Paper 6). The Patent Owner Response (Paper 18, “POR”) unsuccessfully attempts to evade claim 2’s obviousness by mischaracterizing references, creating supposed impediments to combinations where none exists, and misapplying the law. Claim 2 is unpatentable. Neikirk Reply (Ex. 1086), ¶¶1-55.<sup>1</sup>

## **II. A POSITA WOULD HAVE BEEN MOTIVATED TO COMBINE SWIFT, RICQUIER, AND SUZUKI (ALL GROUNDS)**

As set forth in the Petition and supported by the testimony of Dr. Neikirk, a POSITA would have been motivated and found it obvious to apply Ricquier’s known teachings of a CMOS pixel array and off-chip timing and control circuitry in implementing Swift’s image sensor because these teachings provide added flexibility to optimize circuitry placement for a more compact device and, because

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<sup>1</sup> Any differences between the experts’ definitions of a POSITA do not impact claim 2’s obviousness. Neikirk Reply, ¶8. PO’s expert’s testimony (Ex. 2088) fails for the same reasons discussed herein. Neikirk Reply, ¶¶10-55.

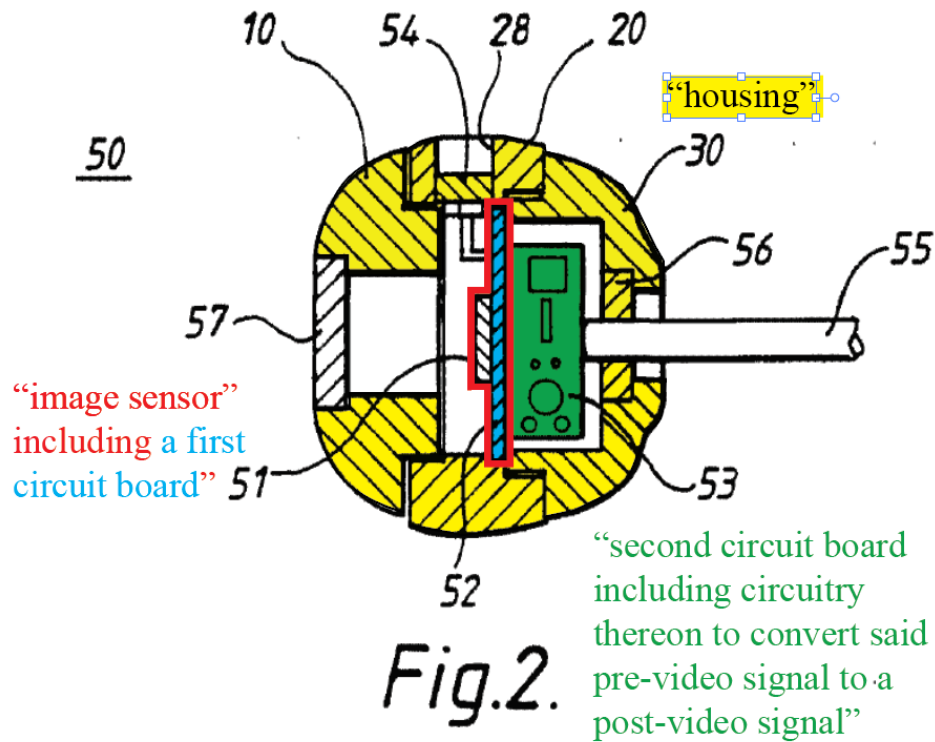
of Ricquier’s express advantages of “selective addressability” and “multiple resolutions...[and] data rates upto 10 MHz.” Ricquier (Exs. 1033, 1038), 2; Neikirk (Ex. 1086), ¶¶239-240; Pet. (Pap. 2) 22-24. A POSITA would also have been motivated to apply Suzuki’s known teachings of stacking circuit boards and of a chip-connecting board having an 8.5-to-10mm diagonal length in implementing Swift’s miniature camera (as modified by Ricquier) to reduce the camera’s size and improve its “stability and reliability” as taught by Suzuki. Suzuki (Ex. 1015), 1:53-56, 3:1-49, 3:61-4:12, 4:30-65; Neikirk, ¶¶241-246; Pet. 24-27.

PO’s arguments rely solely on mischaracterizing the teachings of the prior art and misinterpreting the law.

**A. PO’s Arguments Are Based On Its False Premise That Swift Teaches Only a Camera-on-a-Chip**

As the Petition sets forth and Dr. Neikirk explains, Swift describes an imager apparatus with an image sensor including a first circuit board and converting circuitry on a second circuit board connected to the image sensor, as shown in Swift’s Figure 2 below:





Swift, Fig. 2, 3:31-4:4, 8:31-9:13; Neikirk, ¶¶230-236, 268-270; Pet. 14-20, 38-41. Swift broadly teaches “image sensor 51” is preferably a “CMOS...Active Pixel Sensor” (Swift, 10:1-6), but does not expressly disclose its pixel arrangement nor how timing of “image sensor 51” is controlled and leaves it to a POSITA to apply known imaging technologies. Neikirk, ¶¶254, 261; Pet. 29-31, 34-35.

PO’s attempt to limit Swift’s “CMOS/APS (Active Pixel Sensor) type image sensor” to the “camera-on-a-chip” discussed in the ’052’s background to respond to the motivations to apply Ricquier’s off-chip timing and control teachings (POR 14-17, 24-28, 30, 33, 35-37) ignores Swift’s explicit teachings to the contrary. For

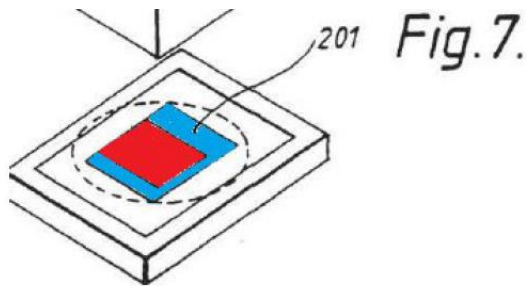
example, PO's arguments that Petitioner failed to identify the motivation in Ricquier to "de-integrat[e]" Swift's alleged camera-on-a-chip and move its timing and control circuitry "off-chip" (POR 28-30) are incorrect and irrelevant for multiple independent reasons.

**First**, Swift never limits its sensor to a camera-on-a-chip. Neikirk Reply, ¶¶10-11. Swift instead teaches that certain image sensor circuitry, *e.g.*, processing circuitry, resides off-chip on circuit board 53. Swift, 9:7-13 ("Various circuitry components are mounted on the circuit board 53...[to] *process image signals* received [from image sensor 51]"), 3:32-4:4; Neikirk, ¶¶228-236; Pet. 15-20; Decision on Institution, Pap. 15 ("DI") 26, 28, 30-31. And, as PO concedes, "conventional CMOS image sensors" did not have "camera timing, control and signal processing circuitry" integrated onto the same die—this was merely a possibility CMOS allowed. POR 10 (citing Ex. 2069, 20 (CMOS makes it "*possible* to integrate functional circuits")); Ex. 2050, 3 (CMOS provides "ability" to integrate)). Further, Swift expressly states its teachings are not limited to any specific embodiment. Swift, 19:8-21.

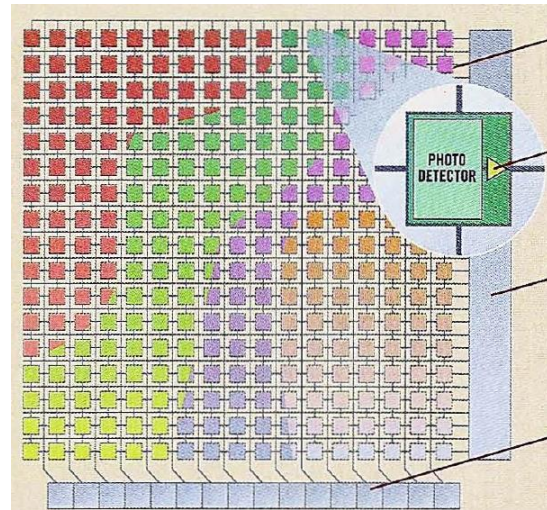
**Second**, Swift's generic disclosure of "CMOS/APS (Active Pixel Sensor) *type*" is not referencing any specific sensor or product as PO asserts (POR 25-27). Swift, 10:1-6. Swift also merely states "[f]urther information on APS-type sensors may be found in the publication '*Laser Focus World*', June 1993, Page 83"

(Fossum)—it does not limit its entire disclosure to a “camera-on-chip” concept “pursued by...JPL” (Ex. 1048 (Fossum), 85) as PO argues (POR 25-27). Swift, 10:4-6; Pet. 16; Neikirk Reply, ¶13. Indeed, contrary to PO’s unsupported assertions, the prior art repeatedly confirms CMOS imagers were not all camera-on-a-chip. Ricquier 2-4; Monroe (Ex. 1007), 3:36-62, 8:8-11, Fig. 3 (CMOS imager with “video processing circuitry” remotely located “within the combined power supply and lighting unit”); Stam (Ex. 1043), Fig. 5, 4:66-5:2, 6:25-28 (“Timing and Control” 203 separate unit from “image sensor 106 [which] may be CMOS active pixel image sensor”); Zarnowski (Ex. 2007), 129-130 (explaining “CMOS imagers now include[] **partial** or complete integration of electronics”); Neikirk, ¶77; Neikirk Reply, ¶¶12-13; Pet. 21-22.

*Third*, PO’s annotated Figure 7 of Swift and comparison to the depiction of Fossum’s device (POR 26-27) are similarly baseless and fail to limit Swift to teaching only a camera-on-a-chip. Swift provides no description of the annotated regions of the sensor 201. Swift, 18:13-23, Fig. 7. And, as shown below, contrary to PO’s and Dr. Lebby’s assertions, there is little to no similarity between Swift’s Figure 7 and “Fossum’s CMOS camera on a chip” that would warrant limiting Swift to Fossum’s disclosures:



POR 26 (Swift, Fig. 7 (annotated by PO))



Ex. 2039 (Ex. 1060) (depicting Fossum's "active pixel sensor")

Neikirk Reply, ¶14.

*And fourth*, even if Swift taught timing and control circuitry on-chip with the CMOS pixel array (it does not), a POSITA nonetheless would have been motivated to apply Ricquier's off-chip timing and control circuitry teachings as discussed in the Petition and below in §II.B. Neikirk, ¶¶237-240; Neikirk Reply, ¶15; Pet. 22-24.

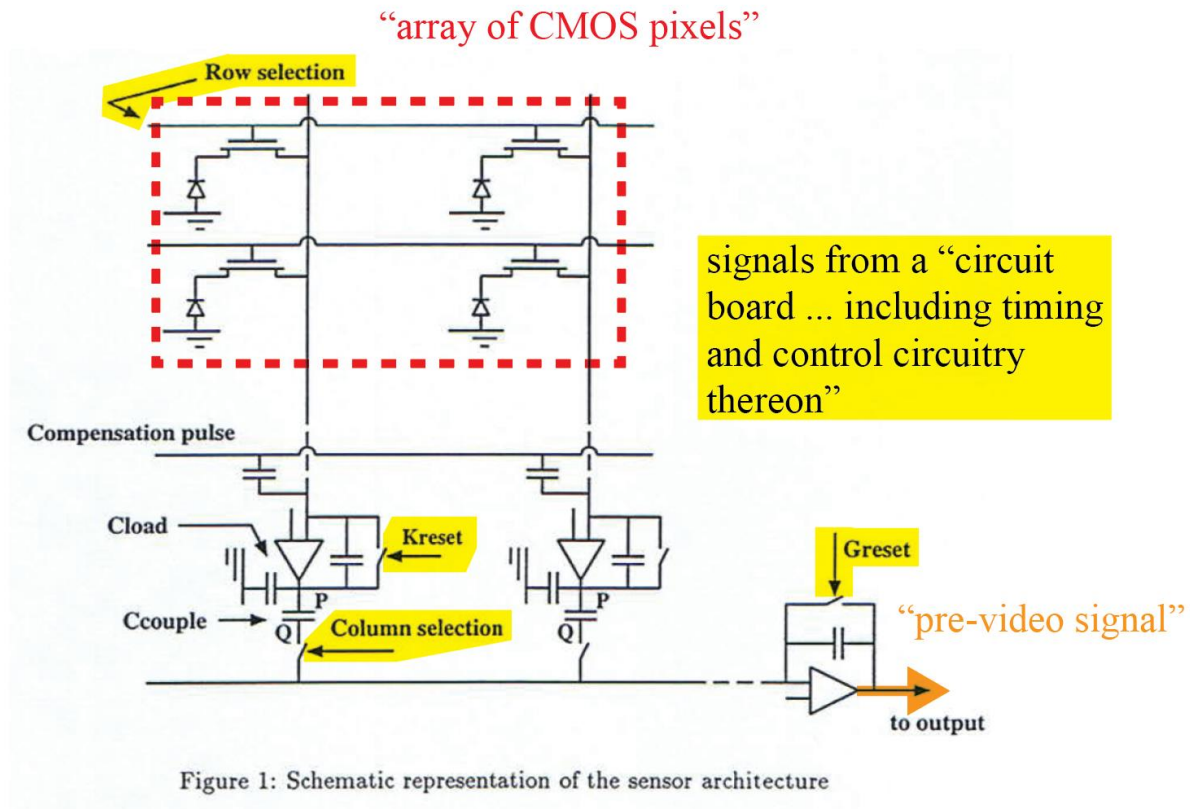
PO's characterization of Swift as a CCD device as yet another purported roadblock to applying Ricquier's CMOS teachings (POR 14-16) is similarly belied by Swift's express disclosure that it instead employs a CMOS/APS sensor. *E.g.*, Swift, Abstract, 4:11-15, 10:1-6, 12:30-32, claim 19; Neikirk, ¶¶230, 254, 258; Pet. 16, 29-31, 33-34. Indeed, Swift never mentions CCD image sensors. PO's reliance on a contemplated size of Swift's housing (POR 14-15) is misplaced as it does not limit Swift to CCD, nor can it contradict Swift's express disclosure of a CMOS

image sensor. Neikirk Reply, ¶¶16-19. Similarly, contrary to PO's argument that "[t]he 12V power supply used in Swift is in the range of voltages used for CCD imagers, not CMOS imagers" (POR 15-16), Swift's "low (eg 12 volt) operating voltage for the camera" is plainly described as an example voltage level for operating all components of the camera. An exemplary voltage does not limit operating voltages of individual components such that the described "CMOS" sensor can be somehow transformed into a CCD imager nowhere described. Swift, 15:28-31; Neikirk Reply, ¶18. Swift's disclosure of circuitry on a separate circuit board from the image sensor also does not indicate Swift is a "CCD imager architecture" as PO argues (POR 14-16). Rather, it confirms, as does Ricquier, that CMOS sensors with off-chip circuitry were well-known. Ricquier, 3, 4, Fig. 1; Neikirk, ¶¶77, 161-165, 238, 259-263; Neikirk Reply, ¶19; Pet. 20-22, 34-36.

**B. PO's Arguments With Respect to Ricquier's Teachings Are Similarly Incorrect and Irrelevant**

While Swift does not expressly disclose the arrangement of its pixels nor how the timing of its "image sensor 51" is controlled and leaves it to a POSITA to apply known imaging technologies (as discussed in §II.A), Ricquier expressly provides these additional details. As shown in Figure 1 below, Ricquier teaches an array of pixels and explains that a "timing controller," realized off-chip, generates the "X-Y addresses and control pulses" and uses "decoders [to] drive...row selection and

column selection signal” from the “X-Y addressable photodiode array.” Ricquier, 3, 4, 9, Fig. 1; Pet. 20-22.



As set forth in the Petition and supported by Dr. Neikirk, a POSITA would have been motivated and found it obvious to apply Ricquier’s known teachings of an array of CMOS pixels and off-chip timing and control circuitry in implementing Swift’s image sensor because Ricquier’s off-chip timing controller adds flexibility in the selection of the placement of circuitry to allow for a more compact camera head. Ricquier, 3, 4; PCB Design Textbook (Ex. 1045), 15, 20; Tanuma (Ex. 1016), 4-5; Neikirk, ¶¶237-240; Pet. 22-24. Ricquier provides further details to realize

express advantages of “selective addressability” and “multiple resolutions...[and] data rates upto 10 MHz.” Ricquier, 2; Neikirk, ¶239; Pet. 22-24; Neikirk Reply, ¶¶20-32.

PO’s arguments regarding hindsight and that a POSITA “would not have modified Swift with Ricquier’s off-chip driving unit if the goal was to ‘minimize the device’s size or profile area’” (POR 28-30) ignore that it was well-known to configure a CMOS imaging device, including its image sensor and related circuitry, to minimize the overall device size as taught by the prior art and explained in the Petition and Dr. Neikirk’s declaration. For example, Swift shows it was known to organize CMOS imaging device components such that the image sensor including a first circuit board is located on a first plane, and the circuitry for converting pre-video signals to post-video signals is located on a second circuit board on a second plane. Swift, 8:31-9:21, 10:12-16, 18:25-33, Fig. 2; Neikirk, ¶¶229-236, 268-271; Neikirk Reply, ¶¶20-23; Pet. 15-20, 38-41. As another example, as shown by Ricquier, it was known to locate the timing controller off-chip from the CMOS image sensor—confirming the timing controller is a component that can be placed on various layers, including stackwise, to allow for a more compact camera head. Neikirk, ¶¶238-239; Ex. 2095 (Neikirk 10/09/20 Dep. Tr.), 38:4-39:13; Pet. 20-24. *See also* §II.A. As explained in the PCB Design textbook, it was known that “fitting...the components into the available space,” including “[b]y making a series

of individual PCBs and then joining them, stackwise, one on top of the other, [resulting in] a multi-layer board” was a common design consideration for compact devices. PCB Design Textbook, 15, 20; Neikirk, ¶239; Pet. 23-24. It was also known that benefits of mounting an image sensor chip on one side of a circuit board and other circuit components on the circuit board’s underside include that it “does not require many lead wires, so there is a high degree of reliability, and excellent matching characteristics...[and] allow[s] for a more compact camera head.” Tanuma, 4-5; Neikirk, ¶239; Pet. 23-24. Further, simply because there are other obvious ways to arrange the circuitry as PO suggests (POR 28-30) does not negate the obvious combination set forth in the Petition. *In re Mouttet*, 686 F.3d 1322, 1334 (Fed. Cir. 2012) (existence of alternatives “does not mean that [the purportedly] inferior combination is inapt for obviousness purposes”).

PO’s argument that the location of the timing and control circuitry cannot be a design choice “because the claimed arrangement solved a particular problem and gave rise to unexpected results” (POR 31) fails for similar reasons. **First**, PO’s alleged problem that all CMOS image sensors had all of the components on the same chip is flawed, as Swift teaches its processing circuitry is on separate board 52 and Ricquier teaches its timing and control circuitry is off-chip, as discussed above in §II.A. PO’s alleged solution of placing circuitry in different locations, beyond being taught by Swift and Ricquier, was also well-known as taught by the PCB Design



textbook, as discussed above. **Second**, there is also no nexus between PO's purported "unexpected result of obviating the need for RFI shielding" and claim 2. Specifically, Mr. Adair explains in his 10/20/98 declaration that the alleged "unexpected result" was that "remoting the processing circuitry from the CMOS imager and timing and control circuits eliminated the need for shielding" from "radio frequency interference (RFI) *which is emitted by electrosurgical generators used during surgery.*" Ex. 1003, 85-86. Not only does claim 2 not recite limitations directed to "electrosurgical generators used during surgery," but Swift already teaches including the processing circuitry remote from the imager. **Third**, even if this were an unexpected result with a nexus to claim 2 (which it is not), that does not make claim 2 any more patentable when the design choice is expressly taught in the art.<sup>2</sup> And, as further discussed in §VI, each of PO's secondary considerations arguments fails. Neikirk Reply, ¶¶24-26, 48-53.

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<sup>2</sup> PO's attack on Dr. Neikirk's statement that he was not drawing any legal conclusion in using the term "design choice" (POR 30-31) again misses the point as experts are not required to draw legal conclusions. *Pregis Corp. v. Kappos*, 700 F.3d 1348, 1355 (Fed. Cir. 2012) (ultimate legal conclusion appropriately left to court). Rather, as Dr. Neikirk explained, "[t]he details of the circuitry, actual schematic circuit diagram, the selection of electrical components to build that circuit, those are

PO's assertion that Ricquier's express advantages of "selective addressability" and "multiple resolutions...[and] data rates upto 10 MHz" would not have motivated a POSITA to implement Ricquier's teachings of an off-chip driving unit in implementing Swift's CMOS sensor "[b]ecause Swift discloses a camera based on Dr. Fossum's CMOS imager, its pixel array already enjoys that advantage" (POR 32-33) is again predicated on its false premise that Swift's teachings are narrowly constrained to Fossum's camera-on-a-chip CMOS imager. *See* §II.A. Swift leaves it to a POSITA to determine the timing and control scheme for its CMOS sensor, and a POSITA would have been motivated to apply the details of Ricquier's off-chip timing and control circuitry in implementing Swift's CMOS sensor to employ the sensor's "selective addressability" and to provide "multiple resolutions...[and] data rates upto 10 MHz." Neikirk Reply, ¶¶27-29. Further, whether these advantages are "associated with Ricquier's timing controller being realized 'off-chip'" (POR 32) misses the point, as a POSITA would have nonetheless

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all design choices that are left to one of skill reading these references." Ex. 2095 (10/9/2020 Dep. Tr.), 73:15-74:11. Specifically, he explained "I don't believe Swift says you have to put [timing and control circuitry] in any specific location. It's a question of a design choice of [a POSITA]." Ex 2095, 44:11-23, 38:4-39:13; Neikirk Reply, ¶23.

been motivated to apply Ricquier's teachings of an array of CMOS pixels and off-chip timing controller in implementing Swift's image sensor as set forth in the Petition. Neikirk, ¶¶237-240; Pet. 22-24.

Ricquier's express benefits are directly attributable to Ricquier's "X-Y addressable architecture" where "X-Y addresses and control pulses are generated by an external driving unit"—that is, Ricquier's timing and control scheme realized in an off-chip driving unit. Ricquier, 3 ("To realise the acquisition of image data only in specific regions of interest, an X-Y addressable architecture was selected. Based on X-Y addresses and control pulses generated by an external driving unit, two decoders drive one particular row selection and column selection signal."), 2-4; Neikirk, ¶¶238-239; Pet. 22-24.

PO's argument that Ricquier's off-chip driver "would limit 'the rate at which the on-chip amplifier can handle charge packets'" (POR 33-34 (citing Ex. 2034, 1:45-52)) is contrary to Ricquier's express teachings and is based on a statement regarding CCD architectures in an unrelated reference (Ex. 2034), irrelevant to Ricquier and the proposed ground. Ricquier expressly discloses that its output amplifier "can operate at speeds upto 10 MHz" and offers a "maximal frame rate...[of] about 125 full images per second." Ricquier, 2 ("[t]he sensor described here, makes it possible to acquire information of the scene in a flexible way and at a relatively high speed"), 5, 8; Neikirk, ¶¶238-239; Pet. 23-24. The statement in Ex.

2034 upon which PO bases its argument references the “serial output” of a CCD architecture, but Ricquier expressly teaches its CMOS architecture avoids the “drawback caused by the inherently serial data flow in CCD architectures” and their “fixed frame rate.” Ricquier, 2; Neikirk Reply, ¶29. And, even if Ricquier’s off-chip driver somehow limited the frame rate (it does not), a POSITA would have been motivated to pursue the desirable properties taught by Ricquier. *In re Urbanski*, 809 F.3d 1237, 1243-44 (Fed. Cir. 2016); *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004).

PO’s arguments that Ricquier “explicitly teaches away from the off-chip driver utilized in its tests” (POR 34-35) misunderstands the law and mischaracterizes Ricquier’s teachings. Teaching away requires the reference to disparage the proposed combination or claimed limitation, which Ricquier does not do. *Meiresonne v. Google*, 849 F.3d 1379, 1382 (Fed. Cir. 2017). Rather, Ricquier’s statements regarding the “*possibility* of further cointegration of processing electronics on the same chip” and “development of a multi-purpose flexible sensor architecture that *can be used* as a module in further sensor systems on a single chip” are directed toward possible future developments and do not discourage the use of its “off-chip” architecture. Ricquier 2-3; Neikirk, ¶¶163-165; Neikirk Reply, ¶30. Moreover, these statements do not indicate that further cointegration in Ricquier is mandatory or that such cointegration would necessarily include Ricquier’s off-

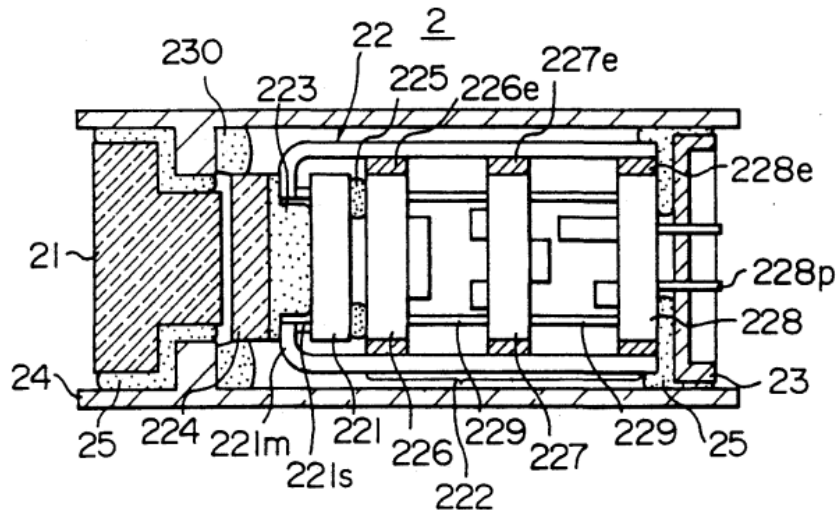
circuit driving unit. DI 25. Additionally, Ricquier does not characterize its device as a “proof of concept prototype” as PO alleges (POR 32) and, even if it did, such a teaching that the off-chip timing and control does work would have only further motivated a POSITA to apply these teachings. Neikirk Reply, ¶30.

PO’s arguments that Ricquier is not reasonably pertinent to the alleged problem(s) identified in the ’052, including arranging the circuitry of a CMOS image sensor and noise reduction (POR 27-32) are irrelevant because PO admits Ricquier is analogous art (POR 27). *See also* Pet. 22. Moreover, Ricquier expressly teaches the claimed arrangement of CMOS circuitry (*e.g.*, Ricquier, Fig. 1) and evaluating amount and sources of noise (*e.g.*, Ricquier, 6, 8). Neikirk Reply, ¶¶31-32.

### **C. PO Mischaracterizes Suzuki’s Teachings as Limited to CCD Technology**

As set forth in the Petition and supported by Dr. Neikirk, Suzuki discloses a camera head for a solid-state image pickup device and expressly discloses configuring an image sensor (“image pickup chip 221”) and multiple circuit boards (226, 227) such that they are in a stacked arrangement, where the “chip-connecting board” (226) is between 8.5 and 10mm. Suzuki, 4:6-11, 3:1-49, Figs. 2, 3A-3D; Neikirk, ¶¶149-159, 241-243; Pet. 24.

**FIG. 2**



Suzuki, Fig. 2.

A POSITA would have been motivated to apply Suzuki's known teachings of configuring an image sensor and circuit boards in a stacked arrangement (and of a "chip-connecting board 226" between 8.5 and 10mm) in implementing Swift's teachings of a miniature camera (as modified by Ricquier's teachings) where Swift's circuit board 53 is oriented parallel to circuit board 52 to reduce the camera's overall size and to improve the camera device's "stability and reliability." Suzuki, 1:53-56, 3:61-4:12, 4:30-65; Neikirk, ¶¶241-242, 149-153, 285-289; Pet. 24-27, 48-50.

PO's argument that "a POSITA would not have looked to Suzuki for ideas of how to implement the system architecture for a CMOS imager" (POR 35) is based on PO's false premise that Suzuki is limited to CCD technology. Suzuki teaches the use of a "solid-state image pickup chip," and nothing in Suzuki limits its solid state

image pickup chips to CCD devices as further discussed in §III. Suzuki, 4:6-11; Neikirk, ¶¶152, 245; Neikirk Reply, ¶¶33-35; Pet. 24, 26-27; DI 22. Contrary to PO's argument that Suzuki's driving circuit and circuit for amplifying the video signal off-chip indicates Suzuki describes a CCD sensor (POR 18), as Dr. Neikirk explained, these disclosures do not specify any requirements of the image pickup chip and certainly do not preclude use of a CMOS sensor. Ex. 2075 (Neikirk 10/08/2020 Dep. Tr.), 23:3-25:25, 31:21-32:12. Further, as discussed in §II.A, CMOS imagers with off-chip circuitry were well-known in the art.

### **III. THE DIMENSION LIMITATION DOES NOT RENDER CLAIM 2 PATENTABLY DISTINGUISHABLE OVER SWIFT IN VIEW OF RICQUIER AND SUZUKI (ALL GROUNDS)**

With respect to claim 2's dimension limitation ("wherein a largest dimension of said image sensor along said first plane is between 2 and 12 millimeters"), PO's arguments (POR 24-25) mischaracterize Suzuki's "solid-state image pickup device" as limited to CCD technology and are, again, based on the false premise that Swift's CMOS APS sensor is Fossum's camera-on-a-chip. Suzuki, 4:6-11; Neikirk, ¶¶152, 245; Pet. 24, 26-27; DI 22. Further, non-critical dimension limitations, such as this, do not alone render a claim patentable.

As discussed in the Petition and in §II.C, a POSITA would have been motivated to apply Suzuki's teachings of a "chip-connecting board 226" having a diagonal length between 8.5 and 10mm in implementing Swift's board 52. Suzuki,

1:53-56, 3:61-4:12, 4:30-65; Neikirk, ¶¶241-242, 149-153, 285-289; Pet. 24-27, 48-50. Suzuki teaches a “solid-state pickup chip,” which, as PO and the ’052 admit, is a general reference to class of devices including CMOS, CCD, metal-oxide semiconductor (MOS), charge injection devices (CID), photo diode arrays (PDA), etc. ’052, 1:57-59; POR 2-3. By referencing solid state imagers generally, Suzuki intentionally did not limit its advantageous teachings to any particular type of solid-state imager. Thus, even if PO’s assertion that Suzuki was filed “prior to the introduction of CMOS imagers” were accurate (it is not), Suzuki’s intentional reference to solid state imagers generally would have motivated a POSITA to apply its teachings to a CMOS imager. Neikirk Reply, ¶¶36-40.

Further, Suzuki was not filed “prior to the introduction of CMOS imagers.” *Cf.* POR 24 (citing Ex. 2092 at 8). For example, prior to both Suzuki’s 12/1991 US filing and 12/1990 Japanese application, Renshaw disclosed “a CMOS sensor chip” with “CMOS sensor pixel[s].” Ex. 1090 (“Renshaw” publicly available 5/3/1990), 3038, Fig. 1. And, U.S. Patent 4,841,348 (Shizukuishi, granted 6/20/1989) disclosed a “solid state optical pickup device...built according to CMOS IC technology.” Ex. 1089, Abstract, 2:47-68. Neikirk Reply, ¶¶35-36. PO’s argument that it would not have been “obvious to de-integrate on-chip components of Swift’s CMOS sensor in order to place them on separate circuit boards” (POR 24-25) fails because it is again based on PO’s false assertion that Swift is a camera-on-a-chip and would require



“de-integrat[ion].” As discussed above in §II.A, PO’s argument is directly contrary to Swift’s express teachings and belied by the prior art, which is replete with examples of CMOS image sensors using off-chip circuitry.

Contrary to PO’s arguments that “Swift discloses a camera having far larger dimensions than either the imaging device recited in the ’052 Patent or Suzuki” (POR 21-23), Swift’s discussion of an “example” “maximum” dimension of the camera’s outer housing of 38mm that PO references in no way sets a minimum size for the housing, nor does it teach the precise size of its image sensor along said first plane (defined by the first circuit board) within the housing, as required by claim 2. Swift, 9:30-34. If anything, Swift’s disclosure of a “maximum” size of 38mm further confirms that Suzuki’s teaching of a “chip-connecting board 226” having a diagonal length between 8.5 and 10mm would fit in implementing Swift’s miniature camera (as modified by Ricquier)—satisfying claim 2’s size limitation. Neikirk, ¶¶285-289; Neikirk Reply, ¶38; Pet. 24-27, 48-50.

PO’s arguments that orienting circuit board 53 parallel with circuit board 52 “would not change the dimensions of circuit board 52, which is far larger than 12mm” (POR 22-23) again misses the point. As explained in the Petition, a POSITA would have been motivated to orient circuit boards 52 and 53 parallel to one another, as Swift suggests (Swift, 18:25-33), to “reduce the camera’s overall size,” including, for example, the camera’s depth. Swift, 10:12-16; Neikirk, ¶243; Neikirk Reply,

¶¶39-40; Pet. 24-25. Further, as explained in the Petition, applying Suzuki's teachings of its chip-connecting board having a diagonal length between 8.5 and 10mm in implementing Swift's circuit board 52 also advantageously reduces the camera's overall size. Neikirk, ¶243; Pet. 25-26.

Moreover, this non-critical limitation relating to image sensor size cannot render the claim patentable. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990) (where "differences between the claimed invention and the prior art is some range or other variable within the claims...applicant must show the particular range is *critical*, generally by showing that the claimed range achieves unexpected results relative to the prior art range"); *Gardner v. TEC Systems*, 725 F.2d 1338, 1345-1349 (Fed. Cir. 1984) (relative dimension did not render claim patentably distinct because it did not cause claimed device to perform differently); MPEP 2144.04 IV.

#### **IV. SWIFT EXPRESSLY DISCLOSES THE CLAIMED CIRCUITRY ON A SECOND CIRCUIT BOARD TO CONVERT THE PRE-VIDEO SIGNAL TO A POST-VIDEO SIGNAL (ALL GROUNDS)**

PO's arguments regarding the limitation of "said second circuit board including circuitry thereon to convert said pre-video signal to a post-video signal" (POR 35-38) are again based on PO's false premises that Swift is a camera-on-a-chip and that Suzuki is limited to CCDs. As discussed above in §II.A, Swift's teachings are not limited to the camera-on-a-chip discussed in Fossum (and in fact, show the exact opposite). In citing the *Laser Focus World* article, Swift simply

stated that “information on APS-type sensors may be found” in the article—not that Swift uses Fossum’s camera-on-a-chip design. Neikirk Reply, ¶¶41-42. Further, PO’s citations to Ex. 1060 (*Business Week* article about Fossum) are irrelevant as that article was published a year after Swift was filed. Neither Ex. 1048 nor Ex. 1060 can rewrite Swift’s express disclosure.

Contrary to PO’s argument that Swift “never states that circuit board 53 includes ‘circuitry...to convert said pre-video signal to a post-video signal’” (POR 36-37), Swift expressly discloses the arrangement of the processing circuitry on board 53. Specifically, Swift teaches its camera includes a “video processor,” and teaches the location of the processor by explaining that “[v]arious circuitry components are mounted on the circuit board 53, to provide power to the image sensor 51, *process image signals received therefrom....*” Swift, 3:32-35, 9:7-13. As this passage provides, “image signals” (pre-video signals—not post-video signals) are received at circuit board 53 from image sensor 51. *Id.*; Neikirk, ¶¶236, 268-273; Neikirk Reply, ¶43; Pet. 38-40. The processing circuitry (“video processor”) on circuit board 53 converts the image signals received from image sensor 51 (pre-video signal) to a “video signal[]” (post-video signal), which is output from the device via a cable for “display” on a “video monitor.” Swift, 15:7-8, 15:13-14, 17:34-18:3, 18:8-11; Neikirk, ¶269; Pet. 38-41; DI 30-31.

PO's argument that "as shown in Fig. 4b of the '052 Patent, the term video processing does not mean or even imply converting a 'pre-video signal to a post-video signal'" (POR 37) is directly contrary to the express disclosures of the '052 and beside the point. For example, the '052 expressly states video processing circuitry performs the conversion: "FIG. 4b is an enlarged schematic diagram of a video processing board having placed thereon the processing circuitry which processes the pre-video signal generated by the array of pixels and which converts the pre-video signal to a post-video signal which may be accepted by a standard video device." '052, 7:9-14, 4:24-28, Fig. 4b. Regardless, as discussed above, Swift expressly discloses that the circuitry for converting the image signal (pre-video signal) to a video signal (post-video signal) is on circuit board 53; Neikirk Reply, ¶44.

**V. LARSON IN VIEW OF SWIFT, RICQUIER, AND SUZUKI  
RENDERS OBVIOUS CLAIM 2 (GROUND 2)**

PO's arguments that a POSITA would not have replaced Larson's CCD image sensor with a CMOS image sensor misconstrue the ground, ignore the motivations set forth in the Petition and supported by Dr. Neikirk, and mischaracterize Swift. The Petition relies on Larson's teachings of "an imaging device (*e.g.*, 'A videophone includes a video camera' that is 'mounted in a tilt and swivel housing' with a 'flat panel [LCD]') with a physical camera and a display screen contained in a single

housing” solely “[t]o the extent further disclosure of a physical camera within the same physical housing as the video monitor to form the claimed ‘imaging device’ is required.” Pet. 50-51 (citing Larson (Ex. 1029), Abstract, 7:8-27; Neikirk, ¶¶290-29). As an initial matter, PO does not assert that such additional disclosure is required. Nevertheless, as discussed in the Petition, a POSITA would have been motivated and found it advantageous to apply the teachings of Swift’s miniature camera (as modified by Ricquier’s and Suzuki’s teachings as set forth in Ground 1) in implementing Larson’s “camera” in the “videophone” with “compact housing.” Larson, 7:14-27; Neikirk, ¶¶290-295; Pet. 51-53. As Larson explains, using a single “tilt and swivel housing” can be used “for ease of positioning the video camera and viewing screen,” “enables the videophone of the invention to be housed in a compact housing,” and “require[s] less power.” Larson, 7:6-27; Neikirk, ¶293.

PO’s argument that “[a] POSITA would not have replaced the CCD image sensor in Larson with...a passive pixel sensor (in Ricquier)” (POR 38) mischaracterizes the ground. Petitioner does not propose “replacing” Larson’s CCD image sensor with Ricquier’s passive pixel sensor, but rather, the ground relies on Swift’s CMOS “Active Pixel Sensor,” which includes an amplifier for each “active pixel.” Pet. 33-34; Neikirk, ¶295. PO’s arguments also fail to address the motivations to apply the teachings of Swift’s miniature camera (as modified by Ricquier’s and Suzuki’s teachings) in implementing Larson’s “camera” in the

“videophone” with a “compact housing.” Larson, 7:6-27; Neikirk, ¶¶290-295; Pet. 51-52. Moreover, the ’052 admits several known advantages of CMOS active pixel sensors over CCDs, including: lower noise, ability to be mass produced, ability to incorporate a number of different electronic controls on smaller circuit boards, and less power consumption. ’052, 1:66-2:19; *see also* Ex. 1060; Neikirk, ¶294; Pet. 51-52.

And contrary to PO’s suggestion that Swift’s teachings are limited to “security and surveillance applications” (POR 38), Swift’s disclosure broadly refers to “miniature cameras”—further demonstrating a POSITA would have been motivated to apply its teachings to Larson. Swift, 1:7-13; Neikirk, ¶294; Neikirk Reply, ¶¶45-47; Pet. 52.

## **VI. PO’S PURPORTED SECONDARY CONSIDERATIONS ARE UNAVAILING**

PO’s arguments fail to provide the necessary nexus between claim 2 and PO’s secondary considerations arguments, let alone evidence of the secondary indicia themselves. *In re GPAC*, 57 F.3d 1573, 1580 (Fed. Cir. 1995); *Demaco Corp. v. F. Von Langsdorff Licensing*, 851 F.2d 1387, 1392 (Fed. Cir. 1988) (burden on patentee to present “prima facie case of the requisite nexus”). There is no presumption of nexus here, as PO has made no showing that its “asserted objective evidence is tied to a specific product and that such product embodies the claimed features, and is

coextensive with them.” *Fox Factory v. SRAM*, 944 F.3d 1366, 1373 (Fed. Cir. 2019). Rather, PO does not specifically identify any product, and makes no attempt to show a specific product embodies the claimed features and is coextensive with them. Neikirk Reply, ¶¶48-50.

With respect to PO’s allegations of commercial success and licensing (POR 41), PO fails to show the ’052 is licensed or practiced. PO provides no information on what patent(s) or product(s) were allegedly licensed or that such product(s) practiced claim 2. Ex. 2074 (referring to licensed “technology”). Moreover, “licensing alone cannot be considered strong evidence of nonobviousness if it cannot also be shown that the licensees did so out of respect for the patent rather than to avoid the expense of litigation.” *In re Affinity Labs*, 856 F.3d 883, 901 (Fed. Cir. 2017).

PO’s allegations of long-felt need (POR 41-43) are not tied to claim 2 as PO fails to demonstrate the alleged need was solved by any novel, claimed aspect of the alleged invention. *In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (where offered secondary consideration “results from something other than what is both claimed and novel in the claim, there is no nexus”). PO’s cited article credits “development of the CMOS sensor” generally and “disposable [endo]scope system” as a significant advancement. Ex. 2089, 2-3. CMOS sensors were not novel, as ’052 concedes, and claim 2 is not directed to an endoscope. ’052, claim 2; Neikirk Reply,

¶50. PO's alleged industry praise (POR 45-46) also lacks the requisite nexus as it too is directed to the unclaimed feature of disposability of endoscope tips.

PO's industry skepticism allegations lack any nexus as PO's alleged skepticism applies to "CMOS in medical applications"—an unclaimed application—and image quality of CMOS sensors, which again are not novel. POR 43-44 (quoting Ex. 1003, 85); Neikirk Reply, ¶51.

Contrary to PO's arguments of industry praise, unexpected results, proceeding contrary to accepted wisdom, and industry skepticism, as discussed in the Petition and §II.A, PO admits the claimed arrangements were "conventional" (POR 10-11) and companies were already developing these products. POR 43-45 (quoting Ex. 1003, 85); Neikirk Reply, 50-53. As discussed in §II.A, it was well-known to locate processing circuitry separate from a CMOS image sensor and that doing so would reduce RF interference. Neikirk, ¶¶299-300; Pet. 53. As PO concedes, Wakabayashi also teaches removing processing circuitry from the solid-state imager. Wakabayashi, 9:10-19; Neikirk, ¶¶72-73, 299; Pet. 22-23, 84; POR 20. *Institut Pasteur v. Focarino*, 738 F.3d 1337, 1347 (Fed. Cir. 2013) ("objective indicia of non-obviousness must be tied to the novel elements of the claim"); *ClassCo v. Apple*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). PO's reliance on a self-serving declaration from the named inventor (POR 43-45) is not sufficient evidence of secondary considerations. *In re Cree*, 818 F.3d 694, 702 (Fed. Cir. 2016) ("self-serving



statements from researchers about their own work do not have the same reliability [as praise from industry]”); *Stride Rite v. Shoes*, IPR2017-01810, Pap. 66, \*51-52 (finding “self-serving testimony from a highly-interested witness” “very weak evidence”).

Even if PO’s sparse documents were somehow credited—which they should not—that evidence could not possibly overcome Petitioner’s compelling case of obviousness. *Wyers v. Master Lock*, 616 F.3d 1231, 1246 (Fed. Cir. 2010).

Dated: February 1, 2021

/Scott A. McKeown/

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**CERTIFICATE OF COMPLIANCE**

Pursuant to 37 CFR §42.24(a) and (d), the undersigned hereby certifies that this Reply to Patent Owner Response complies with the type-volume limitation of 37 CFR §42.24(a)(i) because, exclusive of the exempted portions, it contains 5599 words as counted by the word processing program used to prepare the paper.

Dated: February 1, 2021

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**CERTIFICATE OF SERVICE**

The undersigned certifies that a copy of the foregoing PETITIONER'S  
REPLY TO PATENT OWNER'S RESPONSE was served in its entirety by filing  
through the Patent Trial and Appeal Board End to End (PTAB E2E), as well as  
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