

NON-PUBLIC VERSION – PROTECTIVE ORDER MATERIAL

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

COREPHOTONICS, LTD.,
Patent Owner.

IPR2020-00861
Patent 10,230,898 B2

Before BRYAN F. MOORE, MONICA S. ULLAGADDI, and
BRENT M. DOUGAL, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1, 4, 8–12, 15, 19, and 20 (“the challenged claims”) of U.S. Patent No. 10,230,898 B2 (Ex. 1001, “the ’898 patent”). Paper 2 (“Pet.”). Corephotonics, Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

We instituted an *inter partes* review. Paper 7 (“Institution Decision” or “Inst. Dec.”); *see* 35 U.S.C. § 314(a) (2018); 37 C.F.R. § 42.4(a). Patent Owner filed a Response (Paper 13, “Patent Owner Response” or “PO Resp.”).¹ Petitioner filed a Reply (Paper 21, “Petitioner’s Reply” or “Pet. Reply”).² Thereafter, Patent Owner filed a Sur-Reply (Paper 25, “Patent Owner Sur-Reply” or “PO Sur-Reply”).³

An oral hearing was held on September 9, 2021 and a transcript (Paper 33, “Tr.”) was entered in the record.

We have jurisdiction pursuant to 35 U.S.C. § 6. This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. Having reviewed the arguments and the supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1, 4, 8–12, 15, 19, and 20 of the ’898 patent are unpatentable.

¹ We cite to the sealed version of Patent Owner’s Response (Paper 13). The public version is Paper 14.

² We cite to the sealed version of Petitioner’s Reply (Paper 21). The public version is Paper 22.

³ We cite to the sealed version of Patent Owner’s Sur-Reply (Paper 25). The public version is Paper 26.

II. BACKGROUND

A. *Related Proceedings*

Petitioner and Patent Owner identify the following corresponding district court proceeding: *Corephotonics, Ltd. v. Apple Inc.*, Case No. 5:19-cv-04809 (N.D. Cal.). Pet. 2; Paper 4, 1.⁴

We identify the following related administrative matters, including applications and patents claiming the benefit of the priority of the filing date of patents in the priority chain of the '898 patent. *See* Office Consolidated Trial Practice Guide⁵ at 18; *see also* 84 Fed. Reg. 64,280 (Nov. 21, 2019) (explaining what is considered an “administrative matter”). U.S. Patent No. 10,356,332 ('332 patent) is a continuation of Application No. 15/324,720 (now U.S. Patent No. 10,230,898, “the '898 patent”). The following co-pending proceeding challenges a patent in the priority chain of the '898 patent: IPR2020-00862 (claims 1, 2, 5, 9–14, 17, 21, and 22 of the '332 patent).

B. *The '898 Patent*

The '898 patent is titled “Dual Aperture Zoom Camera with Video Support and Switching / Non-Switching Dynamic Control,” and is directed to a “dual aperture zoom digital camera operable in both still and video modes.” Ex. 1001, code (57).

⁴ Patent Owner cites *Corephotonics, Ltd. v. Apple Inc.*, Case No. 3:19-cv-04809-LHK (N.D. Cal.) (Paper 5, 1), but this case number appears to reflect a typographical error. A PACER search of Case No. 5:19-cv-04809 reveals that Patent Owner’s complaint in that case was erroneously identified as “Civil Action No. 3:19-cv-4809” on its cover page.

⁵ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

The '898 patent describes video mode zoom operation from low zoom factor (ZF) to higher ZF above a switch point (described variously as Z_{switch} or ZF_T or uptransfer ZF), with “[processing] applied to eliminate the changes in the image during crossover from one camera to the other.” *Id.* at 7:57–8:29.

The '898 patent describes that “[s]witching from the Wide camera output to the transformed Tele camera output will be performed unless some special condition (criterion), determined based on inputs obtained from the two camera images, occurs. In other words, switching will not be performed only if [a] no switching criteria is fulfilled.” *Id.* at 10:2–9.

Figure 1A of the '898 patent, reproduced below, illustrates a dual-aperture Zoom imaging system 100 including a Wide imaging section and a Tele imaging section, each having a respective lens with respect field of view (FOV) and respective image sensor to provide image data of an object or scene.

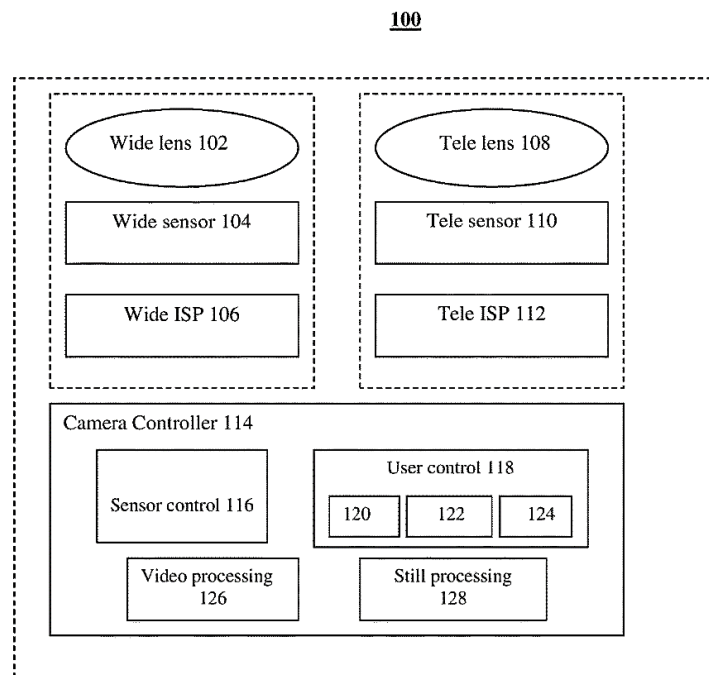


FIG. 1A

Figure 1A shows a dual-aperture zoom imaging system. *Id.*

C. Challenged Claims

Petitioner challenges claims 1, 4, 8–12, 15, 19, and 20 of the '898 patent. Claims 1 and 13 are independent. Claim 1 is reproduced below.

1. A zoom digital camera comprising:

- a) a Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view FOV_W and a Wide sensor, the Wide imaging section operative to provide Wide image data of an object or scene;
- b) a Tele imaging section that includes a fixed focal length Tele lens with a Tele field of view FOV_T that is narrower than FOV_W and a Tele sensor, the Tele imaging section operative to provide Tele image data of the object or scene; and
- c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured to evaluate if a no-switching criterion is fulfilled or not fulfilled, wherein if the no-switching criterion is fulfilled in a zoom-in operation between a lower zoom factor (ZF) value and a higher ZF value at a zoom factor (ZF) higher than an up-transfer ZF, the camera controller is further configured to output a zoom video output image that includes only Wide image data, and wherein if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data.

Ex. 1001, 12:32–54.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1, 4, 8–12, 15, 19, and 20 as follows. *See* Pet. 7.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 4, 8, 12, 15	103	Golan ⁶ , Martin ⁷ , Togo ⁸
9	103	Golan, Martin, Togo, Levey ⁹
11, 19	103	Golan, Martin, Togo, Border ¹⁰
10, 20	103	Golan, Martin, Togo, Parulski ¹¹

In support, Petitioner relies on the declaration of Dr. Frédo Durand (Ex. 1003).

III. ANALYSIS

A. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention 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

⁶ U.S. Patent Application Publication No. 2012/0026366 A1, published Feb. 2, 2012 (Ex. 1005, “Golan”).

⁷ U.S. Patent No. 8,081,206 B2, issued Dec. 20, 2011 (Ex. 1006, “Martin”).

⁸ Japanese Patent Application Publication No. JP 2011/055246 (P2011-55246A), published Mar. 17, 2011 (Ex. 1010, “Togo”); we refer to the English translation.

⁹ U.S. Patent Application Publication No. 2012/0019704 A1, published Jan. 26, 2012 (Ex. 1015, “Levey”).

¹⁰ US Patent Application Pub. No. 2008/0030592 A1, filed Aug. 1, 2006, published Feb. 7, 2008 (Ex. 1009, “Border”).

¹¹ U.S. Patent No. 7,859,588 B2, issued Dec. 28, 2010 (Ex. 1008, “Parulski”).

prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness, i.e., secondary considerations. *See 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) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). The burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in an *inter partes* review). Furthermore, 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).

B. Level of Ordinary Skill in the Art

Petitioner contends

[A] Person of Ordinary Skill in the Art (“POSITA”) at the time of the claimed invention would have a bachelor’s degree or the equivalent degree in electrical and/or computer engineering, or a related field and 2–3 years of experience in imaging systems including optics and image processing. Furthermore, a person with less formal education but more experience, or more formal education but less experience, could have also met the relevant standard for a POSITA.

Pet. 7 (citing Ex. 1003 ¶ 17). Patent Owner argues Petitioner’s definition of a person of ordinary skill in the art improperly fails to require knowledge,

skills or experience in the specific field of photography. PO Resp. 8. According to Patent Owner, the field of photography would represent knowledge, skills and experience that include, e.g., the choice of lens, exposure, aperture and other settings appropriate for the aesthetics of a given shot. *Id.* Additionally, Patent Owner argues that neither an engineering education nor experience in imaging systems, even if they were focused on optics and image processing, require any knowledge, skills or experience in the field of photography. *Id.* at 8–9 (citing Ex. 2001 ¶¶ 32–33 (Hart declaration)).

“The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). “A less sophisticated level of skill generally favors a determination of [non-obviousness] . . . while a higher level of skill favors the reverse.” *Innovention Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011).

Here, as explained below in Section III.E.2., under either articulation of the level of skill in the art Petitioner has shown the claims would have been obvious. Therefore, we do not need to determine whether knowledge of photography is required for the level of skill in this case. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (Where a determination of level of skill would not change the result, “we find no harm under the circumstances of this case in the Board’s failure to set forth express findings as to the level of skill.”).

For the reasons above, we determine, on the full record before us, that the level of ordinary skill in the art proposed by Petitioner is consistent with

the '898 patent and the asserted prior art. We adopt that level for the purpose of this Decision.

C. Claim Construction

For *inter partes* reviews filed on or after November 13, 2018, we apply the same claim construction standard used by Article III federal courts and the ITC, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. 37 C.F.R. § 42.100(b). Accordingly, we construe each challenged claim of the '898 patent to generally have “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.” *Id.*

Petitioner asserts “for the purposes of this proceeding and the analysis presented herein, no claim term requires express construction [and that it] analyzes the claims consistent with ordinary and customary meaning as would be understood by a POSITA in light of the specification.” Pet. 8. Patent Owner does not request construction of any claim term. *See generally* PO Resp.¹²

¹² Patent Owner proposed a construction for the limitation “no-switching criterion,” as recited in each of the challenged claims, in its Preliminary Response. Prelim. Resp. 7–9. Patent Owner asserted “no-switching criterion” should be construed as “one more criteria determined based on inputs obtained from the two camera images.” *Id.* at 7. In the Institution Decision, we did not limit “no-switching criterion” to “one more criteria determined based on inputs obtained from the two camera images.” Patent Owner did not address claim construction in its Patent Owner Response. *See generally* PO Resp. Our Scheduling Order states that “Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.” Paper 8, 8. Thus, Patent Owner’s proposed construction for the limitation “no-switching criterion” is waived, and we do not

We do not discern a dispute between the parties regarding any limitation and we need not expressly construe any limitation to resolve the controversy before us. *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))).

D. Obviousness over Golan, Martin, and Togo

Petitioner contends that claims 1, 4, 8, 12, and 15 are unpatentable as obvious under 35 U.S.C. § 103 over Golan, Martin, and Togo. Pet. 13–59. For the reasons that follow, we determine that the evidence sufficiently supports Petitioner’s contentions, Patent Owner’s contentions regarding secondary considerations of non-obviousness do not weigh in favor of non-obviousness, and thus Petitioner’s contentions establish by a preponderance of evidence that claims 1, 4, 8, 12, and 15 would have been obvious over Golan, Martin, and Togo.

1. Overview of Golan (Ex. 1005)

Golan concerns a “method for continuous electronic zoom in a computerized image acquisition system,” in which the system has “a wide image acquisition device and a tele image acquisition device.” Ex. 1005, code (57). By providing “multiple imaging devices each with a different fixed field of view (FOV),” Golan’s system “facilitates a light weight electronic zoom with a large lossless zooming range.” *Id.* ¶ 9. Golan’s

explicitly construe the term for the purpose of this Decision. *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016).

Figure 1, reproduced below, illustrates a zoom control sub-system for an image acquisition system. *Id.* ¶ 26.

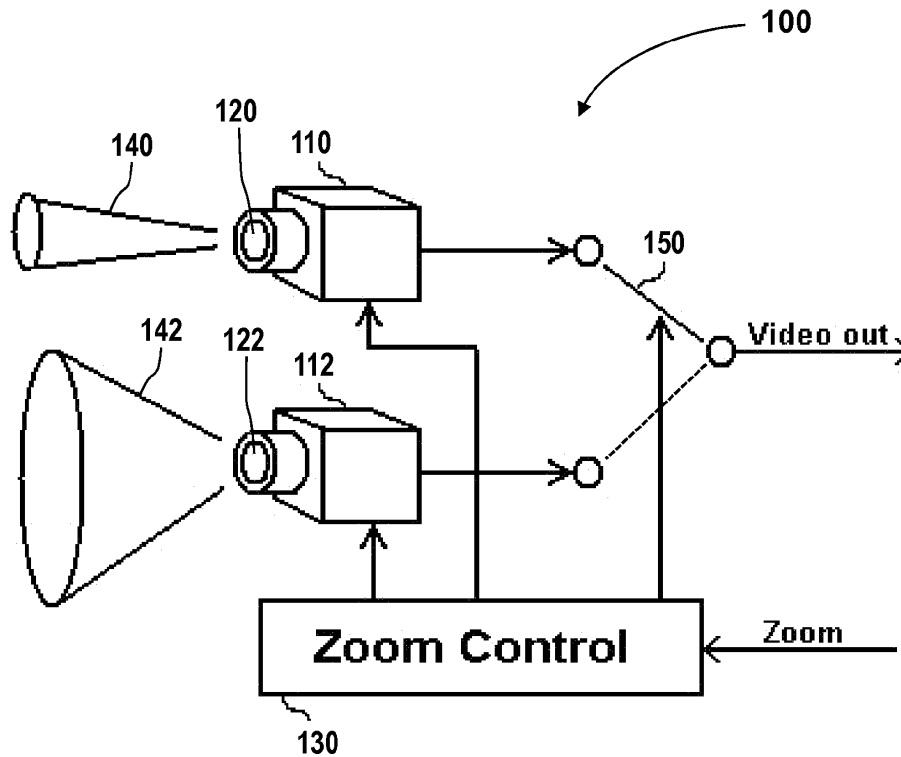


Fig 1

Figure 1 of Golan illustrates a zoom control sub-system for an image acquisition system. *Id.*

According to Golan, “[z]oom control sub-system 100 includes a tele image sensor 110 coupled with a narrow lens 120 having a predesigned FOV 140, a wide image sensor 112 coupled with a wide lens 122 having a predesigned FOV 142, a zoom control module 130 and an image sensor selector 150.” *Id.* ¶ 37. Zoom control circuit 130 selects an appropriate image sensor through image sensor selector 150 and calculates a camera

zoom factor when it receives a required zoom from an operator. *Id.* ¶ 39. Golan’s system facilitates “continuous electronic zoom capabilities with uninterrupted imaging,” which “is also maintained when switching back and forth between adjacently disposed image sensors.” *Id.* ¶ 40.

2. Overview of Martin (Ex. 1006)

Martin concerns a method for generating an autostereoscopic display by aligning a first parallax image and at least one other parallax image. Ex. 1006, code (57). By manipulating parallax images—two or more images with overlapping visual fields but different points of view—Martin’s method creates a moving three-dimensional image without the use of special viewing aids, i.e., an autostereoscopic display. *Id.* at 1:16–20; 3:32–41. Martin’s Figure 1, reproduced below, illustrates a method of capturing parallax images. *Id.* at 3:41–51.

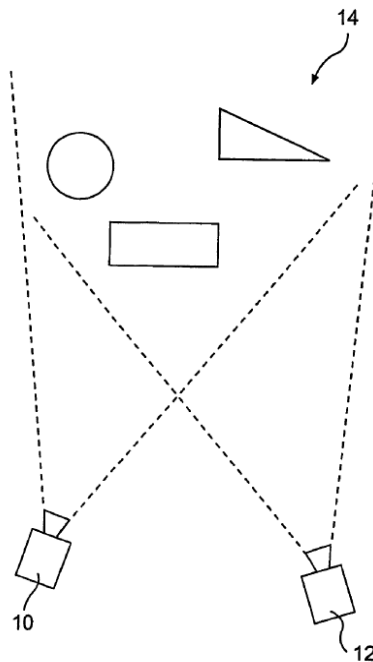
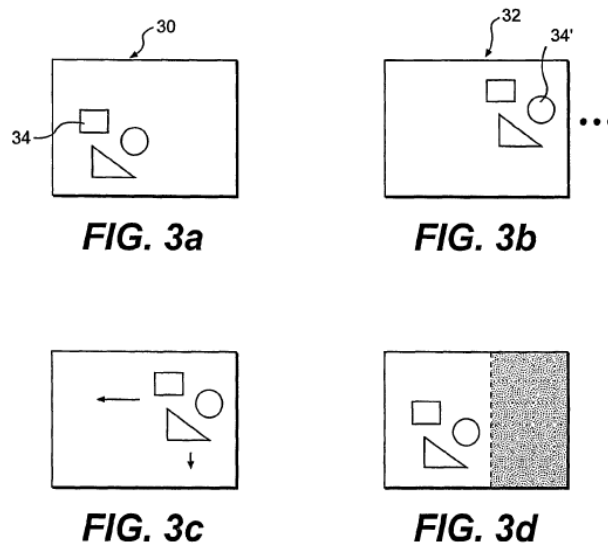


FIG. 1

Figure 1 of Martin illustrates exemplary camera positions for generating parallax images. *Id.* at 3:17–18.

According to Martin, “a camera 10 may capture a first set of images and a camera 12 may capture a second set of images of a common scene 14 while being displaced from one another. The resulting sets of images from cameras 10 and 12 will be parallax images.” *Id.* at 3:42–46. Martin discloses generating a set of aligned parallax images by displaying alternating views of two or more parallax images at a desired view rate and manipulating the images such that at least a portion of the images are aligned with each other. *Id.* at 3:6–13. Figures 3a–3d, reproduced below, illustrate an alignment process.



Figures 3a–3d of Martin illustrate a transformation process for aligning parallax images. *Id.* at 3:20–22.¹³

In Martin, “[t]he alignment matching process begins by selecting a reference image 30, as shown in FIG. 3a, from a set of parallax images.

¹³ According to Petitioner, “[a] POSITA would have understood that element 34’ in FIG. 3b referring to a circle is a clerical error, and instead corresponds to the rectangle corresponding to region 34.” Pet. 17 n.1.

Once reference image 30 has been selected, other images 32, as shown in FIG. 3b, from the parallax image set can be aligned to reference image 30.” *Id.* at 4:39–43. “Reference image 30 may include region of interest 34.” *Id.* at 4:51. “Unaligned image 32 may be manipulated, as shown in FIG. 3c, for example, until region 34’ matches alignment with region 34, as illustrated in FIG. 3d.” *Id.* at 4:54–56. “The manipulation process may be represented by an affine transformation including translation, rotation, scaling, and/or any other desired transformation.” *Id.* at 4:56–59.

Martin discloses that a computer may align the images using convergence points in the images. *Id.* at 5:6–11. “The computer may further perform pattern matching or feature extraction algorithms . . . to match alignment of regions of interest in the selected images at or near the selected convergence points.” *Id.* at 5:11–28. The computer may continuously adjust the transformation parameters to achieve “critical alignment,” corresponding “to a condition where the degree of alignment is sufficient to achieve a stable auto-stereoscopic display. Stability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable.” *Id.* at 5:53–58. Martin further discloses that the process may include “parallax image manipulations of sub-pixel resolution to achieve critical alignment . . . where one image is moved with respect to another image by an amount less than an integral number of pixels.” *Id.* at 5:59–65.

3. *Overview of Togo (Ex. 1010)*

Togo is titled “Telephoto Imaging Device,” and discloses improvements for “[d]igital cameras and imaging devices (cameras) of mobile terminal devices such as mobile phones” that “realize a zoom

function by using a plurality of imaging modules made of a plurality of lenses with different focal lengths— that is, lenses of different fixed magnifications.” Ex. 1010 ¶¶ 2, 7, code (54).

Togo describes switching between the respective imaging modules according to a magnification (zoom factor) set by a user. *Id.* ¶ 7. “For example, in a configuration . . . with a wide-angle lens and . . . a telephoto lens, when a subject is at a short distance, an image . . . [from] the wide-angle lens, which has a short focal length, is switched to, and when the subject is at a long distance, an image . . . [from] the telephoto lens is switched to.” *Id.* ¶ 8. “Small changes in magnification are realized by electronic zooming, which changes [to] a cutout region” of the switched-to image. *Id.*

Togo teaches a zoom digital camera with “[a] first imaging module . . . for a wide-angle image” including a “wide angle lens system 7” and “a first imaging element 8 such as a CCD camera . . .” (a Wide imaging section). *Id.* ¶ 23. Togo’s zoom digital camera also includes “[a] second imaging module 2 . . . for a telephoto image” including a “telephoto lens system 10” and “a second imaging element 11 such as a CCD camera” (a Tele imaging section). *Id.* ¶ 26.

4. *Independent Claim 1*

Patent Owner explicitly contests Petitioner’s showing as to motivation to combine, and the last limitation of claim 1, which recites “a camera controller . . . ,” and presents secondary considerations of non-obviousness. We discuss Petitioner’s contentions as to each limitation and Patent Owner’s arguments below.

“A zoom digital camera comprising:

a) a Wide imaging section that includes a fixed focal length Wide lens with a Wide field of view FOV_W and a Wide sensor, the Wide imaging section operative to provide Wide image data of an object or scene;

b) a Tele imaging section that includes a fixed focal length Tele lens with a Tele field of view FOV_T that is narrower than FOV_W and a Tele sensor, the Tele imaging section operative to provide Tele image data of the object or scene”

Petitioner contends that the embodiment depicted in Figure 1 of Golan teaches “a zoom digital imaging system with multiple imaging devices each defining an aperture for capturing a digital image.” Pet. 33 (citing Ex. 1005 ¶¶ 3, 9, code (54); Ex. 1003 ¶¶ 70–74). Petitioner explains that Golan’s image acquisition system includes, “tele image sensor 110 coupled with a narrow lens 120 having a predesigned FOV 140, a wide image sensor 112 coupled with a wide lens 122 having a predesigned FOV 142, a zoom control module 130 and an image sensor selector 150.” *Id.* at 30–33 (citing Ex. 1005 ¶¶ 37, 39, Fig. 1; Ex. 1003 ¶ 72; Ex. 1001, 3:26–28).

Petitioner further contends that Golan teaches the claimed Wide imaging section and Tele imaging section. *Id.* at 35–39. Specifically, Petitioner argues Golan discloses “a Wide imaging section that includes a wide lens 122 (fixed focal length Wide lens) with FOV [Field of View] 142 (Wide field of view FOV_w) and a wide image sensor 112 (Wide sensor).” *Id.* at 35 (citing Ex. 1005 ¶¶ 36–37, Fig. 1; Ex. 1003 ¶ 76); *see id.* at 36 (citing Ex. 1001, 7:3–5; Ex. 1003 ¶¶ 77–82; Ex. 1005 ¶¶ 9, 36, 37, 43; Ex. 1017, Fig. 4.13, 48 (Jacobson photography textbook)). Petitioner also contends that Golan’s zoom control sub-system 100 includes “a Tele

imaging section that includes a tele image sensor 110 (Tele sensor) coupled with narrow lens 120 (a fixed focal length Tele lens) having fixed FOV 140 (Tele FOV).” *Id.* at 37–38 (citing Ex. 1003 ¶ 86; Ex. 1005 ¶¶ 36, 37, code (57), Fig. 1); *see id.* at 38 (citing Ex. 1003 ¶¶ 87; Ex. 1005 ¶¶ 9, 36, 37, 39, 43). Petitioner further asserts that Golan discloses that “wide FOV 142 is substantially wider than narrow FOV 140.” *Id.* at 38 (quoting Ex. 1005 ¶ 43) (citing Ex. 1003 ¶ 82; Ex. 1005 ¶¶ 9, 37, Fig. 1) (emphasis omitted).

Patent Owner does not specifically address the preamble and the Wide and Tele imaging sections of claim 1. Having reviewed the cited evidence and Petitioner’s contentions, we determine that Petitioner’s contentions are sufficiently supported.¹⁴

“c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured to evaluate if a no-switching criterion is fulfilled or not fulfilled, wherein if the no-switching criterion is fulfilled in a zoom-in operation between a lower zoom factor (ZF) value and a higher ZF value at a zoom factor (ZF) higher than an up-transfer ZF, the camera controller is further configured to output a zoom video output image that includes only Wide image data, and wherein if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data.”

Petitioner contends that “Golan’s zoom control sub-system 100 includes a camera controller including zoom control circuit 130 coupled to the Wide and Tele imaging sections for receiving a requested zoom and

¹⁴ We need not determine whether the preamble is limiting because Petitioner shows sufficiently that it is satisfied by the prior art.

provides an acquired image frame with the requested zoom.” Pet. 40–41 (citing Ex. 1003 ¶¶ 91–95); *see id.* at 39–40 (citing Ex. 1005, Figs. 1 and 2, claim 1, ¶¶ 48, 49; Ex. 1003 ¶¶ 92, 93).

Petitioner relies on the combination of Golan, Martin, and Togo to teach the claimed configuration of the camera controller. *Id.* at 39–55. Specifically, Petitioner contends that “Golan teaches a zoom switching setting that depends on the Wide and Tele fields of view, including a predetermined switch zoom factor $ZF_T = \tan(\text{FOV}_{\text{Wide}}) / \tan(\text{FOV}_{\text{Tele}})$.” *Id.* at 41 (citing Ex. 1003 ¶ 97).

Petitioner contends that “Golan describes that in an example, such a large lossless zooming range has a value of $(\text{Wide_FOV} / \text{Narrow_FOV})^2$, which is provided by ‘switching between the image sensors’ and performing digital zoom to both Wide and Tele images.” *Id.* at 41–42 (citing Ex. 1005 ¶ 9). Petitioner asserts “that [a] POSITA would have understood . . . the underlying geometric relationships and as such, would have understood that Golan’s informal terminology, ‘Wide_FOV/Narrow_FOV,’ corresponds to . . . $\tan(\text{FOV}_{\text{Wide}}) / \tan(\text{FOV}_{\text{Tele}})$ ’ as claimed.” *Id.* at 42. Petitioner further contends that

Golan teaches selecting Wide image sensor and providing a zoom video output image including only Wide image data when a requested zoom factor value is less than the predetermined switch zoom factor ZF_T , and selecting Tele image sensor and providing a zoom video output image including only Tele image data when the requested zoom factor value is greater than the up-transfer ZF (e.g., the predetermined switch zoom factor ZF_T).

Id. (citing Ex. 1003 ¶ 108 (citing Ex. 1005 ¶ 39)).

Petitioner contends that “Togo recognizes that ‘by **switching between or compositing images** of a plurality of optical systems and a plurality of

imaging elements joined to these optical systems, a wide dynamic range of enlargement magnification from wide-angle to telephoto can be realized.” *Id.* at 44–45 (quoting Ex. 1010 ¶¶ 2, 8; citing Ex. 1003 ¶ 111). Petitioner further contends that “Togo recognized that ‘a telephoto imaging module with a long focal length is **less sharp at close distances** compared to a wide-angle imaging module whose focal length is short.” *Id.* at 45 (quoting Ex. 1010 ¶ 12). Further, Petitioner contends that Togo recognizes “[d]uring a zoom in operation, ‘a switch is made from the wide-angle imaging module to the telephoto imaging module. However, at this time, if the subject is close, the **image quality degrades** due to the image being from the telephoto imaging module.” *Id.* (quoting Ex. 1010 ¶ 13; citing Ex. 1003 ¶ 112).

Petitioner contends that “Togo’s solution is for image control means 4 (a camera controller) to employ a no-telephoto **criterion** based on image quality.” *Id.* (citing Ex. 1003 ¶ 113). For example, according to Petitioner “as shown in annotated FIG. 7 . . . one switching criterion is based on when ‘**the image quality** of the cutout image 22 of the wide-angle image becomes **poorer** than **the image quality** of the telephoto image 23.’” *Id.* at 45 (citing Ex. 1010 ¶ 66).

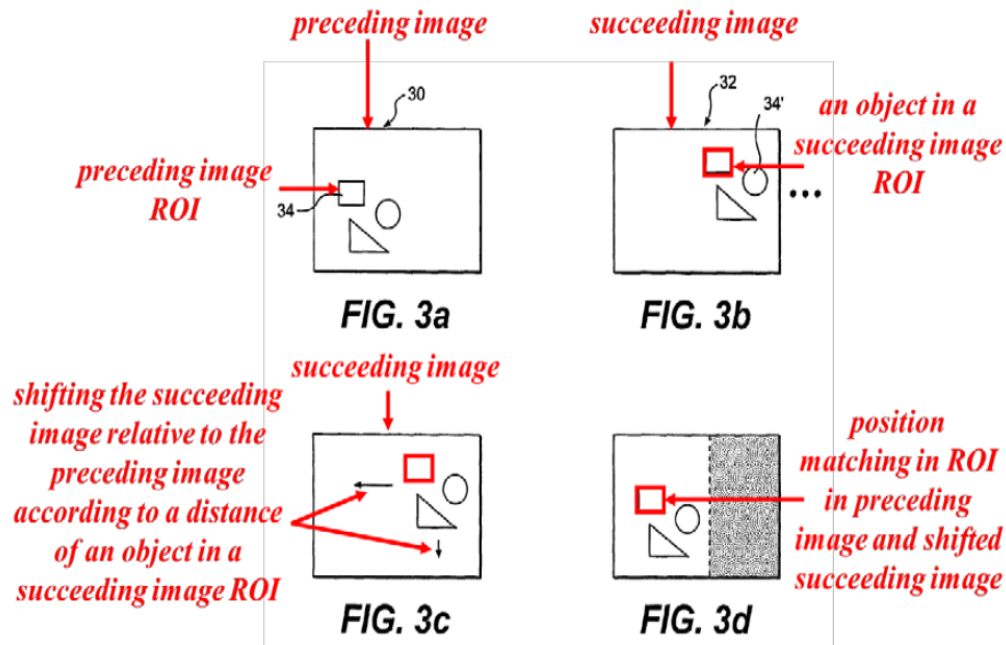
Petitioner also contends that “Togo describes an example image quality no-switching criterion to include that ‘setting magnification $X < A$ ’ or ‘setting magnification $X \geq A$ and the imaging distance $Y \leq B$.” *Id.* (quoting Ex. 1010 ¶¶ 61, 62).

Petitioner contends that Golan combined with Martin and Togo teach the limitation of “if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that

includes only transformed, digitally zoomed Tele image data.” *Id.* at 50. Specifically, Petitioner contends that in addition to the disclosure discussed above, “[a] POSITA would have understood that in the combination, if the no-switching criterion is **not** fulfilled, switching from Wide image to Tele image as taught in Golan is performed, and the zoom video output image includes only digitally-zoomed Tele image data.” *Id.* at 51 (citing Ex. 1005 ¶¶ 9, 36, Fig. 1; Ex. 1010, Fig. 5(4); Ex. 1003 ¶ 123).

As to “transformed, digitally zoomed Tele image data,” Petitioner contends further that “Martin teaches when switching between two successive images having different points of view, executing registration using critical alignment to register a succeeding image to a preceding image to generate **a transformed succeeding image** in video output images for a stable video display.” *Id.* (citing Ex. 1003 ¶ 124).

Martin’s Figure 3, reproduced as annotated by Petitioner below, illustrates registration between two images as part of Martin’s critical alignment. *Id.* at 52–53 (citing e.g. Ex. 1006, 4:51–56).



Petitioner's annotated version of Martin's
Figures 3A–3D.¹⁵

According to Petitioner, with respect to the annotated version of Martin's
Figures 3A through 3D:

A POSITA would have understood that Martin's critical alignment teaches determining correspondences between the coordinate systems of the two images from different points of view, which represent the registration between the two images (e.g., "represented by affine transformation . . . and/or any other desired transformation"), and therefore teaches executing registration of successive images for position matching in the ROI [Region of Interest] and generating a transformed succeeding image (e.g., transformed and shifted succeeding image 32 as in FIG. 3d above).

Id. at 53–54 (citing Ex. 1003 ¶ 128; Ex. 1009 ¶¶ 41, 42; Ex. 1013, Figs. 2.4, 6.2, Tables 2.1, 6.1, 33–35, 273–77; Ex. 1016, 137 (Xiong article on image

¹⁵ Petitioner apparently takes the position that element number 34' should reference the rectangle, not the circle, in Martin's Figure 3b.

registration methods)). Petitioner further argues that “Martin teaches in critical alignment, the transformed succeeding image is used to achieve position matching of ROI between the preceding image and transformed succeeding image to the video output images when switching between the two images for providing stable video output images” and the critical alignment “changes with object distance of the ROI in a specific image, and is performed when switching between each pair of parallax images.” *Id.* at 54 (citing Ex. 1003 ¶ 129; Ex. 1006, 7:36–51, 5:6–21).

Petitioner takes the position that in the digital camera of Golan, Togo, and Martin, “after the no-switching criterion is not fulfilled, when switching from the Wide image (preceding image) to Tele image (succeeding image), a transformed digitally zoomed Tele image (transformed succeeding image as taught by Martin) is provided for smooth transition in the video output image, which renders obvious” the limitation of “if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data.” *Id.* at 55 (citing Ex. 1003 ¶ 128).

Below we address Patent Owner’s arguments regarding this claim limitation, the motivation to combine Golan and Martin, the motivation to combine Golan, Martin, and Togo, and secondary considerations of non-obviousness, respectively.

Patent Owner’s Arguments Regarding Claim Limitation of:

“[the camera controller ...] configured to evaluate if a no-switching criterion is fulfilled or not fulfilled, wherein if the no-switching criterion is fulfilled in a zoom-in operation between a lower zoom factor (ZF) value and a higher ZF value at a zoom factor (ZF) higher than an up-transfer ZF, the camera controller is further configured to output a zoom video output image that includes only Wide image data, wherein if the no-switching criterion is not

fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data”

Patent Owner criticizes Petitioner’s presentation as to claim 1, suggesting Dr. Durand spends too many pages explaining errors in Golan’s paragraph 9 and does not explain how those errors would have affected a person of ordinary skill’s motivation to utilize Golan. PO Resp. 36. Patent Owner appears to suggest, without explicitly arguing, that Golan’s errors would have discouraged one of ordinary skill from looking to Golan to address the subject matter of the claims. *Id.* Because Patent Owner’s argument is unclear and poorly supported, we are unable to determine the extent to which Patent Owner’s argument undermines Petitioner’s showing.

Patent Owner argues that Golan’s teaching that “[t]he zoom control 130 selects an image acquisition device with the having a zoom more proximal to the requested zoom (Ex. 1005, ¶47)” is insufficient to support Petitioner’s contentions as to claim 1. *Id.* (alteration in original). According to Patent Owner, “[a] POSITA would find the term ‘proximal’ far too nebulous and indeterminate to prescribe the specific threshold selection provided by the ’898.” *Id.*

Petitioner responds that a “POSITA would have understood both Golan’s teachings of up-transfer ZF with a switch zoom factor (e.g., at 6x in the 36x zoom range example) when zooming in, and that, in the context of Golan, the term ‘proximal’ in Golan [0047] is far from nebulous.” Pet. Reply 12 (citing Ex. 1040 ¶¶ 63–65 (Durand reply declaration)). We agree. Golan explicitly discloses such thresholds. Ex. 1005 ¶¶ 7–9. Thus, Patent Owner’s argument does not undermine Petitioner’s showing.

Patent Owner also argues that “Petitioner provides not [sic] evidence of Golan disclosing any non-switching criteria that would cause Golan to *not* ‘select an image acquisition device ... having a zoom more proximal to the requested zoom.’” PO Resp. 37 (citing Ex. 2001 ¶ 75) (second alteration in original). Nevertheless, Petitioner relies on Togo to teach this limitation of the claim.¹⁶ Non-obviousness cannot be established by attacking the references individually when a challenge is predicated upon a combination of prior art disclosures. *See In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Thus, Patent Owner’s argument does not undermine Petitioner’s showing.

Patent Owner also argues that Togo’s switching criteria is not “fulfilled in a zoom-in operation between a lower zoom factor (ZF) value and a higher ZF value,” as required by claim 1. PO Resp. 37–38 (quoting Ex. 2001 ¶ 77). Rather, according to Patent Owner, “Togo’s switching criteria are evaluated for a zoom setting regardless of whether the zoom factor was set in a continuously increasing, continuously decreasing or discretely specified manner.” *Id.* Nevertheless, Petitioner relies on Golan to teach the continuous zoom aspect of this limitation of the claim.¹⁷ Non-obviousness cannot be established by attacking the references individually when a challenge is predicated upon a combination of prior art

¹⁶ Petitioner asserts “Petitioner details why and how to combine Togo’ no-switching criterion based on image quality in the combination of Golan and Martin, and POSITA reading Golan would not have been discouraged from the combination.” Pet. Reply 12.

¹⁷ Petitioner asserts “Petitioner details why and how to combine Togo’[s] no-switching criterion based on image quality in the combination of Golan and Martin, and [a] POSITA reading Golan would not have been discouraged from the combination.” Pet. Reply 12.

disclosures. *See Merck & Co.*, 800 F.2d at 1097. Thus, Patent Owner’s argument does not undermine Petitioner’s showing.

Patent Owner also argues that Togo’s alleged no switching criteria is not based on image quality. PO Resp. 38. Patent Owner relies on the following statement in Togo, that “*in the mobile terminal device of the present invention*, the photography distance Y between the photography subject and the mobile terminal device is estimated from an output signal of the autofocusing means or a control signal controlling the autofocusing means.” *Id.* (quoting Ex. 1010 ¶ 19). Although Togo may use autofocus to estimate the distance, Petitioner contends Togo also “describes switching/no-switching based on comparing ‘**image qualities** of the enlarged image 22 of the wide-angle image 20 and the telephoto image 21.’” Pet. Reply 15 (citing Pet 45–46; Ex. 1010 ¶¶ 66–67, Fig. 7 (“image qualities of the enlarged image 22 of the wide-angle image 20 and the telephoto image 21 at the long distance (B) in FIG. 7 are compared”)). Thus, Patent Owner’s argument does not undermine Petitioner’s showing.

Patent Owner also argues that Togo does not “perform image analysis using the disparity of corresponding wide-angle and telephoto pixels to estimate distance.” PO Resp. 38–39. We find the claims do not recite “image analysis;” rather, the claims recite “image quality” which, as explained above, is used by Togo. Therefore, this argument does not undermine Petitioner’s showing.

Finally, as to the limitation of “wherein if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data,” Patent Owner argues that the ’898 patent “teaches away” from

Martin’s use of parallax to create its autostereoscopic effect. *Id.* at 39–40 (citing Ex. 2001 ¶ 84; Ex. 1001, 7:46–48, 7:50–53; Pet. 51). We discuss this issue below in association with the arguments regarding the motivation to combine Golan and Martin.

Having reviewed the whole record including the cited evidence, Petitioner’s contentions, and Patent Owner’s arguments, we determine that Petitioner’s contentions are sufficiently supported.

Petitioner’s Contentions Regarding the Rationale for Combining Golan and Martin

Petitioner contends a person of ordinary skill in the art would have been motivated to apply Martin’s teachings to Golan “to produce the obvious, beneficial, and predictable results of a stable transition between images from different points of view for providing continuous zoom video output images.” Pet. 18–19 (citing Ex. 1003 ¶¶ 49–54). Petitioner supports its contention with the following reasons.

First, “the references are analogous prior art and are in the same field of endeavor pertaining to imaging systems generating video output images using two imaging sections having different points of view.” *Id.* at 19 (quoting Ex. 1003 ¶ 50).

Second, “they share a need to provide continuous video output images when switching between images from imaging sections having different points of view, for example, by using alignments having sub-pixel accuracy.” *Id.* at 19–20 (citing Ex. 1003 ¶ 58); *see id.* (citing Ex. 1005 ¶ 15; Ex. 1006, 5:51–55, 5:59–6:5).

Third, Martin addresses these needs identified in Golan by providing “critical alignment of an ROI [Region of Interest] in two images having

different points of view to calculate ‘transformation parameters of subpixel resolution’ for position matching of the ROI to achieve a stable transition in the continuous zoom video output images of the digital camera of Golan.” *Id.* at 20–21 (quoting Ex. 1006, 5:51–58) (citing Ex. 1003 ¶ 59; Ex. 1005 ¶ 36).

Fourth, applying Martin to the teachings of Golan would have required no more than combining “known elements according to known methods (such as performing critical alignment of an ROI in Wide and Tele images for position matching when switching between Wide and Tele images in zoom control subsystem of Golan) to achieve the benefits of a stable transition in video output images described by Martin.” *Id.* at 21. According to Petitioner, the combined teachings of Golan and Martin would have “produced operable results that are predictable.” *Id.* (citing Ex. 1003 ¶ 49).

Fifth, that Golan and Martin have a “shared goal to provide continuous video output images with seamless transition when switching between images from two imaging sections.” *Id.* at 22 (citing Ex. 1003 ¶ 62). According to Petitioner,

A POSITA would have sought to improve the efficacy of Golan’s image sensor alignments (e.g., determined at the time of manufacture without consideration of different parallax shifts for objects of different distances) with image registration-based critical alignment as taught by Martin (e.g., determined after the images are captured and dependent on object distances) to improve robustness of the seamless transition when switching for continuous zoom output images.

Id. at 22.

Discussion of Petitioner's Reasons to Combine Martin and Golan

With respect to Petitioner's *third* and *fourth* reasons, we find that these reasons are sufficiently supported by the cited evidence. Golan teaches "a first image acquisition device having a first image sensor array coupled with a first lens having a first FOV, typically a wide FOV, and a first electronic zoom and "a second image acquisition device having a second image sensor array coupled with a second lens having a second FOV, typically a narrow FOV, and a second electronic zoom," and that the "*calibration the alignment, between the first image sensor array and the second image sensor array, facilitates continuous electronic zoom with uninterrupted imaging, when switching back and forth between the first image sensor array and the second image sensor array.*" Ex. 1005 ¶¶ 14, 15 (emphasis added). Petitioner argues that the ordinarily skilled artisan would have been motivated "to incorporate Martin's teaching of *executing registration using critical alignment of ROI in two images having different points of view* to calculate 'transformation parameters of sub-pixel resolution' for position matching to achieve a stable transition in the continuous zoom video output images of the digital camera of Golan." Pet. 20 (citing Ex. 1005 ¶ 36; Ex. 1006, 5:51–58; Ex. 1003 ¶ 57) (emphasis added). Petitioner presents evidence, Ahiska (Ex. 1007), that tends to show a relation between electronic calibration and registration for position matching. *Id.* (citing-in-part Ex. 1007, 4:58–62, 10:2–5).

Martin teaches *aligning images*:

Reference image 30 may include a region of interest 34. The same region of interest 34', albeit as viewed from a different point of view, may appear in unaligned image 32. Unaligned image 32 may be manipulated, as shown in FIG. 3c, for example,

until region 34' matches alignment with region 34, as illustrated in FIG. 3d. The manipulation process may be represented by an affine transformation including translation, rotation, scaling, and/or any other desired transformation.

Ex. 1006, 4:51–59. Martin discloses that *critical alignment* “corresponds to a condition where the degree of alignment is sufficient to achieve a stable auto stereoscopic display,” and that “[s]tability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable.” *Id.* at 5:53–58. According to Martin, the “alignment process is the use of parallax image manipulations of sub-pixel resolution to achieve critical alignment” and “the transformations for achieving critical alignment may proceed to a sub-pixel level where one image is moved with respect to another image by an amount less than an integral number of pixels.” *Id.* at 5:59–65.

We determine that Martin’s teaching of critical alignment that reduces positional differences in a region of interest does not conflict with Martin’s teaching of producing or maintaining parallax artifacts in other portions of the image, based on the entirety of the record developed at trial. *See* Ex. 1006, 7:46–51 (“while displaying the images, aligning a user-selected region of interest associated with the first image with a corresponding region of interest of the second image such that said region of interest of the first image occupies in the display the same location as the region of interest in the second image”).

Dr. Durand testifies that “a POSITA would have understood that Martin’s teachings of critical alignment for stable transition between images of different points of view apply to electronic camera systems providing continuous zoom video output [i]mages as taught in Golan, regardless of

whether a three dimensional illusion is provided.” Ex. 1003 ¶ 54. Citing Ahiska (Ex. 1007), Border (Ex. 1009), Orimoto (Ex. 1014), and Hansen (Ex. 1019) to support his testimony, Durand further testifies that

It was well known in the art that for seamless transition between two images of different points of views in continuous zoom video applications, when calibration between two cameras (*e.g.*, the electronic calibration of Golan) is not sufficient alone (*e.g.*, because of shocking, vibration, thermal variation, etc.), image registration of two images from two imaging sections for position matching (*e.g.*, critical alignment of Martin) may be used.

Id. ¶ 52 (citing Ex. 1007, 4:58–62, 10:2–5; Ex. 1014, 1:63–2:1; Ex. 1019, 1059; Ex. 1009 ¶¶ 41, 42). The portion of Hansen (Ex. 1019) cited by Dr. Durand addresses how extrinsic calibration errors occur and “a method to recalibrate extrinsic parameters online to correct drift or bias.” Ex. 1019, 1059 (emphasis omitted). Orimoto discloses how misalignment occurs, irrespective of “how exactly the dual lens camera has been conditioned and adjusted by the manufacturer.” Ex. 1014, 1:63–2:1. Border addresses image registration as an alternative to correspondence (*i.e.*, calibration). Ex. 1009 ¶¶ 41, 42. And Ahiska disclose image registration or matching, when calibration is insufficient, to provide a seamless transition between master and slave cameras and “create the quality of a continuous zoom function.” Ex. 1007, 4:58–62, 10:2–5 (“[i]f calibration between the [wide-angle] master and slave cameras is insufficient alone, image registration or matching can be carried out,” “transition[ing] between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function”).

Petitioner's *third* and *fourth* reasons for combining Golan and Martin are supported by Dr. Durand's testimony quoted above, which is in turn supported by Ahiska and Border. The portions of Border cited by Dr. Durand address image registration as an alternative to correspondence (i.e., calibration). Ex. 1009 ¶¶ 41, 42. The portions of Ahiska cited by Dr. Durand address the additional step of image registration or matching, when calibration is insufficient, to provide a seamless transition between master and slave cameras and "create the quality of a continuous zoom function." Ex. 1007, 4:58–62, 10:2–5. Thus, each of Border and Ahiska show a relation between electronic calibration and registration.

Patent Owner's Arguments Regarding Petitioner's Rationale for Combining Golan and Martin

As to Petitioner's proffered rationale for combining Golan and Martin, Patent Owner contends that the "Golan and Martin references are fundamentally dissimilar, address different problems, and prescribe different techniques to address those different problems." PO Resp. 30 (citing *Nichia Corp. v. Everlight Americas, Inc.*, 855 F.3d 1328, 1340 (Fed. Cir. 2017) (affirming district court conclusion of no motivation to combine where the combination of references relating to LED packages "describe[d] different structures" and "address[ed] different problems")); *see id.* at 31–32 (citing *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1360 (Fed. Cir. 2020); Ex. 2015 ¶ 66). Patent Owner argues that "Golan teaches a preference that camera calibration occur before zooming resulting in 'alignment offsets'" [and teaches that] "[t]ypically, since the spatial offsets between wide image sensor array 110 and tele image sensor array 112 are fixed, the electronic calibration step is performed one time, after the manufacturing of the image

acquisition system and before the first use.” *Id.* at 28 (Ex. 1005 ¶ 44). Patent Owner argues that “Martin, on the other hand, teaches away from Golan with an ‘exemplary embodiment’ that uses ‘convergence points’ in the two camera images to determine alignment that would continue to work even if the position and orientation of the two cameras varied.” *Id.* (quoting Ex. 1006, 5:6–21).

Patent Owner further argues that “[s]ince both Golan and Martin rely on careful ‘sub-pixel’ alignment, these differences in alignment processing would be critical, and it would not be obvious to a POSITA which choice to use for a hypothetical combined embodiment.” *Id.* at 28. Patent Owner also argues “[a] POSITA would understand from Golan that its approach works better if the cameras can be as close as possible to minimize the differences in their points of view.” *Id.* at 27 (citing Ex. 1005 ¶ 22). Patent Owner further argues “Martin on the other hand *requires* ‘parallax images’ that a POSITA would understand as images captured from necessarily different points-of-view.” *Id.* (citing Ex. 1006, 3:56–60; Ex. 2001 ¶ 61).

Petitioner responds by distinguishing *Nichia*, arguing that “the relevant teachings of Golan and Martin address the same problem, and a relation between solutions of Golan and Martin was well-known and no alleged difference between the relevant teachings would require the alteration of Golan’s principles of operation or render Golan inoperable.” Pet. Reply 7 (citing *Nichia Corp.*, 855 F.3d at 1339; *Adidas AG*, 963 F.3d at 1358–159; Pet. 18–20; Ex. 1006, 2:49–50, 5:51–58). According to Petitioner, “for seamless transition between two images in continuous zoom video applications, when calibration between two cameras . . . is not sufficient alone . . . , image registration of two images from two imaging

sections (e.g., critical alignment of Martin) may be used for position matching.” Pet. 54–55 (citing Ex. 1007, 4:58–62; 10:2–5; Ex. 1014, 1:58–62; Ex. 1019, 1059; Ex. 1009 ¶¶ 41–42). Petitioner further contends that a “POSITA starting with Golan would have found it obvious to use Martin’s critical alignment including registration to provide improved seamless transition.” Pet. Reply 6 (citing Pet. 20–21).

We are not persuaded that Golan and Martin are “fundamentally dissimilar,” because Golan and Martin both involve parallax effects caused by two cameras with different fields of view and they both address a common problem—a discontinuity in images that are misaligned due to parallax from two different cameras—albeit in different contexts and with different techniques. *See* PO Resp. 23–31.

Martin also does not need to share a goal, objective, problem, or purpose in order to be combined with Golan. Golan and Martin are not incompatible with each other for having different objectives. *Intelligent Bio-Systems v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016). Even assuming, *arguendo*, that Golan discloses reducing a parallax and Martin discloses the *opposite* (i.e., creating or maintaining a parallax)—this is not necessarily fatal to the combination of these references. Nonetheless, one of the problems noted by each of the references *is* shared in common between Golan and Martin, as discussed in the preceding paragraph. Thus, Patent Owner’s “fundamentally dissimilar” argument does not undermine Petitioner’s contentions.

Patent Owner also argues that “these differences in camera configurations [between Martin and Golan] teach away from each other. PO Resp. 28. Patent Owner also argues that the ’898 patent “teaches away”

from parallax, which Martin depends on. *Id.* at 40 (citing Ex. 2001 ¶ 84; Ex. 1001, 7:50–53). “A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1332 (Fed. Cir. 2008) (quoting *In re Kahn*, 441 F.3d 977, 990 (Fed. Cir. 2006)).

We are not persuaded that the invention claimed in the ’898 patent or Golan teaches away from Martin because they do not discourage or lead one in a direction divergent from Martin’s teachings relevant to “evaluat[ing] if a no-switching criterion is fulfilled or not fulfilled . . .” as recited in claim 1. In addition to providing an autostereoscopic display of 3D images using parallax images, Martin also discloses aligning these same parallax images using transformation parameters. *See* Ex. 1006, 5:38–42. Thus, Martin’s teaching of critical alignment does not appear to be divergent from or incompatible with the scope of independent claim 1 *or* the objectives of the ’898 patent. Nor is Martin incompatible with Golan for having a different objective. Petitioner need not show that Martin shares a common objective with Golan or the patent at issue. *Intelligent Bio-Systems*, 821 F.3d at 1367. Thus, Patent Owner’s teaching away argument does not undermine Petitioner’s contentions.

Patent Owner also argues that although Martin is for autostereoscopic display, there is no evidence in the record of a camera utilizing autostereoscopic visual perception. PO Resp. 24–25. Patent Owner contends “a POSITA would recognize Martin as a display system patent intended for post-processing images for display, whereas Golan is an image

acquisition patent intended for pre-processing images in preparation for photographic image capture.” *Id.* Nevertheless, we determine that Patent Owner does not explain sufficiently in its Patent Owner Response why Martin’s critical alignment could not be used in Golan during image acquisition.

As discussed above, Petitioner, by contrast, presents evidence, i.e. Ahiska (Ex. 1007), that tends to show a relation between electronic calibration and registration for position matching. *See* Pet. 20–21 (citing-in-part Ex. 1007, 4:58–62, 10:2–5 (“If calibration between the master and slave cameras is insufficient alone, image registration or matching can be carried out . . .” and “transition[ing] between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function.”)). Dr. Durand also cites Ahiska, in addition to other references, to support his testimony. Ex. 1003 ¶ 52 (citing Ex. 1007, 4:58–62, 10:2–5; Ex. 1014, 1:58–62 (Orimoto patent) (describing “image registration on the side of the manufacturer . . . to obtain the three dimensional image without noticing misalignment of the plural images”); Ex. 1019, 1059 (Hansen article) (describing how extrinsic calibration errors occur due to shock, vibration, thermal variation and cycling); Ex. 1009 ¶ 52 (explaining that registration between wide image 204 and telephoto image 206 is an alternative to correspondences preferably determined at the time of manufacturing)).

Dr. Durand testifies that

It was well known in the art that for seamless transition between two images of different points of views in continuous zoom video applications, when calibration between two cameras (*e.g.*, the electronic calibration of Golan) is not sufficient alone (*e.g.*,

because of shocking, vibration, thermal variation, etc.), image registration of two images from two imaging sections for position matching (e.g., critical alignment of Martin) may be used.

Id. Dr. Durand’s testimony quoted above is supported by some of the cited references. The cited portion of Hansen (Ex. 1019) addresses how extrinsic calibration errors occur and “a method to recalibrate extrinsic parameters online to correct drift or bias.” Ex. 1019, 1059 (emphasis omitted). The cited portion Orimoto (Ex. 1014) concerns image registration, at the manufacturer’s end, to address misalignment of images. The quoted portion of Orimoto discloses how misalignment occurs, irrespective of “how exactly the dual lens camera has been conditioned and adjusted by the manufacturer.” Ex. 1014, 1:63–2:1. The cited portions of Border (Ex. 1009) address image registration as an alternative to correspondence (i.e., calibration). Ex. 1009 ¶¶ 41, 42. And the cited portions of Ahiska disclose image registration or matching, when calibration is insufficient, to provide a seamless transition between master and slave cameras and “create the quality of a continuous zoom function.” Ex. 1007, 4:58–62, 10:2–5.

Thus, Petitioner has shown sufficiently that one of ordinary skill would have chosen to use registration such as occurs in Martin, in the system of Golan during acquisition.¹⁸ Thus, Patent Owner’s pre- processing

¹⁸ Patent Owner asserts in its Sur-Reply that Petitioner’s statement that Patent Owner’s argument at pages 27–28 of the Patent Owner Response “would not have discouraged POSITA from applying Martin’s critical alignment teachings in Golan” incorporates a nine-paragraph, 1163-word discussion from Dr. Durand into the Petitioner’s Reply in violation of 37 C.F.R. § 42.6(a)(3)’s prohibition on incorporation by reference of arguments from expert declarations. PO Sur-Reply 6. We have reviewed

versus post-processing argument does not undermine Petitioner's contentions.

Patent Owner further argues that “the core problem with Petitioner’s argument for combining Golan and Martin involves a more basic question: ‘whether [a] skilled artisan would have plucked one reference out of the sea of prior art ... and combined it with conventional [] elements to address some need present in the field.’” PO Resp. 24, 29 (quoting *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1337 (Fed. Cir. 2016)) (alterations in original).

Petitioner responds that the evidence of record does not indicate that there was a “sea” of other image registration or position matching patents or literature to choose from; rather it was a finite pool including Martin and Ahiska. *See* Pet. Reply 6. Petitioner further argues that it is not required to show why it chose one reference, in this case, Martin, over another. *Id.* (citing *Infineum USA L.P. v. Chevron Oronite Co. LLC*, 2021 WL 210722, at *4 (Fed. Cir. 2021)). We are persuaded that the evidence of record does not indicate that there were several alternatives that a POSITA could have chosen instead of Martin so as to establish a “sea” or “ocean” as Patent Owner contends, nor has Patent Owner shown Petitioner is relying on the concept of “combining known element to yield predictable results” under which a finite number of alternatives may be required.¹⁹ *See Fanduel, Inc.*

the referenced section of the Reply and declaration and do not find that Petitioner violated the page limits or any other rules.

¹⁹ We do not suggest that this is required. *WBIP* was not concerned with showing that a particular reference could be found in the “sea.” Rather, *WBIP* pointed out that one must show a rationale to combine instead of assuming that “a person of skill, [has] two (and only two) references sitting on the table in front of him.” *WBIP*, 829 F.3d at 1337. In other words, one does **not** need to show that there is something about the references relied on

v. Interactive Games LLC, 966 F.3d 1334, 1346 (Fed. Cir. 2020) (“when the record shows a finite number of identified, predictable solutions to a design need that existed at the relevant time, which a person of ordinary skill in the art ha[d] a good reason to pursue, common sense can supply a motivation to combine”) (citations and internal quotation marks omitted, alteration in original).

We are further persuaded that Petitioner need not explain why it chose Martin over another reference with similar teachings, or why its combination is superior. *See Novartis Pharms. Corp. v. W.-Ward Pharms. Int’l Ltd.*, 923 F.3d 1051, 1059 (Fed. Cir. 2019) (“It is thus improper to require West-Ward to prove that a person of ordinary skill would have selected everolimus over other prior art treatment methods.”); *see also In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004) (“[O]ur case law does not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention.”). Thus, Patent Owner’s “sea” of references argument does not undermine Petitioner’s contentions.

Patent Owner also argues that Durand’s “analogous art” analysis is deficient because it fails to address whether Golan and Martin, separately, are “analogous” to the invention of the ’898 patent, because it instead “only

that is different than *all* other references in the sea *nor* does one need to show the sea is so small that the two references would be easily found (unless one is relying on combining known elements to yield predictable results). *See Yeda Rsch. v. Mylan Pharms. Inc.*, 906 F.3d 1031, 1044–45 (Fed. Cir. 2018) (associating “sea” of prior art argument with concept of “a finite number of identified, predictable solutions”).

asserted that Golan and Martin were ‘analogous’ because they are both in ‘the same field of endeavor.’” PO Sur-Reply 2.

Art is analogous when it is: (1) from the same field of endeavor as the claimed invention; and (2) if the art is not from the same field of endeavor, reasonably pertinent to the particular problem faced by the inventor. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). In its Petition, Petitioner compares Golan and Martin to each other instead of the claimed invention. *See* Pet. 17–18. In its Reply, Petitioner rectifies the improper comparison and asserts that Golan and Martin are in the same field of endeavor as the claimed invention: “pertaining to imaging systems including digital cameras generating video output images of the same scene from two imaging sections having different points of view.” Pet. Reply 3 (citing Pet. 19; Ex. 1005, Fig. 1, code (57), ¶¶ 9, 15, 36; Ex. 1006, Fig. 1, 3:6–13, 3:32–35; 5:51–55).²⁰ Also as discussed above, Petitioner asserts that Golan and Martin “are each pertinent to the problem addressed in the ’898 Patent, namely, achieving ‘a continuous, smooth zoom in video mode.’” *Id.* (citing Ex. 1040 ¶ 32; Ex. 1001, 3:16–17; Petition 18–19; Ex. 1005 ¶ 15; Ex. 1006, 5:51–55).

²⁰ Petitioner properly replied to Patent Owner’s criticism of its showing regarding analogous art. *Dynamic Drinkware, LLC*, 800 F.3d at 1379 (finding an *inter partes* review petitioner has both the “burden of persuasion to prove unpatentability” and also “the initial burden of production,” which “is a shifting burden, ‘the allocation of which depends on where in the process of trial the issue arises.’ The burden of production may entail ‘producing additional evidence and presenting persuasive argument based on new evidence or evidence already of record.’”); *see also Apple Inc. v. Qualcomm Inc.*, IPR2018-01245, Paper 39, 16 (PTAB Jan. 15, 2020) (citing *Drinkware* and finding a petitioner properly established a reference was analogous art for the first time in its Petitioner Reply).

We are persuaded that Golan is in the same field of endeavor as the claimed invention because Golan describes performing digital zoom using a wide image sensor array and lens and a tele image sensor array and lens with the goal of providing “continuous electronic zoom with uninterrupted imaging.” *See* Ex. 1005 ¶ 15. We are persuaded that Martin is reasonably pertinent to the problem faced by the inventor: reducing an image jump effect seen in video output images when switching between cameras that have different fields of view. Both Golan and Martin have multiple cameras with differing fields of view. Martin describes the problem in terms of its solution: “[c]ritical alignment corresponds to a condition where the degree of alignment is sufficient to achieve a stable auto stereoscopic display” and “[s]tability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable.” Ex. 1006, 5:53–58. Thus, Patent Owner’s analogous argument does not undermine Petitioner’s contentions.

As such, and for the foregoing reasons, we are persuaded that Petitioner’s rationale for combining Golan and Martin is supported by sufficient rational underpinning, based on the entirety of the record developed at trial. *See KSR*, 550 at 418.

Petitioner’s Rationale for Combining Golan, Martin, and Togo

Petitioner contends that a person of ordinary skill in the art would have been motivated to apply Togo’s teachings to Golan to “produce the obvious, beneficial, and predictable results of avoiding output image degradation when the quality of the telephoto image data would be degraded based on closeness of the subject as taught by Togo.” Pet. 29–30 (citing Ex.

1003 ¶¶ 49–54). Petitioner supports its contention with the following reasons.

First, “the references are analogous prior art and are in the same field of endeavor pertaining to digital zoom camera systems including a camera controller operatively connected to wide and tele lens systems.” *Id.* at 30 (citing Ex. 1003 ¶ 66).

Second, “the references share a need to provide output images of objects at various ranges with a compact imaging system.” *Id.* at 31–32 (citing Ex. 1003 ¶ 67).

Third, “Golan’s expressed desire to achieve ‘continuous electronic zoom with uninterrupted imaging, when switching back and forth between the first image sensor array and the second image sensor array’ would have motivated a POSITA to incorporate Togo’s teachings of a no-switching criterion based on a specific ‘setting magnification X’ and ‘photography distance Y’ of an object to be imaged.” *Id.* at 32 (citing Ex. 1005 ¶ 15; Ex. 1010 ¶¶ 2, 37, 49; Ex. 1003 ¶ 68).

Fourth, combining the teachings of Togo with the system of Golan “would have produced operable results that are predictable.” *Id.* at 32–33.

We are persuaded by Petitioner’s contentions that Golan’s expressed desire to achieve continuous electronic zoom with uninterrupted imaging, when switching back and forth between the first image sensor array and the second image sensor array would have motivated a person of ordinary skill in the art to incorporate Togo’s teachings of a no-switching criterion based on a specific ‘setting magnification X’ and ‘photography distance Y’ of an object to be imaged.

*Patent Owner's Arguments Regarding Petitioner's Rationale for
Combining Golan, Martin, and Togo*

Patent Owner argues “a POSITA reading Golan would not be motivated to combine it with Togo because the POSITA would not be aware from Golan of any issues regarding focus and subject depth. Ex. 2001, ¶67.” PO Resp. 32. Patent Owner asserts that Golan “assumes both images are always in perfect focus.” *Id.* Petitioner contends “POSITA would have understood the tele image degradation would be an issue for Golan, e.g., when capturing images of a subject at close distance in zoom-in operation using both Tele and Wide imaging system.” Pet. Reply 8 (citing Ex. 1040 ¶ 48). Further, Petitioner contends that a “POSITA would have understood that Golan includes embodiments that focus subjects at various distances, including at close distance and the infinite, and would be motivated to resolve any associated issues using teachings in the art.” *Id.* at 8–9 (Ex. 1040 ¶ 49; Ex. 1005 ¶ 17, claims 3, 17). We agree and thus, Patent Owner’s argument does not undermine Petitioners showing.

Patent Owner also argues because Togo requires parallel optical axes “when the imaging distance (Y) to the subject is long (several tens of m), center positions of the wide-angle image 17 and the telephoto image are substantially equal” and “a function of correcting the center positions of the wide-angle image and the telephoto image as in patent literature 3 is unnecessary. Ex. 1010, [0052].” PO Resp. 34 (citing Ex. 2001 ¶ 70; Ex. 1010 ¶¶ 18, 38) (internal quotations omitted). Patent Owner also argues “Martin teaches away from this requirement by specifying that ‘[a]dditionally, cameras **10 and 12 need not be in any special alignment configuration** to produce suitable parallax images for use with the present

invention.’ *Id.* (Ex. 1006, 3:64–67; Ex. 2001 ¶ 70).” Patent Owner also points to Martin’s teaching that “[previous] methods require the use of at least two ***carefully aligned*** cameras to capture images” and that alignment can be “cumbersome” and “difficult.” *Id.* at 34–35 (citing Ex. 1006, 2:19–59).

We do not agree with Patent Owner’s arguments, which are premised on a “physical” or “bodily” incorporation of limitations of one reference into the other. However, this is not the standard. *See In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) (“[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review.”). The relevant inquiry is whether the claimed subject matter would have been obvious to those of ordinary skill in the art in light of the *combined teachings* of those references. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981). “Combining the *teachings* of references does not involve an ability to combine their specific structures.” *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973). Rather than express obviousness as the physical incorporation of a structure from one reference into the structure of another reference, the prior art should be viewed as a combination of teachings from different sources, and the use of those teachings by one of ordinary skill in the art. *See KSR Int’l Co.*, 550 U.S. at 418 (the conclusion of obviousness can be based on the interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.)

Petitioner contends “Togo’s image-quality-based no-switching criterion teachings apply to the combination regardless of whether a distance

between cameras is close or whether optical axes are parallel.” Pet. Reply 10 (citing Ex. 1040 ¶ 52). Petitioner seeks only “to incorporate Togo’s teachings of a no-switching criterion based on a specific ‘setting magnification X’ and ‘photography distance Y’ of an object to be imaged.” Pet. 32 (citing Ex. 1005 ¶ 15; Ex. 1010 ¶¶ 2, 37, 49; Ex. 1003 ¶ 68). Thus, Patent Owner’s argument does not undermine Petitioners showing

For the foregoing reasons, we are persuaded that Petitioner’s rationale for combining Golan, Martin, and Togo is supported by sufficient rational underpinning. *See KSR*, 550 U.S. at 418. We are further persuaded that the cited evidence sufficiently supports Dr. Durand’s testimony.

Evidence of Secondary Considerations

Patent Owner presents evidence of secondary considerations of non-obviousness. PO Resp. 56–69. As to licensing, Patent Owner presents evidence in the form of emails and its litigation complaint to show that “the licensing discussions between Petitioner and Patent Owner lasted over many years.” *Id.* at 62. “Petitioner specifically asked Patent Owner for an ‘option to license all of Corephotonics IP’ in August 2016.” *Id.* Patent Owner further notes that Petitioner “specifically asked for information about smooth transition technology.” *Id.* (citing Ex. 2007; Ex. 2011; Ex. 2012). “The licensing discussions specifically would have encompassed the smooth transition technology,” and a license to ’898 patent. *Id.* These discussions, Patent Owner contends, establish “that there is a ‘nexus’ between the licensing negotiations between Patent Owner and Petitioner as [to] the claims of the ’898 patent challenged by Petitioner in this proceeding.” *Id.* at 62–63. Patent Owner also lists several companies that licensed Patent

Owner’s technology, and contends that this is “evidence of industry-wide respect for the patented technology.” *Id.* at 63–64 (citing Ex. 2001 ¶ 91).

As to industry praise, Patent Owner cites several articles that show it is an “industry leader in developing dual-camera designs and software technologies to power them.” *Id.* at 64–65.

Patent Owner asserts that the failure of others and “Petitioner’s copying of Patent Owner’s technologies, including the smooth transition techniques that Patent Owner demonstrated to Petitioner, is evidence of non-obviousness.” *Id.* at 68 (citing Ex. 2001 ¶ 150). Patent Owner presents arguments with respect to the failure of Golan and Border inventors to achieve what is disclosed by the ’898 patent. *Id.* at 66–69. Patent Owner also asserts: “[t]hat Petitioner copied the invention of the ’898 patent (among other Corephotonics technologies, which Petitioner also appears to have copied) is strongly implied by the course of conduct between the parties and the timing of Petitioner’s announcement of their own version of ‘smooth transition’ in their iPhone 7 series in Fall of 2016.” *Id.* at 68–69 (citing Ex. 2001 ¶ 150).

Analysis of Patent Owner’s Evidence of Secondary Considerations

Objective indicia of non-obviousness (also referred to as secondary considerations) may include long-felt but unsolved need, failure of others, unexpected results, commercial success, copying, licensing, industry praise, and expert skepticism. *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1379 (Fed. Cir. 2012). Objective indicia are “only relevant to the obviousness inquiry ‘if there is a nexus between the claimed invention and the [objective indicia of non-obviousness].’” *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017) (quoting *Ormco Corp. v. Align Tech., Inc.*, 463

F.3d 1299, 1312 (Fed. Cir. 2006)); *see also ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). As the Federal Circuit explained, “a patentee is entitled to a rebuttable presumption of nexus between the asserted evidence of secondary considerations and a patent claim if the patentee shows that the asserted evidence is tied to a specific product and that the product ‘is the invention disclosed and claimed.’” *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019), *cert. denied*, 141 S. Ct. 373 (2020) (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). That is, presuming nexus is appropriate “when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘embodies the claimed features, and is coextensive with them.’” *Id.* (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018)). On the other hand, the patentee is not entitled to a presumption of nexus if the patented invention is only a component of a commercially successful machine or process. *Id.* (reaffirming the importance of the “coextensiveness” requirement).

Applying *Fox Factory*, the Board uses a two-step analysis in evaluating nexus between the claimed invention and the evidence of secondary considerations. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33 at 33 (PTAB Jan. 24, 2020) (precedential). We first consider whether a patent owner has demonstrated “that its products are coextensive (or nearly coextensive) with the challenged claims,” resulting in a rebuttable presumption of nexus. *Id.* If not, that “does not end the inquiry into secondary considerations”; “the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the ‘direct result of the unique characteristics of the

claimed invention.”” *Id.* (quoting *Fox Factory*, 944 F.3d at 1373–75). Once a patent owner has presented a prima facie case of nexus, the burden of coming forward with evidence in rebuttal shifts to the challenger to adduce evidence showing that the objective indicia were due to extraneous factors other than the patented invention. *Demaco*, 851 F.2d at 1392–93.

With regard to the first step of an analysis under *Fox Factory*, Patent Owner’s evidence of secondary considerations is not tied to a specific product or technology that is disclosed and claimed in the ’898 patent, for the reasons discussed below. *See* Pet. Reply 24–25 (citing *Fox Factory*, 944 F.3d at 1374).

Patent Owner presents evidence of secondary considerations purporting to address at least: industry praise and licensing; commercial success; and failure of others and copying. *See* PO Resp. 56–69.

According to one of the emails submitted by Patent Owner, licensing negotiations with Petitioner involved not only the ’898 patent, but all patents in Patent Owner’s intellectual property portfolio. *Id.* at 62; Ex. 2010 (email chain between Corephotonics and Apple discussing an “option to license all of Corephotonics IP”). In the licensing context, the relevant inquiry is whether there is a nexus between the patent and the licensing activity itself, such that the factfinder can infer that the licensing “arose out of recognition and acceptance of the subject matter claimed” in the patent. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). To the extent that negotiations with Petitioner or any other licensee (*see* PO Resp. 63–64 (listing entities that have taken a license from Patent Owner)) were specific to the smooth transition technology Patent Owner mentions, Petitioner argues that “smooth transition’ [relied on by Patent Owner] refers to techniques used *when*

switching, in order to provide for a more seamless transition between the camera images” but, the “’898 claims recite evaluating a ‘non-switching criterion,’ to determine *whether to switch* between cameras, and depending on the evaluation, outputting the Wide image data or the Tele image data.” Pet. Reply 26 (citing PO Resp. 57–58; Ex. 1001, 5:27–34, 7:41–56, claims 1, 12). Petitioner further argues that “Patent Owner fails to even discuss, let alone prove, whether any usage of ‘smooth transition’ is actually a reference to the *claimed* technique or merely *unclaimed* techniques described as ‘smooth transition’ in the ’898 patent.” *Id.* (citing Ex. 1040 ¶ 107). For the reasons that follow, we find that Petitioner has the better position.

In the ’898 patent,

[a] “smooth transition” (ST) is a transition between cameras or POVs that minimizes the jump effect. This may include matching the position, scale, brightness and color of the output image before and after the transition. However, an entire image position matching between the sub-camera outputs is in many cases impossible, because parallax causes the position shift to be dependent on the object distance. Therefore, in a smooth transition as disclosed herein, the position matching is achieved only in the ROI region while scale brightness and color are matched for the entire output image area.

Ex. 1001, 7:46–56. At its broadest, “[a] ‘smooth transition’ . . . minimizes the jump effect,” and as disclosed in the ’898 patent, this encompasses position matching “only in the ROI region” and matching “scale brightness and color . . . for the entire output image area.” *See id.* In other patents in the continuity chain of the ’898 patent, “smooth transition” is similarly defined. *See* U.S. Patent No. 10,326,942 (“the ’942 patent,” 10:41–51). But this disclosure does not appear to address “evaluat[ing] if a no-switching criterion is fulfilled or not fulfilled, wherein if the no-switching criterion is

fulfilled in a zoom-in operation between a lower zoom factor (ZF) value and a higher ZF value at a zoom factor (ZF) higher than an up-transfer ZF, the camera controller is further configured to output a zoom video output image that includes only Wide image data, and wherein if the no-switching criterion is not fulfilled, the camera controller is further configured to output a zoom video output image that includes only transformed, digitally zoomed Tele image data,” as required by independent claim 1 and similarly required by independent claim 12 of the ’898 patent. That is, independent claim 1 recites a more specific invention than “smooth transition” as it is broadly defined in the ’898 patent.

As Patent Owner discloses “smooth transition” in multiple patents, it is not clear what inventions the term encompasses. *See, e.g.*, Ex. 1001, 7:46–56; ’942 patent, 10:41–51. Patent Owner’s arguments, too, appear to imply that the inventions disclosed in more than one patent are encompassed by smooth transition technology. *See generally* PO Resp. 58–65. The ’898 patent defines a smooth transition as a transition between cameras or POVs that minimizes the jump effect and teaches methods for achieving a smooth transition in video zoom mode, including position matching, to address the different spatial perspectives and viewing angles of each camera, as well as matching scale, brightness, and color. Ex. 1001, 7:46–56. With respect to the ’898 patent specifically, Dr. Hart testifies that its “central innovation” is the “reduction of the image discontinuity in video output seen when a multi-aperture camera switches from one sensor to another during the zooming process *using registration and* position matching.” Ex. 2001 ¶ 147 (emphasis added). Both Dr. Hart’s characterization of the ’898 patent’s “central innovation” and the recitations of claim 1 are more particular than

the broad definition of “smooth transition” in the ’898 patent. Patent Owner’s evidence of industry-wide praise and licensing, commercial success, as well as failure of others and copying is tied to, at its most specific, Patent Owner’s smooth transition technology, which is defined more broadly than the invention recited in claim 1 of the ’898 patent.

For example, as evidence of licensing negotiations, Patent Owner submits Exhibits 2011 and 2012, which discuss “Corephotonic’s technologies and intellectual property, including ‘software that fuses wide angle and telephoto video together,’ ‘sensor synchronization,’ ‘MIPI signaling and image processing requirements,’ and ‘image registration in GPU’” Not only are these areas of technology not limited to the invention recited in claim 1, it is not entirely clear how, aside from image registration, they even relate to it. Exhibit 2007 is an email chain discussing “a number of eleven ‘top level deliverables’.” Those top level deliverables are not limited to the invention recited in claim 1. Exhibit 2008 concerns smooth transitions and technical discussions between Petitioner and Patent Owner. For the reasons discussed above, evidence tied to Patent Owner’s smooth transition technology is not coextensive with the invention recited in claim 1 of the ’898 patent.

As industry praise, Patent Owner cites several articles describing it as a “leader in multi-camera technology,” “world-renowned leader in the mobile imaging space,” a “leading supplie[r]” and a “‘key player’ in the computational photography market.” PO Resp. 64. The praise is for Patent Owner, Corephonics, as a company, not the specific invention recited in claim 1 of the ’898 patent. Similarly, Patent Owner’s evidence of commercial success, which includes articles in Forbes.com, Globes.co.il,

and Engadget.com concerning Samsung’s purchase of Corephotonics, does not specifically address the invention recited in claim 1. *Id.* at 65–66.

As evidence of failure of others, Patent Owner points to Golan’s failure to “recognize the problem of discontinuities due to parallax which are present in such switching or the use of the position matching techniques and image registration techniques discussed in the ’898 patent.” *Id.* at 67 (citing Ex. 2001 ¶ 148). Patent Owner also points to Border’s purported failure to “recognize the need for a ‘continuous’ zoom or ‘smooth transition’ between sensors or,” “the need to provide a ‘continuous zoom video output.’” *Id.* at 67–68 (citing Ex. 2001 ¶ 149). We do not consider Golan’s and Border’s lack of disclosure on this specific problem, even if it is a failure to recognize the problem, sufficient evidence of failure of others to solve the problem. Failure of other requires “that, notwithstanding knowledge of the references, the art *tried and failed* to solve the problem.” *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1338 (Fed. Cir. 2016), *overruled on other grounds by Aqua Prod., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017) (emphasis added). Nevertheless, even if Patent Owner’s argument about Golan and Border is relevant, neither reference has been shown to support failure of others.

For the reasons discussed above, the evidence presented is not sufficiently tied to, or coextensive with, the invention of claim 1 in the ’898 patent in particular. We further determine that, presenting evidence that is tied to “smooth transition” instead of the invention recited in claim 1 as Patent Owner does, does not establish that any of the evidence is coextensive with the invention recited in claim 1 of the ’898 patent.

In view of step 1 of the analysis under *Fox Factory*, we move to step 2 and determine whether Patent Owner’s evidence of secondary considerations

is “the direct result of the unique characteristics of the claimed invention.” *Fox Factory*, 944 F.3d at 1373–75. Patent Owner is not entitled to a presumption of nexus where the relevant product embodies at least two patented inventions, and the burden remains on Patent Owner to show that the claimed secondary considerations were due to the invention claimed in the patent at issue here. *See Therasense, Inc. v. Becton, Dickinson and Co.*, 593 F.3d. 1289, 1299 (Fed. Cir. 2010).

Applying *Therasense*, the Federal Circuit explained that allowing a presumption in such a situation would not be “consistent with *Demaco*’s explanation that nexus cannot be presumed where, for example, ‘the patented invention is only a component of a commercially successful machine or process.’” *See Fox Factory*, 944 F.3d at 1377 (citing *Demaco*, 851 F.2d at 1392) (rejecting a patent owner’s “attempt to reduce the coextensiveness requirement to an inquiry into whether the patent claims broadly cover the product that is the subject of the evidence of secondary considerations”).

For reasons substantially similar to those discussed above, we determine that none of the evidence presented is “the direct result of the unique characteristics of the claimed invention,” because Patent Owner’s evidence is only as particular as discussing smooth transition technology, which we determine above is broader than and thus, not coextensive with the invention recited in claim 1 of the ’898 patent. *See Fox Factory*, 944 F.3d at 1373–75. It is further unclear that any of the industry-wide praise and articles resulted from the preeminence of the invention recited in claim 1 of the ’898 patent.

Because the same evidence of secondary considerations cannot be presumed to be attributable to two or more different features, Patent Owner retains the burden of proving the degree to which the evidence tied to “smooth transition” technology is attributable to the invention recited in the challenged claims. *Fox Factory*, 944 F.3d at 1378 (citing *Therasense*, 593 F.3d at 1299; *WMS Gaming, Inc. v. Int’l. Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999)); *see also Lectrosonics*, Paper 33 at 34–35.

Some of the exact same evidence and arguments submitted in the present proceeding has also been submitted in IPR2020-00905—Petitioner contends that “Patent Owner’s reliance on the same underlying allegations in other PTAB proceedings involving different patents of different scope casts considerable doubt on [Patent Owner’s] argument.” Pet. Reply 25 (citing IPR2020-00905, Paper 15 at 41 (contending that licensing discussions “specifically would have encompassed lens design and image fusion technology” in addition to smooth transition technology)). This is despite the fact that independent claim 1 of U.S. Patent No. 10,225,479 (“the ’479 patent) in IPR2020-00905 recites a different invention from that of the inventions recited in independent claims 1 and 12 of the ’898 patent. Independent claim 1 of the ’479 patent recites, *inter alia*, “a camera controller operatively coupled to the first and second AF mechanisms and to the Wide and Tele image sensors and configured to control the AF mechanisms and to process the Wide and Tele images to create a fused image.” Independent claim 23 of the ’479 patent recites substantially similar features. Neither claim includes “evaluat[ing] if a no switching criterion is fulfilled or not fulfilled” as in the inventions of claims 1 and 12 of the ’898 patent. The ’479 and the ’898 patents do not claim the same inventions. *See*

generally Fox Factory, 944 F.3d at 1377 (rejecting the argument that a presumption should exist where the two patents at issue are related). In this case, the '479 and '898 patents have claims that address different aspects of smooth transition technology.

We are not persuaded that Patent Owner has met its burden to establish a nexus between the merits of the claimed invention and the submitted evidence relating to industry-wide praise and licensing, commercial success, as well as failure of others and copying. Absent a nexus, we determine that Patent Owner's evidence of objective indicia does not weigh in favor of non-obviousness.

Summary — Claim 1

We have reviewed Petitioner's arguments, the supporting testimony provided by Dr. Durand, the cited portions of Golan, Martin, and Togo, and the other cited evidence and we are persuaded that the proposed combination teaches the limitations recited in independent claim 1 as set forth above. Petitioner's rationales for combining Golan and Martin and Golan, Martin, and Togo are set forth earlier in this Section, and are determined to be supported by sufficient rational underpinning for at least the reasons set forth above. Patent Owner's contentions regarding secondary considerations of non-obviousness are set forth above and, as discussed, do not weigh in favor of non-obviousness because Patent Owner has not established a nexus between the claimed invention and the cited evidence. For the foregoing reasons, we conclude Petitioner establishes unpatentability of independent claim 1 over Golan, Martin, and Togo by a preponderance of the evidence.

Accordingly, we are persuaded that Petitioner demonstrates the unpatentability of claim 1 over the combination of Golan, Martin, and Togo by a preponderance of the evidence.

5. *Independent Claim 12*

Independent claim 12 recites a method for providing a digital video output in a multiple aperture zoom digital camera similar to that recited in independent claim 1. Ex. 1001, 13:18–37.

Petitioner’s arguments for independent claim 13 refer, in large part, to its arguments for independent claim 1. *See* Pet. 58–59.

Patent Owner does not present separate arguments for independent claim 12. *See generally* Prelim. Resp. For substantially the same reasons discussed in section III.D.4, we are persuaded that Petitioner sufficiently demonstrates the unpatentability of claim 12 over the combination of Golan, Martin, and Togo by a preponderance of the evidence.

6. *Dependent Claim 4*

Claim 4, which depends from claim 1, further recites “[t]he camera of claim 1, wherein the no-switching criterion includes an effective resolution of the Tele image being lower than an effective resolution of the Wide image.” Ex. 1001, 12:54–56.

Patent Owner asserts that “a POSITA would understand the plain and ordinary meaning of ‘effective resolution,’ as illuminated by the ‘898 [patent] and its description of an ‘effective resolution score’ utilizing image analysis of image sensor data.” PO Resp. 41 (citing Ex. 2001 ¶ 88; Ex. 1001 at 6:4–24). Patent Owner essentially asks us to construe “effective resolution” as requiring calculation of an “effective resolution score” as defined in the Specification of the ’898 patent. Limitations in the

specification must not be read into the claims absent lexicography or disclaimer/disavowal. *Hill-Rom Services, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). We find neither lexicography nor disavowal here.

Petitioner responds to this implicit construction by contending that “the plain and ordinary meaning of ‘effective resolution’ means the degree of detail, which may be measured by image quality including blurriness and sharpness—a meaning supported by undisputed evidence.” Pet. Reply 17 (citing Pet. 56; Ex. 1017, 80–81; Ex. 1020, 7:15–17; Ex. 1003 ¶ 135). Petitioner relies on Jacobson (Ex. 1017), which determines resolution by calculating “resolving power,” and Shabatay (Ex. 1020), which defines resolution using “spatial frequencies.”

Neither party proposed a construction in its initial briefing for “effective resolution.” Petitioner has not explained how its construction of “effective resolution” as image quality including blurriness and sharpness is supported by resolving power and determining spatial frequencies as recited in Jacobson and Shabatay.

We decline to agree with Patent Owner’s implicit request to limit effective resolution to calculating an effective resolution score or with Petitioner’s implicit definition as resolving power involving special frequencies. There is no indication that the patentee intended to limit the claim in that way or redefine effective resolution to be something that can only be determined by an effective resolution score.

The effective resolution score in the ’898 patent does include a measure of sharpness, which tends to support Petitioner’s construction that sharpness and blurriness are a part of “effective resolution.” Ex. 1001, 6:20–

23 (“The effective resolution score can be derived from a combination of the sharpness scores and edge scores.”). We construe “effective resolution” as image quality including but not limited to blurriness and sharpness.

Petitioner relies on Togo’s disclosure doing a comparison based on blurriness and sharpness, but does not explain how the comparison would be done or on what calculations (or strict derivation) it would be based. Pet. 56 (citing Ex. 1010, code (57), ¶¶ 11, 12 (“telephoto imaging module with a long focal length is less sharp at close distances compared to a wide-angle imaging module whose focal length is short”), 57 (“a telephoto image 23 is blurry”), 50 (“Note that because image quality depends on a performance of a lens system that is used and the like, theoretically strict derivation is difficult.”)). Nevertheless, the patentee drafted the claim broadly to require only an “effective resolution” of one image to be lower than the effective resolution of another, rather than an effective resolution score lower than another image’s effective resolution score. Thus, we determine that Togo teaches the limitation of “an effective resolution of the Tele image being lower than an effective resolution of the Wide image.” *See id.* at 55–57.

We have reviewed Petitioner’s arguments and evidence concerning claim 4 and are persuaded that Petitioner sufficiently demonstrates by a preponderance of the evidence the unpatentability of this claim over the combination of Golan, Martin, and Togo. *See id.* at 55–57.

7. *Dependent Claims 8, 15*

Patent Owner does not present separate arguments for claims 8 and 15, which depend directly from claims 1 and 12 respectively. *See generally* PO Resp. We have reviewed Petitioner’s arguments and evidence concerning claims 8 and 15 and are persuaded that Petitioner sufficiently

demonstrates by a preponderance of the evidence the unpatentability of these claims over the combination of Golan, Martin, and Togo. *See* Pet. 57–58, 59.

E. Obviousness over Golan, Martin, Togo, and Levey

1. Overview of Levey (Ex. 1015)

Levey concerns digital cameras and automatically selecting a photography mode. Ex. 1015 ¶ 2. In Levey, a user can select between different photography modes by “single button activation,” instead of interacting with a multi-step menu selection process—this reduces the amount of user input required to select the photography mode. *Id.* ¶ 18.

2. Dependent Claim 9

Claim 9 depends from claim 8, which depends from claim 1. Claim 9 further recites “wherein the user inputs include a zoom factor, a camera mode and a region of interest.” Ex. 1001, 13:8–9.

According to Petitioner,

First, as discussed at [8.1], Golan teaches that the camera controller includes a user control module for receiving user inputs and a sensor control module for configuring each sensor to acquire the Wide and Tele image data based on the user inputs, where in the user inputs include a zoom factor. (APPL-1003), ¶157.

Second, Levey describes “a photography mode user interface for selecting between a plurality of photography modes,” and configuring its image sensor using associated image capture settings. (APPL-1015), Abstract, [0045], [0057], [0070][,][0039], [0041], [0070]-[0071]; (APPL-1003), ¶158.

Pet. 61–62 (emphases omitted). As one reason for combining Golan, Martin, and Levey, Petitioner contends that

a POSITA would have been motivated to incorporate Levey's teachings in the dual-aperture zoom digital camera of Golan combined with Martin to produce the obvious, beneficial, and predictable results of providing a plurality of camera modes "that can be selected by the user to control various elements of the image capture process and the image processing chain."

Id. at 60 (citing Ex. 1015 ¶ 4; Ex. 1003 ¶ 153).

A portion of Martin cited by the Petition describes that "while displaying the images, aligning **a user-selected region of interest** associated with the first image with a corresponding region of interest of the second image such that said region of interest of the first image occupies in the display the same location as the region of interest in the second image." Ex. 1006, 7:36–51 (emphasis added); Ex. 1003 ¶ 157. A portion of Levey cited by the Petition discloses that "[m]ost digital cameras have a variety of photography modes that can be selected by the user to control various elements of the image capture process and the image processing chain." Ex. 1015 ¶ 4. Levey further discloses determining "image capture settings such as the exposure index, the lens F/# [F number], the exposure time and the electronic flash setting, as well as other user settings 175, such as those discussed with reference to FIG. 2," with respect to an automatic mode. *Id.* ¶ 70. As an example, Levey discloses, in a portion cited by the Petition, that "if a user is capturing images at a soccer game, they would typically set the camera to operate in a sport photography mode" which "would generally choose appropriate image capture settings to minimize the motion blur associated with moving subjects." *Id.* ¶ 71.

Patent Owner argues because Levey uses a preview setting that is of lower quality "a POSITA would thus not be motivated to apply Levey's teaching to the task of selecting an appropriate lens based on a zoom setting

for use in the preview window.” Ex. 2001 ¶ 99. However, a portion of Levey cited in the Petition recites that the image sensor is actuated by a timing generator when capturing video images *and also* when previewing a still image. Ex. 1015 ¶ 39 (emphasis added). Patent Owner has not explained sufficiently why Levey is limited to a preview mode.

Patent Owner also argues Levey’s preview mode is not appropriate for “the task of selecting an appropriate lens based on a zoom setting. Claim 9 is not limited to the task of selecting an appropriate lens based on a zoom setting and Patent Owner has not explained sufficiently why claim 9 would be limited to such a task.

Patent Owner argues that a person of ordinary skill in that art would be familiar with photography. We analyze this claim under that level of skill and, below, without Patent Owner’s proposed familiarity with photography. Under that level of skill Patent Owner argues

a POSITA that had additional knowledge, skill and experience in photography would understand that for each and every individual example of a photography mode enumerated by Levey, the photographer may want to access multiple settings of the preview display for framing a shot. For example, each photography mode enumerated by Levey may be executed using a wide-angle or telephoto zoom setting, as the choice of photography mode is independent of the choice of framing.

PO Resp. 45 (citing Ex. 2001 ¶¶ 101–103; Ex. 2003). Patent Owner has not explained sufficiently why the distinction between framing and photography mode would mean that one of ordinary skill would not have wanted both options available on a dual lens camera. We are persuaded by Petitioner’s contention that one of ordinary skill would have been motivated to have both features. Pet. 60 (citing Ex. 1015 ¶ 4; Ex. 1003 ¶¶ 153–159).

Patent Owner also argues “Petitioner seeks to intermix Levey’s ‘photography mode’ with Levey’s ‘camera mode’ since Levey’s user input innovation is used to control *photography mode*, not *camera mode* as required by Claim 9.” PO Resp. 47. To the extent Patent Owner is correct that photography mode is different than camera mode, Patent Owner has not explained sufficiently how that difference would have prevented the use of Levey’s user input with camera modes. Thus, Patent Owner’s argument does not undermine Petitioner’s showing.

Patent Owner also argues “A POSITA would not necessarily be familiar with photography and would therefore not necessarily understand how settings involving the preview display used for framing shots would be related to the settings used for a ‘photography mode.’” *Id.* at 44–45. Again, regardless of one of ordinary skill’s knowledge of a preview display used for framing shots, he or she would either have recognized the photography modes as camera modes as claimed or recognized that Levey’s user input for adjusting photography modes could be combined with Golan’s and Martin’s user controls.

Patent Owner also repeats its argument that Martin involves post-acquisition activity and the ’898 patent involves pre-processing activity. Specifically, Patent Owner argues “the ’898 [patent] discloses the selection of a region of interest *before* the still image is acquired whereas Martin discloses the selection of a region of interest *after* the images used for autostereoscopic display have been acquired.” *Id.* at 48. We rejected this argument above at Section III.D.4. Nevertheless, the claims do not distinguish pre-acquisition and post-acquisition and Patent Owner has not explained sufficiently why pre-acquisition and post-acquisition are

incompatible such that they cannot be combined or undermine the reasons for combining presented by Petitioner. Thus, Patent Owner’s argument does not undermine Petitioner’s showing. We are persuaded by Petitioner’s contention that Martin describes that “aligning a user-selected region of interest associated with the first image with a corresponding region of interest of the second image.” Pet. 61–62 (quoting Ex. 1006, 7:36–51; citing Ex. 1003 ¶ 157).

We are persuaded that Golan discloses the user control module and the sensor control module in the claimed camera controller, Martin discloses “a user-selected region of interest,” and Levey discloses “wherein the user inputs include a zoom factor, a camera mode and a region of interest” based on the cited portions of Golan and Levey. We are persuaded also that Petitioner’s rationale for combining Golan, Martin, Togo, and Levey is supported by sufficient rational underpinning, based on the entirety of the record developed at trial. *See KSR*, 550 at 418. Accordingly, we are persuaded the combination of Golan, Martin, and Levey teaches the limitations recited in claims 9. Thus, we are persuaded that Petitioner has shown, by a preponderance of the evidence, the unpatentability of these claims over the combination of Golan, Martin, Togo and Levey.

F. Obviousness over Golan, Martin, Togo, and Border

1. Overview of Border (Ex. 1009)

Border describes providing a digital camera with an extended zoom range without unduly increasing the size or cost of the digital camera “while providing good perceived image quality throughout the zoom range.” Ex. 1009 ¶ 10. As shown in Figure 5 of Border, reproduced below, the processor of a digital camera includes an image compositor 202 to form a

composite image 208 using the two images, wide image 204 and telephoto image 206 of the same scene, that are captured using lenses having different focal lengths. *Id.* ¶ 70.

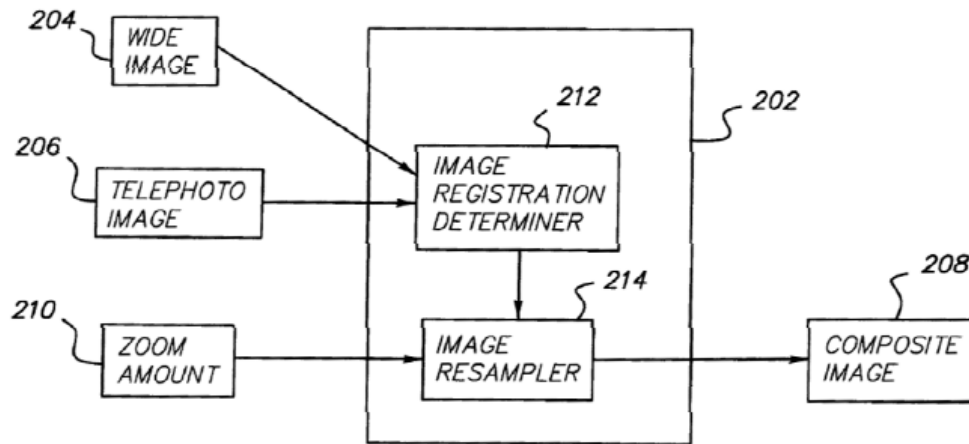


FIG. 5

As seen in Figure 5, above, the image registration determiner 212 determines the registration between the wide image 204 and the telephoto image 206, so that the two images are matched to “locate the high-resolution image accurately into the low-resolution image and then stitched into place so the edge between the two images in the composite image is not discernible.” *Id.* ¶ 29, Fig. 5. Border goes on to explain that in the context of Figure 5, telephoto image 206 captures a smaller portion of the scene, but with greater resolution than wide image 204. *Id.* ¶ 36.

Border also describes that an image resampler 214 of the processor produces the composite image 208 based on a zoom amount Z specifying the desired relative zoom amount of the produced composite image 208. *Id.* ¶ 43. Specifically, Border explains that the composite image 208 is generated from the two images and that the resulting composite image is produced differently for different zoom amount values, such as $Z=1$,

$1 < Z < M$, and $Z = M$, where M is the relative magnification ratio M of the telephoto image 206 to the wide image 204. *Id.* ¶¶ 29, 44.

2. *Dependent Claims 11 and 19*

Claim 11, which depends from claim 1, further recites “wherein the camera controller is further configured to combine in still mode, at a predefined range of ZF values, at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view.” Ex. 1001, 13:13–17. Claim 19, which depends from claim 12, further recites essentially the same features. *Id.* at 14:26–30.

According to Petitioner,

Border describes providing a digital camera include lenses having different focal lengths for an extended zoom range without unduly increasing the size or cost of the digital camera “while providing good perceived image quality throughout the zoom range.”

As shown in Figure 5 of Border. . . , the processor of the digital camera includes an image compositor 202 to form a composite image 208 using the two images, wide image 204 and telephoto image 206.

Pet. 63 (citing Ex. 1003 ¶¶ 162–165) (citations omitted). Petitioner contends that

[a] POSITA would have been motivated to apply Border’s teachings of combining in still mode, at a predefined range of ZF values, at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view in the digital camera of Golan combined with Martin and Togo to achieve the benefit of ‘a zoomed image with high resolution throughout the zoom range and improved image quality’ in still mode as taught by Border.

Id. at 64 (citing Ex. 1009, code (57); Ex. 1003 ¶¶ 166–169). Petitioner contends that in its combination

Golan's zoom control sub-system 100 (as applied in combination with Martin and Togo) is adapted to apply Border's teaching of still mode operation in which wide image and telephoto image are combined, which for zoom amounts between 1 and M (a relative magnification ratio of Tele image to Wide image), uses registration information to transform coordinates of the telephoto image to the wide image and produces a composite image having the point of view of the wide image.

Id. at 70.

Patent Owner argues that none of Golan, Togo, and Border creates a fused image from a particular point of view. PO Resp. 49–50. Patent Owner does not offer a construction of the term “point of view.” Patent Owner implies that “distortion” is required to change a point of view. *Id.* Patent Owner has not cited to evidence explaining sufficiently what distortions are required or why translation and rotation are not enough to change a point of view. We are persuaded by Petitioner's contention that Border teaches using registration information to transform coordinates of the telephoto image to the wide image and produces a composite image having the point of view of the wide image.²¹

Patent Owner also does not offer a construction for the term “fused.” Patent Owner argues that Border results in an image “consist[ing] of a quadrilateral portion from the telephoto point of view surrounded by a

²¹ In an appeal of a related IPR, a similar argument regarding whether a related patent required resolving occlusions cause by different points of view was rejected by the Federal Circuit *Apple Inc. v. Corephotonics Ltd.*, IPR2018-01133, Paper 34 (PTAB Dec. 2, 2019), *aff'd* 857 F. App'x 641 (Fed. Cir. 2021) (nonprecedential). That similar argument was based in part on the essentially the same “rectification” and/or distortion process argued by Patent Owner in this IPR. *Id.*

remaining image portion from the wide-angle point of view.” *Id.* at 50. Even if we agree with Patent Owner’s characterization of Border, Patent Owner has not explained sufficiently how such a combination of the Wide and Tele images would not be considered as being from the Wide point of view based on the transformation of coordinates that was done. *See* Pet. 70.

Patent Owner also suggests that “fus[ing]” as claimed requires “rectification” as shown in Figure 3C of the ’898 patent and excludes any parallax. PO Resp. 51–53. Patent Owner implicitly argues that a limitation to rectification should be read into the claims. Notwithstanding the importance of a specification, limitations in the specification must not be read into the claims absent lexicography or disclaimer/disavowal. *Hill-Rom Services, Inc.*, 755 F.3d at 1371. Thus, absent a clear disavowal or alternative lexicography by a patentee, he or she “is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1367 (Fed. Cir. 2012).

We decline to require the rectification process in order to fuse two images to a particular point of view as claimed. *See* Pet. Reply 21. Thus, Patent Owner’s argument does not undermine Petitioner’s showing. We are persuaded by Petitioner’s reliance on Border’s use of registration information to transform coordinates of the telephoto image to the wide image and produce a composite image having the point of view of the wide image. *See* Pet. 70.

We have reviewed the cited portions of Border and are persuaded the combination of Golan, Martin, Togo, and Border teaches the limitations recited in claims 11 and 19. We are further persuaded that Petitioner’s

rationale for combining Golan, Martin, Togo, and Border is supported by sufficient rational underpinning. Accordingly, we are persuaded Petitioner has shown, by a preponderance of the evidence, the unpatentability of these claims over the combination of Golan, Martin, Togo and Border.

G. Obviousness over Golan, Martin, Togo, and Parulski

1. Overview of Parulski (Ex. 1008)

Parulski concerns “a digital camera that uses multiple lenses and image sensors to provide an improved imaging capability.” *See, e.g.*, Ex. 1008, 1:8–10. In one embodiment, an image capture assembly can be a digital camera that includes two image capture stages. *See id.* at 12:36–45. The two image capture stages can be used to separately capture images of the same scene so that one image capture stage can be used for autofocus and other purposes, and the other is used for capturing an image. *Id.* at 8:9–13. This allows for improved imaging capability without unduly increasing the size or cost of the digital camera. *Id.* at 8:13–16. In one example, the image capture assembly can include a fixed focal length wide angle lens and a fixed focal length telephoto lens. *Id.* at 23:28–40. An image processor that “may provide digital zooming between the wide angle and the telephoto focal lengths; the user may initiate such zooming via a user interface” *Id.* at 23:54–56.

2. Dependent Claims 10 and 20

Claim 10, which depends from claim 1, further recites “wherein the Tele lens includes a ratio of total track length (TTL)/effective focal length (EFL) smaller than 1.” Ex. 1001, 13:10–12.

Petitioner contends “[a] POSITA would have understood that Golan’s tele lens 120 is a telephoto lens, which by definition, has a telephoto ratio smaller than 1 (‘less than unit’).” Pet. 76 (citing Ex. 1003 ¶ 189). Petitioner further contends that to the extent that Patent Owner argues that Golan does not explicitly describe tele lens 120 as a telephoto lens as claimed, it would have been obvious to a POSITA to implement Golan’s tele lens 120 with “a fixed focal length **telephoto lens**” having TTL/EFL smaller than 1 as taught in Parulski for the benefit of a “very small figure.” *Id.* at 77 (citing Ex. 1008, 23:38, 24:20–21; Ex. 1003 ¶ 190).

As rationale for combining, Petitioner contends that a POSITA would have been motivated to apply Parulski’s teachings of, in still mode, combining Wide and Tele image data only in focused areas to generate a fused output image in the system of Golan combined with Martin and Togo for the benefit of a fused output image having a broadened depth of field, at a predefined range of ZF values (e.g., the large lossless zooming range described in Golan) in such a digital camera. *Id.* at 74 (citing Ex. 1008, 28:52–53, 29:4–7, 30:17–20; Ex. 1003 ¶¶ 181–185).

Patent Owner argues

Petitioner confuses the fusion disclosed by Golan, used to fuse the color of a low-resolution image with the detail of a high-resolution monochromatic image, with block 514 of Parulski that uses an “enhancement signal” to “sharpen portions of the primary still image that are positioned near the secondary focus distance.” Ex. 2001, ¶122; Ex. 1003, ¶185; Ex. 1008, 22:40-42. Parulski lacks sufficient disclosure for a POSITA to understand what source of “enhancement signal” was available from the combination of Golan, Martin and Togo. Togo estimates the distance to the subject, but this distance is a single value for the entire pair of wide-angle and telephoto images and does not

indicate which pixels from which image should be used. Ex. 2001, ¶122.

PO Resp. 53–54. As to Golan and Parulski, Petitioner contends a person of ordinary skill “would have been motivated to apply Parulski’s teachings of still mode fusion to a still mode of Golan, while in video mode, maintaining Golan’s design choice of video switching (e.g., for the benefit of reduced computation power of video switching over video fusion).” Pet. Reply 21–22 (citing Pet. 74) (emphasis omitted). We agree and adopt and rely on Petitioner’s contentions explained above. As to Togo’s estimate of distance and Border’s enhancement signal, we do not find this argument persuasive because it is directed to bodily incorporation and not to what the combined teachings would have suggested to one of skill in the art. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); Pet. Reply 22.

We are persuaded that the cited portions of Golan, Martin, Togo, and Parulski teach the limitations recited in claim 10. We are also persuaded that the ordinarily skilled artisan would have combined Golan, Martin, and Parulski.

Claim 20, which depends from claim 12, further recites “the step of configuring the camera controller to combine in still mode, at a predefined range of ZF values, at least some of the Wide and Tele image data to provide a fused output image includes configuring the camera controller to combine Wide and Tele image data only in focused areas.” Ex. 1001, 14:31–36.

Petitioner contends that “Golan’s zoom control sub-system 100 (as applied in combination with Martin and Togo in claim 12) is adapted to apply Parulski’s teaching of still mode operation in which wide image and telephoto image are combined only in focused areas, which for a

predetermined lossless zooming range, produces a fused output image having a broadened depth of field.” Pet. 80 (citing Ex. 1003 ¶¶ 192–196). We are persuaded that the cited portions of Golan, Martin, Togo, and Parulski teach the limitations recited in claim 20.

Patent Owner also argues that it would require “undue experimentation” to combine the references because “Parulski does not disclose this ‘enhancement signal,’ nor does Parulski disclose how this enhancement signal is used to sharpen pixels in the primary still image.” PO Resp. 55. To the extent that Patent Owner argues that Border is not enabled, “[i]n general, a prior art reference asserted under § 103 does not necessarily have to enable its own disclosure, i.e., be ‘self-enabling,’ to be relevant to the obviousness inquiry.” *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1380 (Fed. Cir. 2021).

Additionally, we do not find Patent Owner’s argument regarding combining the enhancement signal of Parulski with Golan and Martin persuasive because it is directed to bodily incorporation and not to what the combined teachings would have suggested to one of skill in the art. *In re Keller*, 642 F.2d at 425; Pet. Reply 23. As to the feasibility of the combination, we credit Dr. Durand’s testimony that the combination would have been within the ordinary skill in the art. Ex. 1003 ¶¶ 192–196; Ex. 1040 ¶ 101.

Patent Owner also argues

Parulski[’s] “broadened depth of field” that Petitioner points to addresses an entirely different issue than the one addressed and required by Claim 20. Ex. 2001, ¶129. In light of the specification, a POSITA would understand Claim 20 “focus” in the context of “[t]he ROI is the region of interest on which both cameras are focused on.” Ex. 1001, 6:50-51. This region of

interest is used specifically for the fusion of Wide and Tele images. "... [T]he position matching is achieved only in the ROI region while scale brightness and color are matched for the entire output image area." *Id.* at 7:54-56. A POSITA would understand Claim 20 "to combine ... *at least some* of the Wide and Tele image data to provide a *fused* output image includes configuring the camera controller to *combine Wide and Tele image data only in focused areas*" (emphasis added). In other words, a POSITA reading claim 20 in light of the '898 specification would understand the requirement to only fuse (transform to the same point of view) the same portion of the Wide and Tele images only where *both* were in focus. Dr. Durand uses Parulski to show how one might combine portions of images together where *either* was in focus. Ex. 2001, ¶129.

PO Resp. 55–56. Petitioner responds

PO's reliance upon "position matching [] achieved only in the ROI region" (POR, 56) is inapposite because that description is for "Video Mode Operation/Function," not for still mode as claimed. (APPL- 1001), 7:40-56. On the contrary, the '898 Patent describes under "**Still Mode** Operation/Function" that image processing "fuses the wide and the Tele images to...**provide wide dynamic range**," (APPL-1001), 7:14-30, which is consistent with the issue addressed by Parulski's fusion to provide 'broadened depth of field.' APPL-1040, ¶102.

Pet. Reply 23 (alterations in original). We agree with Petitioner that Petitioner's contentions in the Petition rely on the still mode function and thus, Patent Owner's argument does not undermine Petitioner's showing.

For the foregoing reasons, we are persuaded the combination of Golan, Martin, and Parulski teaches the limitations recited in claims 10 and 20. We are further persuaded that Petitioner's rationale for combining Golan, Martin, Togo, and Parulski is supported by sufficient rational underpinning. Accordingly, Petitioner has shown by a preponderance of the

evidence the unpatentability of these claims over Golan, Martin, Togo, and Parulski.

IV. CONCLUSION

For the foregoing reasons, we conclude that Petitioner has established unpatentability of: claims 1–4, 8, 12, and 15 over Golan, Martin, and Togo; claim 9 over Golan, Martin, Togo, and Levey; claims 11 and 19 over Golan, Martin, Togo, and Border; and claims 10 and 20 over Golan, Martin, Togo, and Parulski.²² Our conclusions regarding the challenged claims are summarized below:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–4, 8, 12, 15	103	Golan, Martin, Togo	1–4, 8, 12, 15	
9	103	Golan, Martin, Togo, Levey	9	
11, 19	103	Golan, Martin, Togo, Border	11, 19	
10, 20	103	Golan, Martin, Togo, Parulski	10, 20	

²² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
Overall Outcome			1, 4, 8–12, 15, 19, 20	

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 4, 8–12, 15, 19, and 20 of the '898 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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