

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

COREPHOTONICS, LTD.,
Patent Owner.

IPR2020-00487
Patent 9,661,233 B2

Before BRYAN F. MOORE, GREGG I. ANDERSON, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

ULLAGADDI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Dismissing Petitioner's Motion to Exclude

35 U.S.C. § 318(a), 37 C.F.R. § 42.64

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–18 (“the challenged claims”) of U.S. Patent No. 9,661,233 B2 (Ex. 1001, “the ’233 patent”). Paper 2 (“Pet.”). Corephotonics, Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 6. With the Board’s authorization, Petitioner filed a Reply (Paper 7) to Patent Owner’s Preliminary Response, and Patent Owner thereafter filed a Sur-Reply (Paper 8).

We initially concluded that Petitioner failed to establish a reasonable likelihood of prevailing in demonstrating that the challenged claims are unpatentable. Paper 9 (“Decision Denying Institution” or “DDI”). Specifically, we concluded that Petitioner’s rationale for combining Golan and Martin was not sufficiently supported by a rational underpinning. Dec. 26 (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)). Accordingly, we declined to institute trial on the challenged claims of the ’233 patent. *Id.*

Petitioner filed a request for rehearing (Paper 10, “Rehearing Request” or “Reh’g Req.”) of our Decision Denying Institution. We granted that request and instituted trial (Paper 13, “Institution Decision” or “Inst. Dec.”) on all challenged claims on all grounds set forth in the Petition. Patent Owner filed a Response (Paper 16, “Patent Owner Response” or “PO. Resp.”).¹ Petitioner filed a Reply (Paper 25, “Petitioner’s Reply” or “Pet.

¹ We cite to the sealed version of Patent Owner’s Response (Paper 16). The public version is Paper 48.

Reply”).² Thereafter, Patent Owner filed a Sur-Reply (Paper 33, “Patent Owner Sur-Reply” or “PO Sur-Reply”).

An oral hearing was held on August 5, 2021, during which evidence of secondary considerations was argued, and a public transcript (Paper 53, “Tr.”) and a confidential transcript (Paper 54, “Conf. Tr.”), were entered in the record.

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision 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 1–18 of the ’233 patent are unpatentable.

II. BACKGROUND

A. *Related Proceedings*

Petitioner and Patent Owner identify the following district court proceeding involving the ’233 patent: *Corephotonics Ltd. v. Apple Inc.*, Case No. 5:19-cv-04809 (N.D. Cal.). Pet. 2; Paper 5, 1.³

We identify the following related administrative matters, including every application and patent claiming the benefit of the priority of the filing

² We cite to the sealed version of Petitioner’s Reply (Paper 25). The public version is Paper 44.

³ Patent Owner cites *Corephotonics, Ltd. v. Apple Inc.*, Case No. 3:19-cv-04809-LHK (N.D. Cal.) (Paper 6, 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.

date of the '233 patent. *See* Office Consolidated Trial Practice Guide⁴ at 18; *see also* 84 Fed. Reg. 64,280 (Nov. 21, 2019):

U.S. Patent No. 9,185,291 B1 (IPR2018-01348, Institution Denied);
U.S. Patent No. 10,015,408 B2 (IPR2020-00488, Institution Denied),
(IPR2020-00489, Final Written Decision Issued, Pending Rehearing
Request, Pending Precedential Opinion Panel (POP) Decision);
U.S. Patent No. 10,326,942 B2 (IPR2020-00860, Instituted, Final
Written Decision Pending);
U.S. Patent No. 10,225,479 B2 (IPR2020-00905, IPR2020-00906,
Both Instituted, Final Written Decisions Pending);
U.S. App. No. 16/198,181 (Pending at Institution of the Present
Proceeding, now U.S. Patent No. 10,904,444, issued on January 26, 2021);
and
U.S. App. No. 16/368,222 (Pending at Institution of the Present
Proceeding, now U.S. Patent No. 10,841,500, issued on November 17,
2020).

A. The '233 Patent

The '233 patent concerns a dual-aperture zoom digital camera that operates in both still and video modes. Ex. 1001, code (57). The camera includes a Wide sub-camera and a Tele sub-camera, each of which includes a fixed focal length lens, an image sensor, and an image signal processor. *Id.* at 3:30–33. Figure 1A, reproduced below, illustrates a dual-aperture zoom imaging system, which is also referred to as a digital camera. *Id.* at 5:57–58, 6:14–17.

⁴ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>

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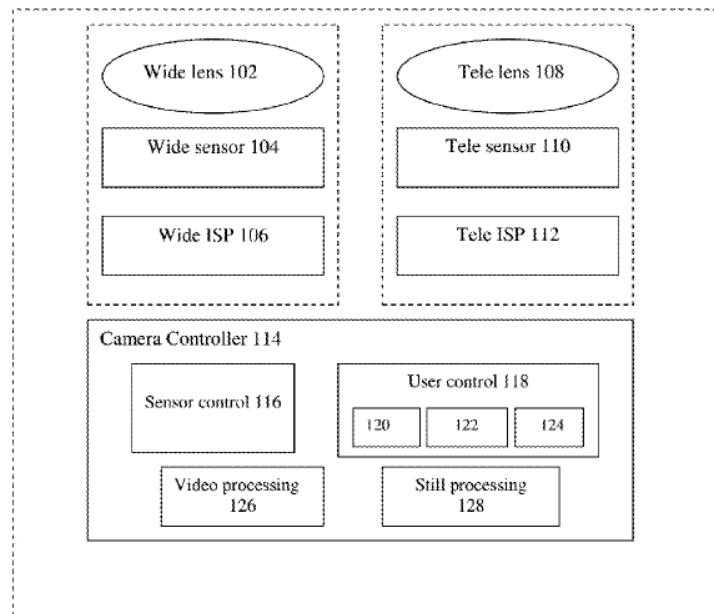


FIG. 1A

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

In still mode, the '233 patent discloses performing zoom by either fully or partially fusing Wide and Tele images, where a fused image includes information from both Wide and Tele images. *Id.* at 3:42–45. In video mode, however, the '233 patent discloses performing optical zoom by switching between Wide and Tele images—i.e., without fusion—in order “to shorten computation time requirements, thus enabling high video rates.” *Id.* at 3:49–52. The invention uses the Wide sub-camera output for a low zoom factor (“ZF”) and the Tele sub-camera output for a high ZF. *Id.* at 11:8–24.

Typically, a user sees a jump, or discontinuous image change, when the camera switches between sub-camera output images. *Id.* at 10:32–34. The '233 patent addresses this issue by employing a “smooth transition,” which “is a transition between cameras or POVs that minimizes the jump effect,” and which “may include matching the position, scale, brightness and color of the output image before and after the transition.” *Id.* at 10:36–40.

Although “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,” a smooth transition may achieve position matching “only in the [region of interest (‘ROI’)] while scale brightness and color are matched for the entire output image area.” *Id.* at 10:40–46.

B. Challenged Claims

Petitioner challenges claims 1–18 of the ’233 patent. Claims 1 and 10 are independent. Independent claims 1 and 10 are reproduced below.

1. A multiple aperture zoom digital camera, comprising:
 - a) a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (POV), the Wide imaging section operative to output a Wide image;
 - b) a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele POV that is narrower than the Wide POV, the Tele imaging section operative to output a Tele image; and
 - c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured to reduce an image jump effect seen in video output images and to provide continuous zoom video output images by executing registration between the Wide and Tele images for performing position matching to the video output images when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa.
10. A method for providing video digital output in a multiple aperture zoom digital camera, comprising steps of:
 - a) providing a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (FOV), the Wide imaging section operative to output a Wide image;

b) providing a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, the Tele imaging section operative to output a Tele image; and

c) utilizing a controller for reducing an image jump effect seen in video output images and for providing continuous zoom video output images, by executing, with the help of the controller, registration between the Wide and Tele images for performing position matching to the video output images when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa.

Ex. 1001, 13:18–35; 14:12–29.

C. Asserted Ground of Unpatentability

Petitioner asserts that claims 1–18 would have been unpatentable as follows. *See* Pet. 7.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–4, 7, 10–13, 16	103	Golan, ⁵ Martin
5, 6, 14, 15	103	Golan, Martin, ⁶ Ahiska ⁷
8, 17	103	Golan, Martin, Levey ⁸
9, 18	103	Golan, Martin, Parulski ⁹

In support, Petitioner relies on the First and Second Declarations of Dr. Frédo Durand (Exs. 1003, 1040). Patent Owner relies on the Declaration of Dr. Eli Saber (Ex. 2015).

⁵ U.S. Patent Application Publication No. 2012/0026366 A1, published Feb. 2, 2012 (Ex. 1005, “Golan”).

⁶ U.S. Patent No. 8,081,206 B2, issued Dec. 20, 2011 (Ex. 1006, “Martin”).

⁷ U.S. Patent No. 7,990,422 B2, issued Aug. 2, 2011 (Ex. 1007, “Ahiska”).

⁸ U.S. Patent Application Publication No. 2012/0019704 (Ex. 1015, “Levey”).

⁹ U.S. Patent No. 7,859,588 B2, issued Dec. 28, 2010 (Ex. 1008, “Parulski”).

III. ANALYSIS

A. *Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented and the prior art are such that the subject matter 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 said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when presented, objective evidence of nonobviousness, 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) (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. v. 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 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.

Pet. 5. Petitioner supports its contention with the testimony of Dr. Durand. Ex. 1003 ¶ 17. Patent Owner “adopts Petitioner’s definition of the level of ordinary skill. . . .” PO Resp. 7 (citing Pet. 3; Ex. 2015 ¶¶ 31–33).

The level of ordinary skill in the art proposed by Petitioner is consistent with the ’233 patent and the asserted prior art. Where pertinent, we apply Petitioner’s definition in making the findings and conclusions rendered in this Decision.

C. Claim Construction

We apply the same claim construction standard used by Article III federal courts and the International Trade Commission (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) (2019). Accordingly, we construe each challenged claim of the ’233 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.*

“reduce an image jump effect seen in video output images”

Claim 1 recites “a camera controller operatively coupled to the Wide and Tele imaging sections and configured to reduce an image jump effect seen in video output images.” Ex. 1001, 13:27–29. Claim 11 recites “utilizing a controller for reducing an image jump effect seen in video output images.” *Id.* at 14:22–23. Petitioner contends “a POSITA would have

understood ‘*reduce an image jump effect seen in video output images*’ to mean “reduce a discontinuous image change in video output images.” Pet. 6 (citing Ex. 1003 ¶¶ 41–43). Petitioner asserts the Specification supports this proposed construction. *Id.* (citing Ex. 1001, 10:30–40).

Patent Owner “adopts, for this IPR proceeding only, Petitioner’s proposed construction for the phrase ‘reduce an image jump effect seen in video output images’ and appl[ies] it in [its] analysis herein.” PO Resp. 8 (citing Ex. 2015 ¶¶ 34–36).

We do not discern a dispute between the parties regarding this limitation and we need not expressly construe this 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 and Martin

Petitioner contends claims 1–4, 7, 10–13, and 16 are unpatentable under 35 U.S.C. § 103 over Golan and Martin. Pet. 13–53.

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 image 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 Figure 1,

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

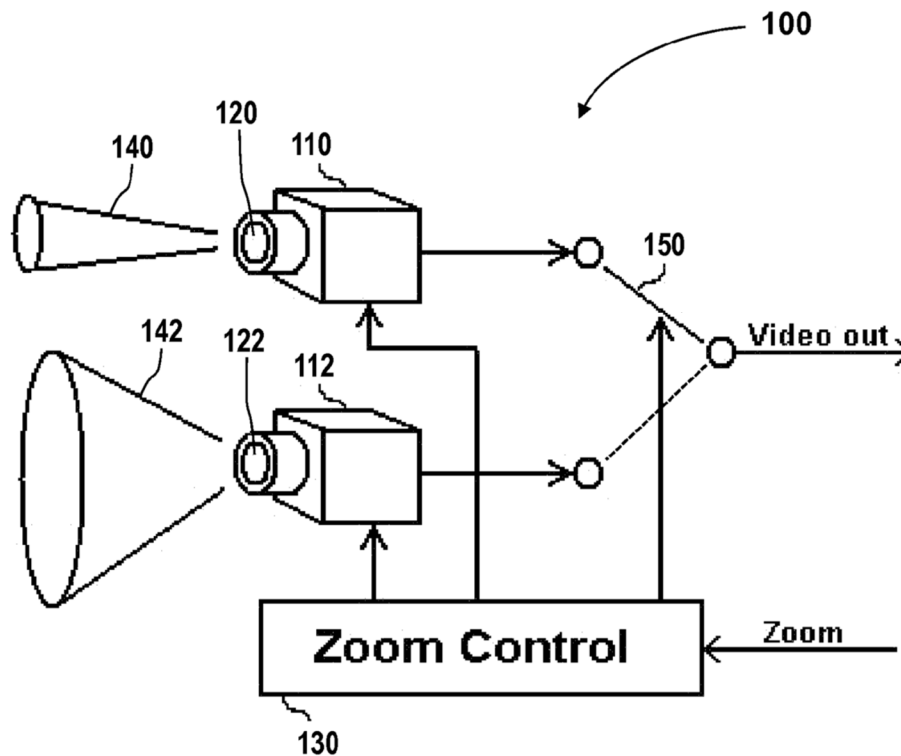


Fig 1

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 module 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.

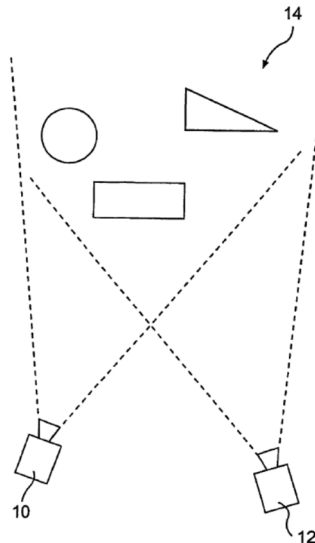
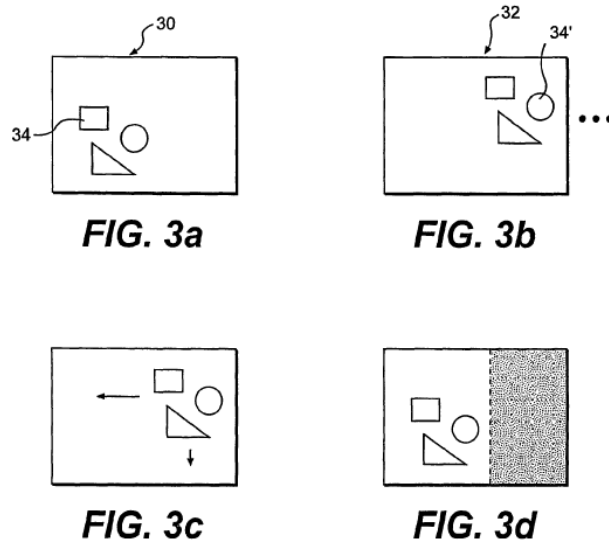


FIG. 1

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

According to Martin, “camera 10 may capture a first set of images and [] camera 12 may capture a second set of images of [] 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. *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.

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

Martin discloses that a computer may align the images using convergence points in the reference image and unaligned image. *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 5:11–21. 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. *Analysis of Independent Claim 1*

Claim 1 recites, “[a] multiple aperture zoom digital camera, comprising”

Petitioner contends that Golan teaches “a zoom digital imaging system with multiple imaging devices each defining an aperture for capturing a digital image.” Pet. 20 (citing Ex. 1005, code (54), ¶¶ 3, 9; Ex. 1003 ¶ 61).

*“a) a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (POV), the Wide imaging section operative to output a Wide image;
b) a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele POV that is narrower than the Wide POV, the Tele imaging section operative to output a Tele image; and”*

Petitioner argues Golan's Figure 1 discloses an embodiment with "a zoom control sub-system 100, which includes 'a tele image sensor 110 coupled with a narrow lens 120 . . . a wide image sensor 112 coupled with a wide lens 122 . . . a zoom control module 130 and an image sensor selector 150.'" *Id.* at 21 (quoting Ex. 1005 ¶¶ 37, 39) (citing Ex. 1003 ¶ 62) (emphasis omitted). Petitioner argues that "[i]n Golan's image acquisition system, each of the Wide imaging device (including wide image sensor 112 and wide lens 122) and the Tele imaging device (including tele image sensor 110 and narrow lens 120) defines an aperture for generating a corresponding digital image." *Id.* at 22 (citing Ex. 1005, Fig. 1; Ex. 1003 ¶ 63).

According to Petitioner, Golan discloses "a Wide imaging section that includes wide lens 122 (fixed focal length Wide lens) with FOV 142 (Wide field of view FOV) and wide image sensor 112 (Wide sensor)." *Id.* at 22–23 (citing Ex. 1005 ¶¶ 36, 37, Fig. 1; Ex. 1003 ¶ 66). Petitioner asserts that Golan's wide lens 122 has a predesigned field of view that is fixed, and is thus a fixed focal length lens. *See id.* at 23 (citing Ex. 1001, 7:3–5; Ex. 1003 ¶¶ 67–72; Ex. 1005 ¶¶ 9, 36, 37, 43; Ex. 1017, Fig. 4.13, 48).

Petitioner also argues Golan discloses "a Tele imaging section that includes 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 24–25 (citing Ex. 1005, code (57), ¶¶ 36, 37, Fig. 1; Ex. 1003 ¶ 76).

Petitioner asserts that Golan's tele lens 120 has a predesigned field of view that is fixed, and is thus a fixed focal length lens. *See id.* at 25 (citing Ex. 1003 ¶ 77; Ex. 1005 ¶¶ 9, 36, 37, 43). Petitioner further argues that Golan discloses "that tele FOV 140 is narrower than wide FOV 142," by citing to

Golan's disclosure that "[p]referably, wide FOV 142 is substantially wider than narrow FOV 140." *Id.* (quoting Ex. 1005 ¶ 43) (citing Ex. 1003 ¶ 78; Ex. 1005 ¶¶ 9, 37, Fig. 1) (emphasis omitted). Petitioner further notes that "Golan teaches that zoom control sub-system 100 includes a camera controller including zoom control circuit 130 coupled to the Wide and Tele imaging sections." Pet. 26 (citing Ex. 1003 ¶ 82).

"c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured to reduce an image jump effect seen in video output images and to provide continuous zoom video output images by executing registration between the Wide and Tele images for performing position matching to the video output images when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa."

According to Petitioner, "Golan teaches a camera controller 'configured to reduce an image jump effect seen in video output images and to provide continuous zoom video output images...when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa' as recited in the claim using electronic calibration." *Id.* at 28 (citing Ex. 1003 ¶ 87) (emphasis omitted). Petitioner specifically argues "Golan teaches performing 'electronic calibration' to '**determine the alignment offsets** between wide image sensor array 110 and tele image sensor array 112,' which '**facilitates continuous electronic zoom with uninterrupted imaging**, when **switching** back and forth between the first image sensor array and the second image'" "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 20, 29 (Ex. 1005, code (57), ¶¶ 14, 15, 21, 38, 45, 48; Ex. 1003 ¶ 89).

In addition to Golan's teachings, Petitioner alleges

Martin teaches reducing an image jump effect seen in video output images and providing stable video output images “*by executing registration between [two images] for performing position matching to the video output images when switching*” between those two images as recited in the claim, by performing critical alignment when switching between two parallax images in video output images.

Pet. 31 (Ex. 1003 ¶ 92). Specifically, Petitioner relies on the testimony of Dr. Durand relating to Martin's teaching, including Martin's Figure 1, of “a computing device configured to perform critical alignment of two images to reduce discontinuity in video output images and to provide stable video output images by executing registration between two parallax images having different point of views for performing position matching to the video output images when switching.” Ex. 1003 ¶ 93 (citing Ex. 1006, 3:39–46, Fig. 1).

Dr. Durand testifies, in particular, that “Martin describes cameras 10 and 12, [as] ‘being displaced from each other,’ capture sets of images ‘of a common scene 14,’ and that the ‘resulting sets of images from cameras of images from cameras 10 and 12 will be parallax images.’” *Id.* (quoting Ex. 1006, 3:39–46). Thus, Petitioner argues that “Martin's critical alignment discloses executing registration for position matching to ‘reduce an image jump effect seen in video output images’ as claimed . . . because it teaches reducing a discontinuous image change in video output images to achieve a stable transition between two parallax images from different points of view.” Pet. 34 (citing Pet. § VI.A; Ex. 1003 ¶ 98) (emphasis omitted).

(a) *Petitioner's Rationale for Combining*

Petitioner contends that 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. 17 (citing Ex. 1003 ¶¶ 54–59). Petitioner supports its rationale for combining Golan and Martin with the following reasons.

First, that Golan and Martin “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.* (citing Ex. 1003 ¶ 55).

Second, that both Golan and Martin share an objective, that is, “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 18 (citing Ex. 1003 ¶ 56); *see id.* (citing Ex. 1005 ¶ 15; Ex. 1006, 5:51–55, 5:59–6:5).

Third, 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 POSITA to incorporate Martin’s teaching of executing registration using critical alignment of region of interest 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. It was well known to a POSITA that, for seamless transition between two images (e.g., from imaging sections having different points of views and/or wider and narrower fields of view) in zoom video, when a fixed calibration between the two imaging sections (e.g., electronic calibration of Golan) is not sufficient alone (e.g., because calibrated alignments change), registration of the two images (e.g., critical alignment of Martin) is beneficial for accurate position matching to video output images.

Pet. 18–19 (citing Ex. 1005 ¶ 36; Ex. 1006, 5:51–58; Ex. 1003 ¶ 57; *see also id.* (citing Ex. 1014, 1:63–2:1; Ex. 1019, 1059; Ex. 1009 ¶¶ 41, 42; 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” “to transition between the master view and the slave view as seamless as possible to create the quality of a continuous zoom function”) (emphasis omitted)).

Fourth, that “combining the teachings of Martin with the system of Golan would have produced operable results that are predictable” and that “combining Martin’s teachings of executing registration using critical alignment . . . for position matching to achieve a stable transition in continuous zoom video output images of the digital camera of Golan would have been no more than the combination of known elements according to known methods. . . .” *Id.* at 19–20 (citing Ex. 1003 ¶ 58). Petitioner asserts that it “would have been obvious to a POSITA to achieve the benefits of a stable transition in video output images described by Martin.” *Id.* at 20.

Fifth, that “a POSITA would have understood that Martin’s teachings of critical alignment apply to electronic camera systems providing continuous zoom video output images as taught in Golan, regardless of whether the position-matched images are switched to provide a three-dimensional illusion as in Martin” because Golan and Martin have a “shared goal.” *Id.* (citing Ex. 1003 ¶ 59).

(b) *Discussion of Petitioner’s Challenge,
Including Rationale for Combining*

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 region[s] of interest 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. 19 (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 ¶ 59. 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. ¶ 57 (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. 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.

We have also reviewed Petitioner’s arguments, the cited portions of Golan and Martin, and Dr. Durand’s accompanying testimony and supporting evidence, and we are persuaded that Petitioner’s contentions set forth above as to the limitations recited in independent claim 1 are sufficiently supported.

We address Patent Owner’s arguments and objective indicia of non-obviousness below.

(c) *Analysis of Patent Owner’s
Contentions and Petitioner’s Responsive
Contentions*

First, 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. 21 (citing *Nichia Corp. v. Everlight Americas, Inc.*, 855 F.3d 1328, 1340 (Fed. Cir. 2017) (Patent Owner arguing district court conclusion affirmed after finding 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 24 (citing *Adidas AG v. Nike, Inc.*, 963 F.3d

1355, 1360 (Fed. Cir. 2020); Ex. 2015 ¶ 66). Patent Owner argues that “Golan prescribes an ‘electronic calibration’ based on the physical location of the two image sensors in Golan’s digital camera, and that ‘electronic calibration’ is performed only once and without the use of position matching being performed on image data.” *Id.* at 21–22 (citing Ex. 2015 ¶ 62). “Martin’s objective, in contrast, is to ‘produc[e] two-dimensional images that, upon display, can be perceived to be three-dimensional’ and, specifically, to address ‘one or more of the problems associated with the prior art three-dimensional image display systems and methods.’” *Id.* at 22 (quoting Ex. 1006, 2:60–62) (citing Ex. 2015 ¶ 63).

Patent Owner further contends that “[n]othing in Martin evinces an impression that a POSITA would have perceived Martin to have a similar goal to Golan’s stated goal of providing ‘continuous electronic zoom’ in video output images (e.g., in the digital camera’s digital-display viewfinder) when switching between two image sensors.” *Id.* at 28. In support, Patent Owner contends that Golan’s video is displayed at “the industry-standard 24 frames-per-second (or ‘24 Hz’),” whereas Martin’s “alternating views” are displayed at 3Hz to 6Hz. *Id.* Patent Owner also contends that:

Petitioner’s alleged “switching” in Martin is unlike the “switching” in Golan. Golan’s “switching” concerns the video displayed for electronic zoom when the camera “switches” “back and forth between the wide image sensor array and the tele image sensor array” between different zoom factors. The purported “switching” in Martin, to the extent it could even be fairly described as “switching,” refers to the ***alternating*** display of two specific image frames that is refreshed three to six times per second. Thus, a POSITA would not consider Golan and Martin to be concerned with the same kind of “switching.”

Id. at 28–29 (citing Ex. 1005, code (57); Ex. 2015 ¶ 76).

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.” Pet. Reply 9 (citing Pet. 18–19). According to Petitioner, “Martin itself explains that ‘proper alignment and color/luminance matching of the cameras can be difficult,’ and describes critical alignment of region of interest (e.g., using transformation coefficients) to achieve a stable transition.” *Id.* (quoting Ex. 1006, 2:49–50) (citing Ex. 1006, 5:51–58; Ex. 1040 ¶ 27). Petitioner asserts that Golan and Martin both disclose “imaging systems including digital cameras generating video output images using two imaging sections having different points of view.” *Id.* at 2 (citing Ex. 1040 ¶ 4; Pet. 17–18; Ex. 1005, Fig. 1, code (57), ¶¶ 9, 15, 36; Ex. 1006, Fig. 1, 3:6–13, 3:32–35, 4:10–15; Ex. 1041, 43, 55–59).

Petitioner also asserts that Golan and Martin “are each pertinent to the problem addressed in the ’233 Patent, namely, ‘a “jump” (discontinuous) image change’ ‘[w]hen a dual-aperture camera switches the camera output between sub-cameras or points of view.’” *Id.* at 3 (citing Ex. 1040 ¶ 6; Ex. 1001, 10:32–34; Pet. 17–19; Ex. 1005 ¶ 15 (electronic calibration “facilitates continuous electronic zoom with uninterrupted imaging, when switching back and forth between...[first and] second image sensor array[s]”); Ex. 1006, 5:51–55 (critical alignment “to achieve a stable autostereoscopic display,” in video/moving images when switching between alternating views)).

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. 15, 20–21, 24.

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. 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.

Second, Patent Owner contends that “Golan does not teach ‘image registration’ as part of its system for providing a ‘continuous electronic zoom.’” PO Resp. 17. “Instead, Golan teaches using an ‘electronic calibration’ based on the physical (spatial) location of the two image sensors in the camera.” *Id.* Patent Owner notes that

Golan’s “electronic calibration” is performed only once, after the camera’s manufacture and before its first use, to yield values representing the “alignment offsets” in the form of X-, Y-, and (optionally) Z-coordinate offset values. Those values are then used to achieve “continuous electronic zoom . . . when switching back and forth between adjacently disposed image sensors.”

Id. (quoting Ex. 1005 ¶ 40) (citing Ex. 1005 ¶ 38; Ex. 2015 ¶ 54; Ex. 2014, 29:6–32:2).

Patent Owner points to Applicant’s statement during prosecution that, “[a]lthough position matching was known per se at the effective time of filing, the known art does not teach to use position matching for solving the aforementioned problem as part of the zooming process in video imaging, as

claimed....” PO Resp. 19 (quoting Ex. 1002, 314–15). Patent Owner further contends that

None of the alleged prior art cited in the Petition discloses or teaches position matching (or any conventional image registration techniques, such as those discussed in Martin) to address the parallax discontinuities present in the zooming process of a multi-aperture camera system. Like the Examiner did with the Zitova reference in the prosecution history of the ’233 patent, Petitioner here relies on Martin principally for its discussion of conventional image registration techniques to modify Golan’s digital zooming process.

Id. at 19–20 (citing Ex. 2015 ¶ 58).

As Patent Owner notes, Petitioner’s combination relies on Golan for teaching “continuous electronic zoom . . . when switching back and forth between adjacently disposed image sensors” and Martin for “conventional” image registration techniques for position matching. *Id.* at 17 (quoting Ex. 1005 ¶ 40) (citing Ex. 2015 ¶ 54), 20. That “Golan does not teach ‘image registration’ as part of its system for providing a ‘continuous electronic zoom’” and Martin does not “address the parallax discontinuities” in the context of a “zooming process of a multi-aperture camera system” does not undermine Petitioner’s showing. *Id.* at 17, 19–20 (citing Ex. 2015 ¶ 58). Patent Owner’s arguments individually attack the references and do not consider them in the combination presented by Petitioner. *See In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.”) (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

Similarly, when Patent Owner distinguishes Golan’s display of video at a switching rate (e.g., 24 Hz) as being faster than that of Martin (e.g., 3Hz

to 6 Hz), we note that Petitioner does not rely on Martin for its teaching of switching. *See* PO Resp. 28–29. This argument also individually attacks the references and does not consider them in the combination presented by Petitioner. *See Merck*, 800 F.2d 1091 at 1097. To the extent Patent Owner is arguing that Martin’s switching rate must be combined with or incorporated into Golan, Petitioner’s combination is based on Golan’s teaching of switching, not Martin’s teaching of switching. *See Keller*, 642 F.2d at 426 (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . .”).

Similarly, Patent Owner’s citations to the prosecution history and contentions that Martin, like Zitova, is directed to conventional image registration techniques, and that “the known art does not teach to use position matching for solving the [image jump effect] as part of the zooming process in video imaging,” do not undermine Petitioner’s showing because Petitioner points to the combination of Golan and Martin, not Golan or Martin individually, to teach the limitations of independent claim 1. PO Resp. 19 (quoting Ex. 1002, 314–315); *see id.* at 18–20; *In re Merck*, 800 F.2d at 1097. Further, Patent Owner’s assertion that Martin teaches conventional image registration techniques is not dispositive—how Martin is characterized is less relevant than how it meets the claim limitations.

Third, Patent Owner contends 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 with conventional [] elements to address some

need present in the field.” PO Resp. 16 (quoting *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1337 (Fed. Cir. 2016)).

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. 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, for example, Zitova. *Id.* at 6–7 (citing *Infineum USA L.P. v. Chevron Oronite Co. LLC*, 2021 WL 210722, *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 is required.¹⁰ See *Fanduel, Inc. 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

¹⁰ 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 and 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 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, 1045 (Fed. Cir. 2018) (associating “sea” of prior art argument with concept of “a finite number of identified, predictable solutions”).

to pursue, common sense can supply a motivation to combine”) (citations and internal quotation marks omitted).

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.”).

Fourth, Patent Owner contends that “knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references.” PO Resp. 25 (quoting *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017)) (quoting *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008)).

Metalcraft is distinguishable. In that case, a party, Toro, provided “no explanation or reasoning for concluding that one of skill in the art would have combined these particular references to produce the claimed invention. Without any explanation as to how or why the references would be combined to arrive at the claimed invention,” the court was “left with only hindsight bias that *KSR* warns against.” *Metalcraft*, 848 F.3d at 1367 (citing *KSR*, 550 U.S. at 421).

Here, Petitioner has reasons supporting its rationale for combining along with supporting evidence. Petitioner presents evidence, Ahiska (Ex.

1007), that tends to show a relation between electronic calibration and registration for position matching. Pet. 19, 34 (citing 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.”)). We note that Petitioner sufficiently shows through its citation to, for example, Ahiska, both knowledge of the problem, insufficient calibration, as well as not just a motivation to solve the problem, but an actual solution, or at least an improvement or next step—image registration for position matching as evidenced by at least Ahiska. Border also shows knowledge of the same problem, insufficient calibration, and a solution, image registration, as an alternative. *See id.* at 19 (citing Ex. 1009 ¶¶ 41, 42). Based on the entirety of the record developed at trial, Petitioner has shown a relation between electronic calibration and registration for position matching.

Fifth, Patent Owner contends 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 ’233 patent,” because it instead “appears to be limited to comparing Golan and Martin with one another and opining that they are in the ‘same field of endeavor.’” PO Resp. 30 (citing Ex. 2015 ¶ 55) (emphasis omitted).

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: “in the field of imaging systems, and more specifically, imaging systems including digital cameras [for] generating video output images using two imaging sections having different points of view.” Pet. Reply 2 (citing Ex. 1040 ¶ 4; Pet. 17–18; Ex. 1005, Fig. 1, code (57), ¶¶ 9, 15, 36; Ex. 1006, Fig. 1, 3:6–13, 3:32–35; 4:10–15; Ex. 1041, 43, 55–59).¹¹ Also as discussed above, Petitioner asserts that Golan and Martin “are each pertinent to the problem addressed in the ’233 Patent, namely, ‘a “jump” (discontinuous) image change’ ‘[w]hen a dual-aperture camera switches the camera output between sub-cameras or points of view.’” *Id.* at 3 (citing Ex. 1040 ¶ 6; Ex. 1001, 10:32–34; Pet. 17–19; Ex. 1005 ¶ 15; Ex. 1006, 5:51–55).

We are persuaded that Golan is in the same field of endeavor as the claimed invention because it 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.”

¹¹ 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 January 15, 2020) (citing *Drinkware* and finding a petitioner properly established a reference was analogous art for the first time in its Petitioner Reply).

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.

*(d) Patent Owner’s Evidence of
Secondary Considerations*

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.” PO Resp. 35. By its own admission, “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 U.S. Patent No. 9,185,291, to which the ’233 patent claims priority. *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 ’233 patent challenged by Petitioner in this proceeding.” *Id.* 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 36–37 (citing Ex. 2015 ¶ 91).

Patent Owner cites several articles that show it is an “industry leader in developing dual-camera designs and software technologies to power them.” PO Resp. 37–38.

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 41 (citing Ex. 2015 ¶ 100). Patent Owner presents arguments with respect to the failure of Golan and Border inventors to achieve what is disclosed by the ’233 patent. *Id.* at 39–41. Patent Owner also asserts: “[t]hat Petitioner copied the invention of the ’233 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 41 (citing Ex. 2015 ¶ 100).

(e) *Analysis of Patent Owner’s Evidence
of Secondary Considerations*

Objective indicia of nonobviousness (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 nonobviousness].’” *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 was 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 ’233 patent, for the reasons discussed below. *See* Pet. Reply 16–17 (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. 30–41.

According to one of the emails submitted by Patent Owner, licensing negotiations with Petitioner involved not only the ’233 patent, but all patents in Patent Owner’s intellectual property portfolio. *Id.* at 35; 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. 36 (listing entities that have taken a license from Patent Owner)) were specific to the smooth transition technology Patent Owner mentions, Petitioner argues that Patent

Owner “improperly seeks to conflate any use of the term ‘smooth transition technology’ with the ’233 patent’s ‘reduce an image jump effect . . . by executing registration . . . for performing position matching.’” Pet. Reply 18 (citing PO Resp. 1–2, 47, 50, 54, 56–57; Ex. 1040 ¶ 43) (emphasis omitted). 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 ’233 patent.” *Id.* (citing Ex. 1040 ¶ 43). For the reasons that follow, we find that Petitioner has the better position.

In the ’233 patent,

[a] “smooth transition” 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, 10:36–46. At its broadest, “[a] ‘smooth transition’ . . . minimizes the jump effect,” and as disclosed in the ’233 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 ’233 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 “reduc[ing] an image jump effect seen in video output images and to provide continuous zoom video output images *by executing registration between the Wide and Tele images* for

performing position matching to the video output images when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa,” as required by independent claim 1 of the ’233 patent. That is, independent claim 1 recites a more specific invention than “smooth transition” as it is broadly defined in the ’233 patent.

As Patent Owner discloses “smooth transition” in multiple patents, it is not clear what inventions the term encompasses. *See e.g.*, Ex. 1001, 10:36–46; ’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. 35–37. Patent Owner’s declarant, Dr. Saber, testifies that “[t]he ’233 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. 2015 ¶ 20 (citing Ex. 1001, 10:36–38, 10:40–46). With respect to the ’233 patent specifically, Dr. Saber 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.” *Id.* ¶ 97 (emphasis added). Both Dr. Saber’s characterization of the ’233 patent’s “central innovation” and the recitations of claim 1 are more particular than the broad definition of “smooth transition” in the ’233 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 '233 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 '233 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. 37. The praise is for Patent Owner, Corephonics as a company, not the specific invention recited in claim 1 of the '233 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 Corephonics, does not specifically address the invention recited in claim 1. *Id.* at 38.

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 '233 patent." *Id.* at 40 (citing Ex. 2015 ¶ 98). 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 40–41 (citing Ex. 2015 ¶ 99). 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 are 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 '233 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 '233 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 ’233 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 ’233 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 17 (citing IPR2020-00905, Patent Owner’s Response, 41, 74–75 (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 10 of the ’233 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 “executing registration” for “position matching” as in the inventions of claims 1 and 10 of the ’233 patent. The ’479 and the ’233 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 '233 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 nonobviousness.

We have reviewed Petitioner's arguments, the supporting testimony provided by Dr. Durand, and cited portions of Golan and Martin, 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 rationale for combining Golan and Martin is set forth in Section III.D.3.a, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth in III.D.3.b. For the foregoing reasons, we conclude Petitioner establishes unpatentability of independent claim 1 over Golan and Martin by a preponderance of the evidence.

4. Analysis of Independent Claim 10

Independent claim 10 recites, *inter alia*, "[a] method for providing video digital output in a multiple aperture zoom digital camera" and features similar to those recited in independent claim 1. Ex. 1001, 14:12–13.

Petitioner's arguments for independent claim 10 refer, in large part, to its arguments for independent claim 1. *See* Pet. 50–52.

Patent Owner does not present separate arguments for independent claim 10. *See generally* PO Resp. For substantially the same reasons discussed in section III.D.3, we conclude that Petitioner establishes

unpatentability of claim 10 over the combination of Golan and Martin by a preponderance of the evidence.

5. Dependent Claims 2 and 11

Claim 2 recites “wherein the camera controller is further configured to: calculate a transformation coefficient and to resample Tele image data or Wide image data according to the transformation coefficient for providing the position matching to the video output images.” Claim 11 recites substantially similar features.

Petitioner contends that, “in the combination of Golan and Martin, zoom control sub-system 100 includes a camera controller configured to execute registration using critical alignment of regions of interest of Wide and Tele images when switching between the Wide and Tele images.” Pet. 35 (citing Ex. 1003 ¶ 102); *see* Ex. 1003 ¶¶ 101–104. Petitioner further contends that, “in Martin’s critical alignment process, ‘transformation parameters...may be continuously adjusted until critical alignment is achieved,’” and that “[e]xamples of transformation parameters include ‘translation parameters, scaling parameters, [and] rotation values,’ and ‘transformation parameters of sub-pixel resolution’ may be calculated.” *Id.* at 36 (citing Ex. 1006, 4:62–63, 5:51–53, 5:6–37, 5:44–47, 6:35–36); *see* Ex. 1001, 11:46–47 (disclosing that “registration is performed between the Wide and Tele images to output a transformation coefficient”) (emphasis omitted).

Petitioner also contends that a “POSITA would have known that image registration uses a resampling process to apply transformation coefficient to a first image to generate a transformed first image for position matching the transformed first image with a second image.” Pet. 37–38 (citing Ex. 1016, 137 (explaining that steps in image registration for two

images “from different viewpoints or by different sensors” include “image transformation and image resampling”), Fig. 5, 151–152 (by using transformation coefficients, “[o]ne image can then be transformed to overlay the other image precisely, in which the pixels of the image being transformed need to be resampled”); Ex. 1003 ¶ 107).

Patent Owner does not present separate arguments for dependent claims 2 and 11. *See generally* PO Resp. We have reviewed Petitioner’s arguments, the supporting testimony provided by Dr. Durand, the cited portions of Golan and Martin, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. Petitioner’s rationale for combining Golan and Martin is set forth in Section III.D.3.a, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth above in Section III.D.3.b. As such, we conclude Petitioner establishes unpatentability of dependent claims 2 and 11 over the combination of Golan and Martin by a preponderance of the evidence.

6. Dependent Claims 3 and 12

Claims 3 and 12 recite “wherein the position matching is performed in a region of interest.”

Petitioner contends that “Martin describes in providing video images, the alternating views of images from different points of view are manipulated to ‘match alignment,’ which ‘refers to a condition in which a region of interest in an image to be aligned (i.e., converged) is positioned such that it occupies the same location within the frame of the image to be aligned as the corresponding region in a reference image frame.’” Pet. 40 (citing Ex. 1006, 4:24–37) (emphasis omitted). According to Petitioner,

“Martin explains that the ‘region of interest may be all or part of the image to be aligned,’ and that such a region of interest may be selected by a user.” *Id.* (citing Ex. 1006, Figs. 3A–3D (aligning regions 34 and 34’), 4:37–38, 4:54–56, 5:6–21, 7:46–51; Ex. 1003 ¶ 114) (emphasis omitted).

Petitioner explains “Martin describes that ‘[c]ritical alignment corresponds to a condition where the degree of alignment is sufficient to achieve a stable autostereoscopic display,’ and explains that ‘[s]tability of the whole image may not be required, as long as at least a particular region of interest in the autostereoscopic display is stable.’” *Id.* at 41 (citing Ex. 1006, 5:51–58) (emphasis omitted).

Patent Owner does not present separate arguments for dependent claims 3 and 12. *See generally* PO Resp. We have reviewed Petitioner’s arguments, the supporting testimony provided by Dr. Durand, the cited portions of Golan and Martin, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. Petitioner’s rationale for combining Golan and Martin is set forth in Section III.D.3.a, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth above in Section III.D.3.b. As such, we determine Petitioner establishes unpatentability of dependent claims 3 and 12 over Golan and Martin by a preponderance of the evidence.

7. Dependent Claims 4 and 13

Claim 4 recites, “wherein the camera controller is further configured, when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa, to reduce the image jump effect seen

in video output images by matching scale between the Wide and Tele images.” Claim 13 recites substantially similar features.

Petitioner contends that “Martin describes that, in video images, the alternating views of parallax images are manipulated to ‘**match alignment**,’ which ‘may be represented by an affine transformation including ... **scaling**, and/or any other desired transformation.’” Pet. 42 (citing Ex. 1006, 4:24–37, 4:56–59, 5:44–47; 7:52–53 (“[T]he step of aligning includes at least one of translation, rotation, and **scaling**.”)).

Patent Owner does not present separate arguments for dependent claims 4 and 13. *See generally* PO Resp. We have reviewed Petitioner’s arguments, the supporting testimony provided by Dr. Durand, the cited portions of Golan and Martin, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. Petitioner’s rationale for combining Golan and Martin is set forth in Section III.D.3.a, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth above in Section III.D.3.b. As such, we determine Petitioner establishes unpatentability of dependent claims 4 and 13 over Golan and Martin by a preponderance of the evidence.

8. Dependent Claims 7 and 16

Claim 7 recites, “wherein the switching is between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein each output image has a respective output resolution, wherein at the lower ZF value the output resolution is determined by the Wide sensor and wherein at the higher ZF value the output resolution is determined by the Tele sensor.” Claim 16 recites substantially similar features.

Petitioner contends that Golan “teaches an example for providing a lossless zooming range of 36 where ‘Wide_FOV=Narrow_FOV*6,’ where Golan’s informal terminology, ‘Wide_FOV/Narrow_FOV,’ corresponds to the relative magnification ratio of an object “**magnified** in tele image sensor 110 with respect to wide image sensor 112.” Pet. 45 (citing Ex. 1005 ¶¶ 9, 37; Ex. 1017, Fig. 4.13; Ex. 1003 ¶125). As such, Petitioner contends “in Golan, the lossless zooming range (e.g., 36) is provided by switching between Wide and Tele sensors at a switch zoom factor (e.g., 6) depending on the relative magnification ratio of Tele image to Wide image, performing digital zoom to the Wide image for a requested zoom factor between 1 and 6, and performing digital zoom to the Tele image for a requested zoom factor between 6 and 36.” *Id.* (citing Ex. 1003 ¶¶ 125–126).

Petitioner further contends “Golan teaches that each output image has a respective output resolution, which is determined by the Wide sensor (at the lower ZF value) or the Tele sensor (at the higher ZF value) providing that output image.” *Id.* at 46 (citing Ex. 1003 ¶ 130). According to Petitioner, a “POSITA would have understood that the ‘*output resolution*’ as claimed means the video output resolution including pixel counts of the output image as described in ’233 Patent.” *Id.* (citing Ex. 1003 ¶ 130; Ex. 1001, 11:52–56 (“the output video resolution (for example 1080p)”), 12:19–22, 7:29–31).

Patent Owner does not present separate arguments for dependent claims 7 and 16. *See generally* PO Resp. We have reviewed Petitioner’s arguments, the supporting testimony provided by Dr. Durand, the cited portions of Golan and Martin, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination

teaches the limitations recited in these claims. Petitioner’s rationale for combining Golan and Martin is set forth in Section III.D.3.a, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth above in Section III.D.3.b. As such, we determine Petitioner establishes unpatentability of dependent claims 7 and 16 over Golan and Martin by a preponderance of the evidence.

E. Obviousness over Golan, Martin, and Ahiska

1. Overview of Ahiska

Ahiska concerns automatically expanding the zoom capability of a wide-angle video camera. Ex. 1007, 1:17–18. In one embodiment, a wide-angle, master camera is used to capture images and automatically identify an ROI, and a slave camera can be used to zoom into the identified ROI. *Id.* at 2:55–62. Ahiska’s disclosed intent “is to transition between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function.” *Id.* at 10:2–5. When view matching with ROI is achieved, “the perspective corrected master camera view is replaced by adjusted slave camera view to achieve an expanded zoom function.” *See id.* at 10:15–32.

2. Dependent Claims 5 and 14

Claim 5 recites “wherein the camera controller is further configured, when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa, to reduce the image jump effect seen in video output images by matching brightness between the Wide and Tele images.” Claim 14 recites substantially similar features.

Petitioner contends that “Ahiska teaches matching various image properties (*e.g.*, matching ‘brightness and exposure levels’ by equalizing

color histograms, matching color by removing ‘possible color offsets [] by histogram equalization’) between the master and slave views for switching to achieve a ‘transition between the master view and the slave view as **seamlessly as possible** to create the quality of a **continuous zoom function.**” Pet. 57–58 (quoting Ex. 1007, 9:44–52; 10:2–10:5) (citing Ex. 1022, 62–66 (discussing color matching) and 241–244 (discussing histogram equalization))).

As rationale for combining, Petitioner contends 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 POSITA to incorporate Ahiska’s teaching of matching image properties including brightness and color in the combination of Golan and Martin to achieve seamless transition “to create the quality of a continuous zoom function.”

Id. at 56 (citing Ex. 1005 ¶ 36; Ex. 1007, 10:2–5) (citing Ex. 1012, 4:16–26 (by maintaining similarities of characteristics in two images, transitions between the two images have less discontinuities and are more acceptable to the user); Ex. 1003 ¶ 163)). Petitioner further contends that “[l]ike the system of Golan combined with Martin, Ahiska describes an intention ‘to **transition** between the [wider-angle] master view and the [narrower] slave view **as seamless as possible to create the quality of a continuous zoom function.**” *Id.* (quoting Ex. 1007, 10:2–5).

We have reviewed Petitioner’s arguments, the supporting testimony of Dr. Durand, the cited portions of Golan, Martin, and Ahiska, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. *Id.* at 57–59. We further determine that Petitioner’s rationale for combining

is supported by sufficient rational underpinning for at least the reasons set forth in III.D.3.a and III.D.3.b, as well as in this section in the preceding paragraph. *See id.* at 55–57. Accordingly, we are persuaded that Petitioner establishes unpatentability of claims 5 and 14 over the combination of Golan, Martin, and Ahiska by a preponderance of the evidence.

3. *Dependent Claims 6 and 15*

Claim 6 recites “wherein the camera controller is further configured to reduce the image jump effect seen in video output images by matching color between the Wide and Tele images when switching from an output of the Tele imaging section to a output of the Wide imaging section or vice versa.” Claim 15 recites substantially similar features.

Petitioner contends “a POSITA would have been motivated to incorporate Ahiska’s teachings of matching image properties in the combination of Golan and Martin to match brightness and color between the Wide and Tele images to achieve seamless transition ‘to create the quality of a continuous zoom function.’” Pet. 59 (quoting Ex. 1007, 10:2–5) (citing Ex. 1005 ¶ 36; Ex. 1003 ¶ 172); *see id.* (citing Ex. 1003 ¶¶ 171, 173). Petitioner cites its discussion of claim 5 (*see id.* at 57–58), and specifically, Ahiska’s teachings of “matching various image properties (*e.g.*, matching ‘brightness and exposure levels’ by equalizing color histograms, matching color by removing ‘possible color offsets [] by histogram equalization’) between the master and slave views for switching to achieve a ‘transition between the master view and the slave view **as seamlessly as possible** to create the quality of a **continuous zoom function**.’” *Id.* at 57–58 (quoting Ex. 1007, 10:2–5) (citing Ex. 1007, 9:44–52; Ex. 1022, 62–66 (discussing color matching) and 241–244 (discussing histogram equalization)).

We have reviewed Petitioner’s arguments, the cited portions of Golan, Martin, and Ahiska, the supporting testimony of Dr. Durand, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. *Id.* at 59–60. Petitioner relies on its rationale for combining as set forth in Sections III.D.3.a and III.E.2, which we determine is supported by sufficient rational underpinning for at least the reasons set forth in Section III.D.3.b and Section III.E.2. *See id.* at 55–57. Accordingly, we are persuaded that Petitioner establishes the unpatentability of claims 6 and 15 over the combination of Golan, Martin, and Ahiska by a preponderance of the evidence.

F. Obviousness over Golan, Martin, and Levey

1. Overview of Levey

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 Claims 8 and 17

Claim 8 recites “wherein 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 images based on a user input that includes a camera mode and the zoom factor.” Claim 17 recites substantially similar features.

According to Petitioner, “Golan teaches ‘providing **a user** of the image acquisition device with a **zoom selecting control**, thereby obtaining **a**

requested zoom.” Pet. 63–64 (citing Ex. 1005, code (57), Fig. 2, ¶¶ 45–46, claim 1). “Golan teaches that the camera controller includes zoom control circuit 130 (sensor control module) for configuring each sensor to acquire the Wide and Tele images based on a user input zoom factor.” *Id.* at 64 (citing Ex. 1003 ¶ 187). Petitioner further contends that “[z]oom control circuit 130 **receives a required zoom** from an operator of the image acquisition system, and **selects the relevant image sensor (110 and 112) by activating image sensor selector 150 position**’ based on the required zoom from the user input.” *Id.* (citing Ex. 1005 ¶¶ 39, 47, 48). According to Petitioner, “Golan teaches that zoom control 130 configures only the selected image sensor of image sensors 110 and 112 to be in operation and configures the other image sensor to be bypassed based on a user input zoom factor.” *Id.* at 64–65 (citing Ex. 1003 ¶ 188). Thus, Petitioner contends that “Golan teaches ‘a sensor control module for configuring each sensor to acquire the Wide and Tele images based on a user input that includes...the zoom factor’ as claimed.” *Id.* at 65 (citing Ex. 1003 ¶ 188) (emphasis omitted).

Petitioner also contends that “Levey describes ‘a photography mode user interface for selecting between a plurality of photography modes, the photography modes having associated image capture and image processing settings,’ and the various camera modes include ‘different pixel resolution modes,’ ‘video capture mode, still capture mode, and review mode.’” Pet. 65 (citing Ex. 1015, code (57), ¶¶ 45, 57, 70). Petitioner also contends that “Levey describes configuring its image sensor (e.g., by timing generator 12) using image capture settings (e.g., lower/higher resolutions of sensor image data, ‘the exposure index, the lens F/#, the exposure time and the electronic

flash setting’) associated with the user selected camera mode.” *Id.* (citing Ex. 1015 ¶¶ 39, 41, 70, 71).

As rationale for combining, Petitioner contends that “a POSITA would have been motivated to incorporate Levey’s teachings of configuring an image sensor to acquire an image based on a user input camera mode in the combination of Golan and Martin” because “[a] POSITA designing a zoom digital camera would have been motivated to provide the ability for users to capture images in various camera modes (e.g., video, still, portrait, landscape, etc.)” using Levey’s teaching of “select[ing] by the user to control various elements of the image capture process and the image processing chain.” *Id.* at 62 (quoting Ex. 1015 ¶ 4) (citing Ex. 1003 ¶¶ 182, 183); *see also id.* at 61–62 (discussing other reasons to combine Levey with Golan and Martin).

We have reviewed Petitioner’s arguments, the supporting testimony of Dr. Durand, the cited portions of Golan, Martin, and Levey, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. *Id.* at 63–66. Petitioner’s rationale for combining these references is supported by sufficient rational underpinning for at least the reasons set forth above in Sections III.D.3.a and III.D.3.b, as well as in this section in the preceding paragraph. *See* Pet. 61–63. Accordingly, we are persuaded that Petitioner establishes the unpatentability of claims 8 and 17 over the combination of Golan, Martin, and Levey by a preponderance of the evidence.

G. Obviousness over Golan, Martin, and Parulski

1. Overview of Parulski

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 9 and 18

Claim 9 recites “wherein the camera controller configuration to provide video output images during switching between a lower ZF value and a higher ZF value or vice versa includes a configuration to use at high ZF secondary information from the Wide imaging section and to use at low ZF secondary information from the Tele imaging section.” Claim 18 recites substantially similar features.

Petitioner contends “Parulski teaches that at block 102, ‘the zoom position setting is **compared to a value X** at which the image capture function **switches from the first image capture stage to the second image**

capture stage.” Pet. 72 (quoting Ex. 1008, 15:54–57) (citing Ex. 1005, 18:27–29; Ex. 1003 ¶ 209). Petitioner further contends that “[w]hen switching to a lower ZF value (less than or equal to switch zoom position ‘X’), at block 118, ‘a video image is captured in block 118 by the first image capture stage 1,’ which corresponds to the Wide imaging section of image capture assembly 610.” *Id.* at 73 (citing Ex. 1008, 18:37–38). Petitioner contends that “[w]hen switching to a higher ZF value (greater than switch zoom position ‘X’), at block 138, ‘a video image is captured in block 138 with the second image capture stage 2,’ which corresponds to the Tele imaging section of image capture assembly 610.” *Id.* (citing Ex. 1008, 18:52–53).

As rationale for combining, Petitioner contends that

a POSITA would have been motivated to incorporate the teachings of Parulski in the combination of Golan and Martin because they share a need to provide improved quality digital zoom video output images, which switches between images from two imaging sections having different points of view and fields of view at a switch zoom point.

Pet. 69–70 (citing Ex. 1008, Fig. 8; 18:25–59; Ex. 1003 ¶ 202).

Petitioner further contends that

combining Parulski’s teachings of when switching between Wide and Tele images, using, at high and low ZFs, secondary information from the Wide and Tele imaging sections respectively with the system of Golan and Martin would have produced operable results that are predictable, and would have been no more than the combination of known elements according to known methods (such as performing scene data analysis of images from a secondary imaging section to provide secondary information for adjusting capture parameters of the primary imaging section for providing the video output image when switching between Wide and Tele images in zoom control sub-

system of Golan and Martin), and would have been obvious to a POSITA to achieve the benefits of continuous zoom video output images having improved quality described by Parulski.

Id. at 70 (citing Ex. 1003 ¶¶ 203–204).

We have reviewed Petitioner’s arguments, the supporting testimony of Dr. Durand, the cited portions of Golan, Martin, and Parulski, and Patent Owner’s objective evidence of secondary considerations and are persuaded that the proposed combination teaches the limitations recited in these claims. *Id.* at 71–75. Petitioner’s rationale for combining these references is supported by sufficient rational underpinning for at least the reasons set forth above in Sections III.D.3.a and III.D.3.b, as well as in this section. *See id.* at 69–70. Accordingly, we are persuaded that Petitioner establishes the unpatentability of claims 9 and 18 over the combination of Golan, Martin, and Parulski by a preponderance of the evidence.

IV. MOTION TO EXCLUDE

Petitioner objected to Patent Owner’s inclusion of Exhibit 2101, 2102, 2103, and 2104 with its Sur-Reply. Paper 35, 1 (citing 37 C.F.R. § 42.23(b)). Petitioner later filed a Motion to Exclude these exhibits. Paper 42. Patent Owner opposed Petitioner’s Motion. Paper 45. As we do not rely on any of these exhibits in rendering the findings and conclusions in this Decision, we dismiss Petitioner’s Motion to Exclude Exhibits 2101, 2102, 2103, and 2104 as moot.

V. CONCLUSION

For the foregoing reasons, we conclude that Petitioner has established unpatentability of: claims 1–4, 7, 10–13, and 16 over Golan and Martin; claims 5, 6, 14, and 15 over Golan, Martin, and Ahiska; claims 8 and 17 over Golan, Martin, and Levey; and claims 9 and 18 over Golan, Martin, and

Parulski.¹² 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, 7, 10–13, 16	103	Golan, Martin	1–4, 7, 10–13, 16	
5, 6, 14, 15	103	Golan, Martin, Ahiska	5, 6, 14, 15	
8, 17	103	Golan, Martin, Levey	8, 17	
9, 18	103	Golan, Martin, Parulski	9, 18	
Overall Outcome			1–18	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–18 of the '233 patent are determined to be unpatentable;

FURTHER ORDERED that Petitioner's Motion to Exclude Exhibits 2101, 2102, 2013, and 2104 is dismissed as moot; and

¹² 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).

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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