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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIGN TECHNOLOGY, INC.
Petitioner

v.

3SHAPE A/S
Patent Owner

Case No. PGR2018-00103
Patent 9,962,244

PATENT OWNER'S PRELIMINARY RESPONSE TO THE PETITION FOR POST-GRANT REVIEW OF U.S. PATENT NO. 9,962,244

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I. INTRODUCTION

Patent Owner, 3Shape A/S ("3Shape" or "Patent Owner"), submits this Preliminary Response to the Second Corrected Petition for Post-Grant Review ("Petition" or "Pet.") filed by Align Technology, Inc. ("Align" or "Petitioner") on October 29, 2018 and served on October 30, 2018 against U.S. Patent No. 9,962,244 (Ex.1001, "the '244 Patent"). Pursuant to 37 C.F.R. § 42.207(b) and the Notice of Filing Date Accorded to Petition and Time for Filing Patent Owner Preliminary Response, mailed November 19, 2018 (Paper 8), this Patent Owner's Preliminary Response is timely filed.

The Board should deny institution of the Petition for two reasons. First, the cited art does not disclose or suggest the claim feature "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information." Second, Petitioner fails to provide a reason with rational underpinnings as to why a person of ordinary skill in the art would have somehow modified or combined the cited art to arrive at the claimed invention.

II. STATEMENT OF THE PRECISE RELIEF REQUESTED

Patent Owner requests that the Board deny institution of the Petition with respect to all challenged claims and all asserted grounds. A full statement of the reasons for the relief requested is set forth in Sections III., IV., V., and VI.

III. TECHNICAL BACKGROUND AND THE '244 PATENT

The claimed invention of the '244 Patent provides an improvement over conventional techniques for scanning surface geometry and color.

A. Thiel425, Thiel576, and Fisker

Prior art techniques of obtaining surface geometry and color of an object required the use of separate devices. Ex.1013 at ¶¶ [0003]-[0005]. Thiel425 (Ex.1012) discloses a device for obtaining surface geometry. Ex.1012 at ¶¶ [0013], [0024]. Advances in the art resulted in devices that obtained both surface geometry and color. One such device is disclosed in Thiel576 (Ex.1013). Ex.1013 at ¶ [0006]. Thiel576 discloses switching between two different modes of operation– namely, a first mode to measure surface geometry and a second mode to measure color. *Id*. at ¶¶ [0007], [0016]-[0017]. Another such device is disclosed in Fisker (Ex.1005). Ex.1005 at ¶ [0151]. Fisker discloses a scanning process which obtains a large volume of two-dimensional (2D) images. *Id*. at ¶¶ [0028], [0030]. Surface geometry and color can be obtained from this large volume of 2D images, but no single image is used to obtain both surface geometry and color. *Id*. at ¶¶ [0074], [0151].

B. The ’244 Patent

The ’244 Patent discusses WO 2010/145669 which corresponds to Fisker. Ex.1001 at 1:24-32, References Cited; Ex.1005; Ex.2001. The ’244 Patent distinguishes the scanners disclosed therein from Fisker:

> [In Fisker] several sequential images, each taken for an illumination of a different color – typically blue, green, and red – are combined to form a synthetic color image. This approach hence requires means to change light source color, such as color filters. Furthermore, in handheld use, the scanner will move relative to the scanned object during the illumination sequence, reducing the quality of the synthetic color images.

Id. at 1:25-32. *See also id.* at 3:11-29.

The ’244 Patent discloses that a problem with conventional devices that measure both surface geometry and color of an object is that there is a slight delay between obtaining images for measuring surface geometry and obtaining images for measuring color. *Id*. at 1:33-38. This delay occurs in devices employing sequential illumination in different colors to form a synthetic image. *Id*. at 1:38-40. Strict timing requirements and/or compensation for relative motion of the object and scanner system between obtaining surface geometry and surface color, is needed to address the effects of the delay. *Id*. at 2:65-3:29.

The ’244 Patent discloses eliminating the delay between obtaining surface geometry information and surface color information, and eliminates the need for

strict timing requirements and motion compensation. *Id*. The '244 Patent provides "perfect" alignment of surface geometry and surface color information because the surface geometry and color information are derived from the same 2D image. *Id*.

C. The Claims of the '244 Patent

The '244 Patent contains thirty-five (35) claims. Ex.1001 at cols. 19-24. Claims 1, 29, 31, 32, and 34 are independent claims. The independent claims challenged in this Petition are claims 1 and 29:

> 1. A focus scanner for recording surface geometry and surface color of an object, the focus scanner comprising:
>
> a multichromatic light source configured for providing a multichromatic probe light for illumination of the object,
>
> a color image sensor comprising an array of image sensor pixels for capturing one or more 2D images of light received from said object,
>
> wherein the focus scanner is configured to operate by translating a focus plane along an optical axis of the focus scanner and capturing a series of the 2D images, each 2D image of the series is at a different focus plane position such that the series of captured 2D images forms a stack of 2D images; and
>
> a data processing system configured to derive surface geometry information for a block of said image sensor pixels from the 2D images in the stack of 2D images captured by said color image sensor, the data processing system also

configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information;

wherein the data processing system further is configured to combining a number of sub-scans to generate a digital 3D representation of the object, and determining object color of a least one point of the generated digital 3D representation of the object from sub-scan color of the sub-scans combined to generate the digital 3D representation, such that the digital 3D representation expresses both geometry and color profile of the object, and

wherein determining the object color comprises computing a weighted average of sub-scan color values derived for corresponding points in overlapping sub-scans at that point of the object surface.

29. A focus scanner for recording surface geometry and surface color of an object, the focus scanner comprising:

a multichromatic light source configured for providing a multichromatic probe light for illumination of the object,

a color image sensor comprising an array of image sensor pixels for capturing one or more 2D images of light received from said object,

wherein the focus scanner is configured to operate by translating a focus plane along an optical axis of the

focus scanner and capturing a series of the 2D images, each 2D image of the series is at a different focus plane position such that the series of captured 2D images forms a stack of 2D images; and

a data processing system configured to derive surface geometry information for a block of said image sensor pixels from the 2D images in the stack of 2D images captured by said color image sensor, the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information, and

where the data processing system further is configured to detecting saturated pixels in the captured 2D images and for mitigating or removing the error in the derived surface color information or the sub-scan color caused by the pixel saturation.

Ex.1001 at cols. 19, 22. Claims 2-28 directly or indirectly depend directly from claim 1.

IV. CLAIM CONSTRUCTION

Claims in an unexpired patent subject to post-grant review are given the broadest reasonable interpretation ("BRI") in light of the specification of the patent in which they appear. 37 C.F.R. § 42.200(b) (as amended at 81 Fed. Reg. 18766

(April 1, 2016); *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131 (2016).[1] Patent Owner submits the following construction.

> **"the data processing system also configured to derive surface color information…from at least one of the 2D images used to derive the surface geometry information"**

Independent claims 1 and 29 of the '244 Patent recite "the data processing system also configured to derive surface color information…from at least one of the 2D images used to derive the surface geometry information." Ex.1001 at 19:48-52, 22:21-25. Petitioner does not explicitly construe this recitation.[2]

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[1] The Petition was filed prior to November 13, 2018. The challenged claims are to be construed under BRI. *See* 83 Fed. Reg. 51340 (Oct. 11, 2018).

[2] The Petition does not set forth any explicit claim construction for any term of the challenged claims. "[F]ailure to offer a construction and analysis of a term critical to understanding the scope of [the] independent claims" is grounds for denying institution. *Jiawei Tech. (HK) Ltd. v. Simon Nicholas Richmond*, IPR2014-00937, Paper 24 at 4 (PTAB Feb. 6, 2014). Petitioner fails to meet its burden here because Petitioner provides no such construction of the recitation.

The phrase "2D images" in the recitation are the same "2D images" used to derive surface geometry information. This is apparent from the recitation of the definite article "the" prior to each instance of the term "2D images." Thus, the recitation requires the data processing system to be configured to derive ***both*** surface geometry information ***and*** surface color information ***from the same at least one 2D image*** captured by said color image sensor.

V. ARGUMENT

Petitioner fails to establish that it is more likely than not that any claim of the '244 Patent challenged in any of the grounds presented in the Petition is unpatentable.[3] Thus, the Petition should be denied with respect to all challenged claims and grounds.

A. Petitioner Fails to Establish that It Is More Likely than Not that Fisker and Szeliski (Ground 1) and Fisker and Matsumoto (Ground 2) Render Claims 1-5, 7-10, 15, 16, 18, 21-22, 24, 26, and 28 Obvious.

Petitioner fails to meet its burden concerning Grounds 1 and 2 of the Petition.

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[3] Petitioner fails to satisfy its burden even assuming, for purposes of determining whether to institute, that Petitioner's definition of a person of ordinary skill in the art ("POSITA") at page 17 of the Petition is correct.

1. Fisker does not disclose or suggest "the data processing system also configured to *derive surface color information* for the block of said image sensor pixels *from at least one of the 2D images used to derive the surface geometry information*"

Fisker does not disclose or suggest a data processing system configured to derive ***both*** surface geometry information ***and*** surface color information ***from the same at least one 2D image*** captured by said color image sensor. *See* Section IV. This is true for four reasons. First, Fisker's disclosure of "scanning" of a surface shape and color relates to a general process of obtaining image data, not to the selection of a specific 2D image. Second, Fisker's disclosure of "simultaneous scanning" and "scanned together" to obtain surface shape and color relates to Fisker's general process of scanning, not the selection of a specific 2D image. Third, "simultaneous scanning" cannot mean obtaining surface geometry and color at a single moment in time because "simultaneous scanning" encompasses obtaining multiple images at ***varying*** times. Fourth, nothing in the '244 Specification indicates that "simultaneous scanning" would somehow result in deriving surface color information and surface geometry information from the same 2D image.

a. Fisker's disclosure of "scanning" of a surface shape and color relates to a general process of obtaining image data, not to the selection of a specific 2D image

Petitioner asserts that Fisker's disclosure of "simultaneously scanning of a surface shape and color" corresponds to deriving surface color information from at least one of the 2D images used to derive the surface geometry. Pet. at 25-28 (citing Ex.1005 at ¶ [0228]). Petitioner is mistaken. Petitioner overlooks the fact that the scanning process in Fisker broadly encompasses collecting a voluminous number of 2D images. Ex.1005 at ¶¶ [0028], [0030], [0074]. Fisker teaches that its scanning process results in an "enormous amount of data" (*e.g.*, the numerous 2D images produced from scanning). *Id.* at ¶ [0074]. Such disclosure of "simultaneously scanning" is insufficient to demonstrate that the ***same*** particular 2D image within the enormous amount of data obtained from Fisker's scanning is used to derive ***both*** surface geometry information ***and*** surface color information ***from the same at least one 2D image***, as claimed.

Petitioner provides no explanation of the meaning of "scanning" in Fisker's disclosure. While Fisker does not expressly define the term "scan," Fisker uses this term in a broad sense to generally describe the process by which a focus scanning apparatus measures a 3D geometry of surfaces. *Id.* at ¶ [0001]. Fisker discloses embodiments suitable for "intraoral scanning" such as "scanning dental impression, gypsum models, wax bites, dental prosthetics and abutments." *Id.*

Fisker discloses embodiments for scanning a human ear. *Id*. Fisker discloses that the "probe is adapted to ***scan*** at least a part of the surface of a cavity, such as an ear canal." *Id*. at ¶ [0162] (emphasis added).

The term "scan" in Fisker encompasses collecting data obtained over a range of focal plane positions. Fisker discloses that its:

> invention provides for a variation of the focus plane of the pattern over a range of focus plane positions while maintaining a fixed spatial relation of the scanner and the object. It does not means that the ***scan*** must be provided with a fixed spatial relation of the scanner and the object, but merely that the focus plane can be varied (***scanned***) with a fixed spatial relation of the scanner and the object. [Emphases added.]

Id. at ¶ [0023]. Fisker also discloses that a "pivotal point of the invention is the variation, i.e. ***scanning***, of the focal plane without moving the scanner in relation to the object being scanned." *Id*. at ¶ [0063] (emphasis added). Similarly, Fisker discloses that the "focus position may be varied in equal steps from one end of the scanning region to the other." *Id*. at ¶ [0092], [0114], [0128], [0253]. Fisker discloses that "[d]uring ***scanning*** the focus position is changed over a range of values…." *Id*. at ¶ [0278] (emphasis added). Fisker defines a "sub-scan" as the process of collecting a number of 2D images at different positions of the focus plane and at different instances of the pattern. *Id*. at ¶¶ [0028], [0030]. Necessarily, then, a "scan" results in a volume of images that exceeds the

collection of 2D images obtained from such "***sub***-scan." In fact, as discussed above, Fisker provides that "real time high resolution 3D ***scanning*** creates an enormous amount of data." *Id*. at ¶ [0074] (emphasis added). Thus, Fisker's scanning process produces an enormous amount of 2D images, including image data obtained over a range of focal plane positions.

b. Fisker's disclosure of "simultaneous scanning" and "scanned together" to obtain surface shape and color relates to Fisker's general process of scanning, not the selection of a specific 2D image

Petitioner relies on Fisker's disclosure of "registering the color of the individual surface elements of the object being ***scanned together*** with the surface topology of the object being scanned." Pet. at 27 (citing Ex.1005 at ¶ [0151]). Similarly, Petitioner relies on Fisker's disclosure of "a device for ***simultaneous scanning*** of a surface shape and color." *Id.* (citing Ex.1005 at ¶ [0228]). As discussed above, scanning is a term broadly used in Fisker to describe the process of obtaining "an enormous amount of data". Thus, Fisker's "scanned together" and "simultaneous scanning" disclosures, in the context of the meaning of "scan" in Fisker, simply means that both color and surface topology are obtained from a voluminous collection of 2D images obtained from this general "scanning" process. Even if Fisker simultaneously obtains surface shape and color information by way of its scanning process, this does not necessarily mean that the ***same*** at least one particular 2D image within the enormous amount of data obtained from Fisker's

scanning must be used to derive ***both*** surface geometry information ***and*** surface color information. For example, it is possible in Fisker for some of the 2D images among the voluminous collection obtained from scanning to be used to obtain surface shape and other, different 2D images among the voluminous collection obtained from scanning to be used to obtain color. Petitioner has failed to demonstrate that such claimed feature is an inherent result of Fisker's "simultaneous scanning" and "scanned together" disclosures. *See In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993) ("The mere fact that a certain thing may result from a given set of circumstances is not sufficient [to establish inherency.]" (*quoting In re Oelrich*, 666 F.2d 578, 581-82 (C.C.P.A. 1981). *See also In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Nor does Petitioner provide any reason for why it would have been obvious to modify Fisker to arrive at deriving both surface geometry information and surface color information from the same at least one 2D image.

Petitioner does not provide any meaningful explanation as to how or why Fisker's disclosures of "simultaneous scanning" and "scanned together" somehow teach a data processing system "configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information" as claimed. In fact, Petitioner fails to provide any explanation of what is meant by Fisker's disclosure of "simultaneous

scanning" and "scanned together." Petitioner fails to satisfy its burden for this reason alone.

c. "Simultaneous scanning" cannot mean obtaining surface geometry and color at the same single moment in time because "simultaneous scanning" encompasses obtaining multiple images at *varying* times

Fisker discloses that the embodiment shown in Fig. 9, which Petitioner relies on for "simultaneous scanning of a surface shape and color", utilizes a "time-varying pattern" for measuring color:

> [t]he ***color measure is performed as follows***: For a given focus position and amplitude of the ***time-varying pattern*** projected onto the probed object is determined for each sensor element in the sensor 181 by one of the above mentioned methods for each of the light sources individually. In the preferred embodiment only one light source is switched on at the time, and the light sources are switched on after turn. [Emphases added.]

Ex.1005 at ¶ [0279]. Petitioner alleges that Fisker's disclosure of "simultaneous scanning" in connection with Fig. 9 teaches deriving both surface geometry and color from the same 2D image. Pet. at 26-27. Petitioner is mistaken. Fisker explicitly discloses that in the Fig. 9 embodiment which employs "simultaneous scanning," a "***time-varying*** pattern" is utilized for measuring color. Ex.1005 at ¶ [0279]. Because the pattern is time-varying and images are captured at varying times, multiple images obtained at varying times would be required to measure

color. *Id.* at ¶ [0082] ("The correlation measure is thus at least computed with sensor signals recorded at different times"), ¶ [0036] (defining "Time varying pattern" as "A pattern that varies in time"). Petitioner has not explained how the "simultaneous scanning" in Fig. 9, when read in light of the use of the "time-varying pattern" in Fig. 9, somehow results in deriving both surface geometry and surface color of the object from the same at least one 2D image. Fisker's disclosure of "simultaneous scanning of a surface shape and color" cannot mean obtaining surface geometry and color at the same single moment in time, because Fisker discloses that "simultaneous scanning" encompasses obtaining multiple images at varying times.

Further, Petitioner alleges that in Fisker, an "amplitude is determined for each group of pixels (i.e., block of pixels) (*id.*, [0030]) for at least one color at every focal plane position." Pet. at 27. Again, Fisker's amplitude for each group of pixels relates to the voluminous collection of 2D images captured during Fisker's scanning process. Ex.1005 at ¶ [0028]. Petitioner's reliance on Fisker's disclosure of determining amplitude fails to demonstrate that surface geometry and surface color information are derived from the ***same*** at least one 2D image in a voluminous collection of 2D images. Petitioner and its expert misapprehend Fisker by suggesting that Fisker discloses using the ***same*** amplitude of light received at the sensor elements at every focus position to determine surface

topology and surface color. Pet. at 27-28 (citing Ex.1003 at ¶ [0105]). Petitioner's misapprehension is based on Petitioner's interpretation of Fisker's disclosure of "simultaneous scanning" and "scanned together," which, as discussed above, does not pertain to deriving surface geometry and surface color information from the same at least one 2D image. Petitioner has not demonstrated that Fisker inherently discloses deriving surface geometry and surface color information from the same 2D image.

d. Nothing in the '244 Specification indicates that "simultaneous scanning" would somehow result in deriving surface geometry and surface color information from the same 2D image

Petitioner asserts that the '244 Patent's disclosure of surface geometry and color information being "acquired simultaneously" is similar to Fisker's disclosure of "simultaneous scanning":

> The '244 Patent discloses a scanner system for recording surface geometry and surface color, in which the surface geometry and color information are 'acquired *simultaneously*' using one image sensor. (Ex.1001, 2:1-13.) Similarly, Fisker teaches, and illustrated in Figure 9, a device for 'simultaneous scanning of a surface shape and color' using one image sensor 181. (Ex.1005, [0228], [0244].)

Pet. at 26-27. However, Petitioner takes the "acquired simultaneously" disclosure of the '244 Patent out of context by not reciting the remainder of the sentence. That sentence reads:

> [o]ne aspect of the application is to provide a scanner system and a method for recording surface geometry and surface color of an object, in which the information relating to the surface geometry and to the surface color are acquired simultaneously ***such that an alignment of data relating to the recorded surface geometry and data relating to the recorded surface color is not required in order to generate a digital 3D representation of the object expressing both color and geometry of the object***. [Emphasis added.]

Ex.1001 at 2:5-13. Thus, the claims of the '244 Patent are not merely directed to "acquiring simultaneously" surface geometry and surface color, as Petitioner suggests. Rather, the '244 Patent explains that surface geometry and surface color are "acquiring simultaneously" ***such that*** alignment of data relating to the recorded surface geometry and data relating to the recorded surface color is not required. This is achieved in the '244 Patent by using the same at least one 2D image to derive both surface color and surface geometry, as claimed. *Id*. at 3:12-18.

Moreover, the '244 Patent separately describes the feature of deriving surface color information from at least one of the 2D images from which the surface color information is derived:

> the data processing system is configured for deriving surface geometry information from a plurality of 2D images of a series of captured 2D images and for deriving surface color information from at least one of the 2D images from which the surface color information is derived.

Ex.1001, 3:47-52. The '244 Patent also discloses that "[t]he surface color information can be derived from one 2D image." *Id*. at 18:48-49. Contrary to Petitioner's suggestions, nothing in the '244 Patent indicates that Fisker's "simultaneous scanning" would somehow inherently result in deriving surface color information from at least one of the 2D images from which the surface geometry information is derived.

In fact, the claimed focus scanner of the '244 Patent provides advantages not found in Fisker. As discussed above, the '244 Patent explains that alignment is "perfect," for example, as the result of using the same 2D image to derive both surface color and surface geometry. *Id*. at 3:12-18. The perfect alignment is the result of not having a slight delay between recording images used to derive surface color and recording images used to derive surface geometry. *Id*. at 1:33-43. Fisker is completely silent regarding any advantage in relation to such an alignment. Further, Fisker discloses obtaining both surface color and surface topology information from a voluminous collection of 2D images. *See* Section V.A.1. Fisker's scanner system does not obtain surface color and surface geometry from the same at least one 2D image and, thus, Fisker's scanner system does not obtain the advantages disclosed in the '244 Patent.

2. Petitioner fails to explain how and why Fisker's Fig. 9 embodiment would have been combined with Fisker's white light embodiment to somehow arrive at the claimed invention

Petitioner relies on two distinct embodiments of Fisker—the embodiment depicted in Fig. 9 ("the Fig. 9 embodiment") and the embodiment employing a white light source ("the white light source embodiment")—for allegedly disclosing distinct claim limitations. Specifically, Petitioner relies on the Fig. 9 embodiment of Fisker for its use of "simultaneously scanning of a surface shape and color." Pet. at 26-28. Petitioner alleges that such "simultaneous scanning of a surface shape and color" satisfies the claimed deriving of both surface geometry information and surface color information from the same at least one 2D image. *Id.* Petitioner relies on Fisker's white light source embodiment for allegedly satisfying the claimed "multichromatic probe light." Pet. at 22-23. However, Petitioner fails to explain how and why Fisker's Fig. 9 embodiment would somehow have been combined with Fisker's white light source embodiment to arrive at the claimed invention.

a. The Fig. 9 embodiment of Fisker does not produce a "multichromatic probe light" as claimed

Claim 1 of the '244 Patent requires "a multichromatic light source configured for providing ***a multichromatic probe light*** for illumination of the

object." Ex.1001 at 19:33-35. Fisker's Fig. 9 embodiment does not provide a "multichromatic probe light." Fig. 9 of Fisker is reproduced below:

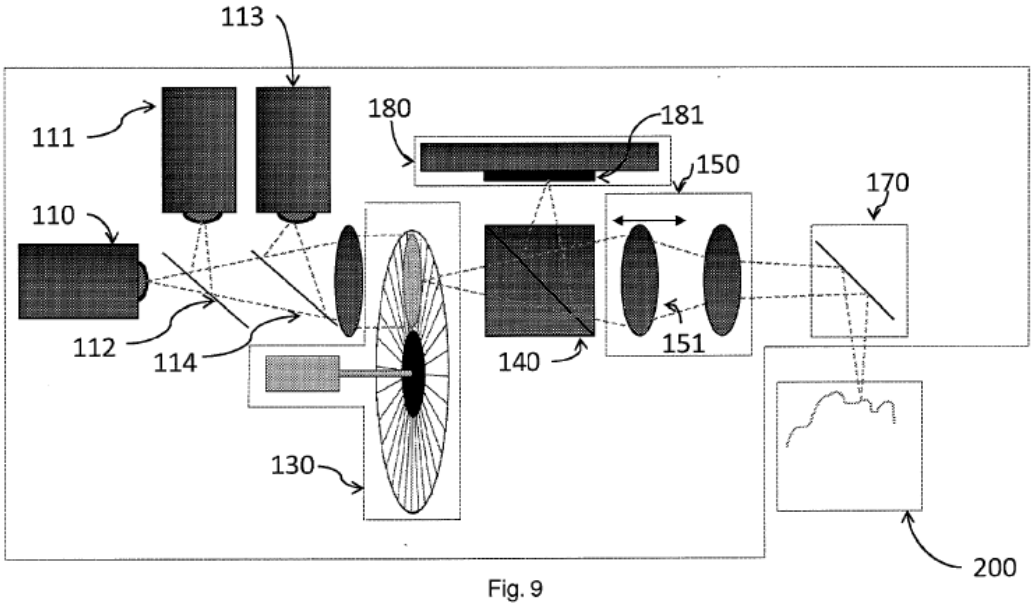

Fig. 9 of Fisker

Fisker's Fig. 9 embodiment includes three monochromatic light sources – namely, a red light source 110, a green light source 111, and a blue light source 113. Ex.1005 at ¶ [0279]. *See also id.* at ¶ [0151] (disclosing "at least three monochromatic light sources"). Fisker discloses that one monochromatic light source is switched on at a time. *Id.* at ¶ [0157] ("***switching between*** at least two colors, preferably three colors, such as red, green and blue, of the probe light for a focal plane position", "***switching on and off*** different monochromatic light sources (having one only light source turned on at a time)" (emphases added)). *See also id.* at ¶ [0279]. The "switching" monochromatic light sources of Fisker's Fig. 9

embodiment produce light from one light source at a time and thus, by definition, produce ***monochromatic*** light. *Id.* The switching monochromatic light sources do not produce the claimed "***multichromatic*** probe light." In fact, Petitioner makes no assertion that the monochromatic light sources 110, 111, 113 of Fisker's Fig. 9 embodiment produce a "multichromatic probe light."

Instead, Petitioner refers to a different embodiment for purportedly satisfying the claimed multichromatic probe light:

> Fisker further discloses that '[t]o obtain color information the light source needs to be white or to comprise at least three monochromatic light sources with colors distributed across the visible part of the electromagnetic spectrum.' (Ex.1005, [0151].) ***The '244 Patent provides a white light source as an example of a multichromatic light source.*** (Ex.1001, 5:23-25.) Thus, Fisker teaches this limitation. [Emphasis added.]

Pet. at 22-23. However, this embodiment which employs the white light source ("the white light source embodiment") is distinct from Fisker's Fig. 9 embodiment which employs three monochromatic light sources. Ex.1005 at Fig. 9 (Fig. 9 does not employ a white light source or multichromatic probe light). As discussed below, Petitioner provides no explanation as to how or why a POSITA would have combined Fisker's Fig. 9 embodiment with Fisker's white light source embodiment to somehow arrive at the claimed invention.

b. Petitioner fails to explain how and why Fisker's Fig. 9 embodiment would have been combined with Fisker's white light embodiment

As discussed above, Petitioner relies on Fisker's Fig. 9 embodiment of "a device for 'simultaneous scanning of a surface shape and color' using one image sensor 181" for purportedly disclosing the claimed feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry." Pet. at 26-27 (citing Ex.1005 at ¶ [0228]). Separately, Petitioner relies on Fisker's white light source embodiment for the purported use of a multichromatic probe light. Pet. at 22-23. However, Fisker discloses that the "simultaneous scanning" of the Fig. 9 embodiment is achieved by using three separate monochromatic light sources where "only one light source is switched on at the time." Ex.1005 at ¶ [0279]. The Petition is completely silent as to any purported reason for combining the white light embodiment of Fisker (which employs a white light source) with the Fig. 9 embodiment of Fisker (which employs switching between monochromatic light sources) to achieve the "simultaneous scanning" relied on by Petitioner. Nor does Petitioner or its expert explain how the Fig. 9 embodiment somehow would have been modified to arrive at the use of "a multichromatic probe light" while retaining the "simultaneously scanning" functionality of the Fig. 9 embodiment.

In fact, Fisker teaches that the switching monochromatic light sources are responsible for obtaining the "simultaneous scanning of a surface shape and color." Ex.1005 ¶ [0228] (disclosing that the "simultaneous scanning of a surface shape and color" is obtained by the Fig. 9 embodiment), ¶ [0279] (disclosing the use of switching monochromatic light sources of the Fig. 9 embodiment to obtain color measurement). ***Replacing the switching monochromatic light sources of the Fig. 9 embodiment with the white light source of Fisker's white light source embodiment would have removed the very structure Fisker teaches is responsible for obtaining "simultaneous scanning of a surface shape and color."*** However, Petitioner does not even go so far as to suggest such a modification to Fisker's Fig. 9 embodiment. Petitioner has not provided any explanation of how Fisker's Fig. 9 and white light source embodiments would somehow have been modified to work together. The grounds based on Fisker should be denied institution for this reason alone.

Petitioner bears the burden of providing a reason with rational underpinnings for combining Fisker's Fig. 9 embodiment with Fisker's white light source embodiment, but fails to do so here. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007); *In re Stepan Co.*, 868 F.3d 1342, 1346 (Fed. Cir. 2017) ("Whether a rejection is based on combining disclosures from multiple references, ***combining multiple embodiments from a single reference,*** or selecting from large

lists of elements in a single reference, there must be a motivation to make the combination…, otherwise a skilled artisan would not arrive at the claimed combination. [Emphasis added.]"); *Abiomed, Inc. v. Maquet Cardiovascular, LLC,* IPR2017-01204, Paper 9 at 11 (PTAB Oct. 23, 2017) (denying institution because "Petitioner simply fails to explain sufficiently *why* one skilled in the art would have found it obvious to combine the teachings" of "different embodiments" of a single reference (emphasis in original)).

The only modifications proposed in the Petition in Grounds 1 and 2 with respect to Fisker relate to adding features of the secondary references (Szeliski and Matsumoto). Such alleged modifications do not relate to "simultaneous scanning" or the use of white light. Pet. at 31-43. Petitioner's purported obviousness rationales merely relate to the independent claim 1 feature of "computing a weighted average of sub-scan color values." *Id*. Petitioner has not even alleged a motivation to combine the Fig. 9 embodiment with the white light embodiment, and thus has failed to satisfy its burden.

Petitioner bears the burden of explaining how such purported combination would have operated to arrive at the claimed invention, but fails to provide any explanation in its Petition. *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994, (Fed. Cir. 2017). Further, Petitioner's expert does not explain what modifications would have been made to Fisker's Fig. 9 embodiment to somehow

make use of the white light source of Fisker's white light embodiment, much less provide a reason as to why such modifications would have been made. Petitioner's expert cites to no underlying facts or data to support his conclusions for combining Fisker's Fig. 9 embodiment with Fisker's white light source embodiment, and thus his testimony should be given no weight. 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight"). *See also ActiveVideo Networks, Inc. v. Verizon Commc'n, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012); *Kinetic Technologies, Inc. v. Skyworks Solutions, Inc.*, IPR2014-00529, Paper 8 at 15 (PTAB Sep. 23, 2014) ("The Declaration does not explain the 'how,' 'what,' and 'why' of the proposed combination of references…. Accordingly, we give [the] Declaration no probative weight.").

3. Szeliski and Matsumoto each fail to cure the deficiencies of Fisker

Szeliski (Ex.1006) and Matsumoto (Ex.1007) each fail to remedy the above-described deficiencies of Fisker. Petitioner relies on Szeliski and Matsumoto solely for allegedly disclosing the feature of "wherein determining the object color comprises computing a weighted average of sub-scan color values derived for corresponding points in overlapping sub-scans at that point of the object surface"

recited in claim 1.[4] Pet. at 31-43. That is, Petitioner does not rely on either Szeliski or Matsumoto for disclosing "the data processing system also configured to derive surface color information … from at least one of the 2D images used to derive the surface geometry information." *Id*. at 26-28. Szeliski and Matsumoto (like Fisker) do not disclose or suggest such claimed subject matter. Nor does Petitioner rely on Szeliski or Matsumoto for disclosing "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object." *Id*. at 22-23. Further, Szeliski and Matsumoto provide no reason for combining Fisker's Fig. 9 embodiment with Fisker's white light source embodiment to arrive at the claimed invention.

For at least the foregoing reasons, Petitioner fails to demonstrate that independent claim 1 would have been obvious.

4. The dependent claims would not have been obvious over the combination of Fisker and either Szeliski or Matsumoto

Each of claims 2-5, 7-10, 15, 16, 18, 21, 22, 24, 26, and 28 directly or indirectly depend from claim 1. Petitioner has not met its burden concerning the

[4] Patent Owner does not concede that Szeliski or Matsumoto discloses or suggests this feature.

dependent claims for at least the same reasons discussed above in Sections V.A.1.-V.A.3. concerning independent claim 1.

B. Petitioner Fails to Satisfy Its Burden with Respect to Grounds 3 and 4

Petitioner fails to establish that it is more likely than not that the combinations of Fisker and Yamada (Ground 3) and Fisker and Suzuki (Ground 4) would have rendered claim 29 obvious for two reasons. First, independent claim 29 would not have been obvious for at least the same reasons discussed above with respect to independent claim 1. Second, Yamada and Suzuki each fail to remedy the above-described deficiencies of Fisker.

1. Petitioner fails to demonstrate that independent claim 29 would have been obvious

Petitioner fails to demonstrate that independent claim 29 would have been obvious for at least the same reasons discussed above with respect to independent claim 1. Like independent claim 1, independent claim 29 recites the claim feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information."[5] Ex.1001 at 19:48-52, 22:21-25.

[5] This claim recitation is designated as element [1.4.b] and element [29.4.b] in the Petition. *See* Pet. at Appendix A.

Further, like independent claim 1, independent claim 29 recites the claim feature of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object."[6] *Id.* at 19:33-35, 22:6-8.

Concerning features [29.P] to [29.4b] of independent claim 29, Petitioner relies on its arguments concerning features [1.P] to [1.4b] of claim 1. Pet. at 58-59 ("Fisker teaches limitation [29.P]-[29.4b] for at least the reasons described above."). Thus, for the same reasons discussed above in Sections V.A.1-3. (discussing identical recitations in independent claim 1), Petitioner fails to demonstrate that Fisker discloses or suggests the independent claim 29 feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry." Further, for the same reasons discussed above in Sections V.A.1-3., Petitioner fails to provide an explanation of how and why Fisker's Fig. 9 embodiment would have been combined with Fisker's white light embodiment to somehow arrive at the claimed invention.

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[6] This claim recitation is designated as element [1.1] and element [29.1] in the Petition. *See* Pet. at Appendix A.

2. Yamada and Suzuki each fail to cure the deficiencies of Fisker

Yamada (Ex.1008) and Suzuki (Ex.1009) each fail to remedy the above-described deficiencies of Fisker. Petitioner relies on Yamada and Suzuki solely for allegedly disclosing the independent claim 1 feature of "where the data processing system further is configured to detecting saturated pixels in the captured 2D images and for mitigating or removing the error in the derived surface color information or the sub-scan color caused by the pixel saturation."[7] Pet. at 59-66; Ex.1001 at 22:26-30. That is, Petitioner does not rely on either Yamada or Suzuki to show the independent claim 1 features of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object, [and] … the data processing system also configured to derive surface color information … from at least one of the 2D images used to derive the surface geometry information." Ex.1001 at 22:6-25. Yamada and Suzuki (like Fisker) do not disclose or suggest such claimed subject matter. Further, Yamada and Suzuki provide no reason with rational underpinnings for combining Fisker's Fig. 9

[7] Patent Owner does not concede that Yamada or Suzuki discloses or suggests this feature.

embodiment with Fisker's white light source embodiment to arrive at the claimed invention.

For at least the foregoing reasons, Petitioner has not met its burden with respect to independent claim 29.

C. Petitioner Fails to Establish that It Is More Likely than Not that Fisker, Szeliski, and Yamada (Ground 5), Fisker, Szeliski, and Suzuki (Ground 6), Fisker, Matsumoto, and Yamada (Ground 7), and Fisker, Matsumoto, and Suzuki (Ground 8) render claim 12 Obvious

Petitioner challenges claim 12 of the '244 Patent in Grounds 5 to 8. Pet. at 58-66. Claim 12 would not have been obvious for at least the same reasons discussed above with respect to independent claim 1, from which claim 12 depends. Ex.1001, 20:57-61. For the same reasons discussed above in Sections V.A.1-3., Petitioner fails to demonstrate that Fisker discloses or suggests the feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry." Further, for the same reasons discussed above in Sections V.A.1-3., Petitioner fails to provide an explanation of how and why Fisker's Fig. 9 embodiment would have been combined with Fisker's white light embodiment to somehow arrive at the claimed invention.

Szeliski, Yamada, Suzuki, and Matsumoto (the additional art cited in Grounds 5 to 8) each fail to remedy the above-described deficiencies of Fisker. In

Grounds 5 to 8, Petitioner additionally relies on Szeliski, Yamada, Suzuki, and Matsumoto solely for allegedly disclosing the subject matter explicitly recited in claim 12.[8] Pet. at 66. That is, Petitioner does not rely on Szeliski, Yamada, Suzuki, or Matsumoto to show the independent claim 1 features of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object, [and] … the data processing system also configured to derive surface color information … from at least one of the 2D images used to derive the surface geometry information." Ex.1001 at 22:6-25. Szeliski, Yamada, Suzuki, and Matsumoto (like Fisker) do not disclose or suggest such claimed subject matter. Further, Szeliski, Yamada, Suzuki, and Matsumoto provide no reason with rational underpinnings for combining Fisker's Fig. 9 embodiment with Fisker's white light source embodiment to arrive at the claimed invention.

Thus, Petitioner fails to establish that it is more likely than not that the combinations of Fisker, Szeliski, and Yamada (Ground 5), Fisker, Szeliski, and Suzuki (Ground 6), Fisker, Matsumoto, and Yamada (Ground 7), and Fisker, Matsumoto, and Suzuki (Ground 8) would have rendered claim 12 obvious.

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[8] Patent Owner does not concede that Szeliski, Yamada, Suzuki, or Matsumoto discloses or suggests this feature.

D. Petitioner Fails to Establish that It Is More Likely than Not that Thiel425, Thiel576, and Szeliski (Ground 9) and Thiel425, Thiel576, and Matsumoto (Ground 10) Render Claims 1, 22, and 24 Obvious

Petitioner fails to meet its burden concerning Grounds 9 and 10 of the Petition.

1. Neither Thiel425 nor Thiel576 discloses or suggests "the data processing system also configured to *derive surface color information* for the block of said image sensor pixels *from at least one of the 2D images used to derive the surface geometry information*"

Petitioner alleges that the claim recitation "the data processing system also configured to *derive surface color information* for the block of said image sensor pixels *from at least one of the 2D images used to derive the surface geometry information*" would have been obvious from the combination of Thiel425 and Thiel576. Pet. at 76-78. Petitioner is mistaken. Thiel425 and Thiel576 fail to disclose or suggest such claimed subject matter for the following reasons.

a. Petitioner concedes that Thiel425 does not disclose deriving surface color information from a 2D image

Petitioner concedes that Thiel425 "does not explicitly disclose determining surface color information of the object of interest from at least one of images in the stack of 2D images." Pet. at 76. In fact, Thiel425 does not even disclose deriving surface color information for an object at all. Instead, Thiel425 merely relates to a handheld dental camera for obtaining optical ***3D measurements***. Ex.1012 at

¶ [0002], [0016], [0079], [0085]. Thiel425 is completely silent concerning any data processing system programmed to derive ***surface color information***. Therefore, Thiel425 fails to disclose or suggest a data processing system configured to derive both surface geometry information ***and surface color information*** from the same at least one 2D image captured by said color image sensor, as required by claim 1.

b. Thiel576 does not disclose or suggest deriving both surface geometry information and surface color information from the same at least one 2D image

Like Thiel425, Thiel576 does not disclose or suggest deriving both surface geometry information and surface color information from the same at least one 2D image, as required by claim 1. Petitioner makes no assertion that Thiel576 discloses or suggests such claimed subject matter. Pet. at 76-78. Thiel576 discloses a device having ***two modes – namely, a first mode for optical 3D depth measurement and a second mode for colorimetric measurement.*** Ex.1013 at Abstract. As shown in annotated Fig. 2 of Thiel576 below, when Thiel576's device is in the first mode for surface topology measurement, a broad-band illuminating beam is focused onto a first plane 15. *Id*. at Abstract; Fig. 2; ¶¶ [0105]-[0106]. When the device is in the second mode for colorimetric measurement, the broad-band illuminating beam is focused onto a second plane 30 ***other than the first plane 15***. *Id*.

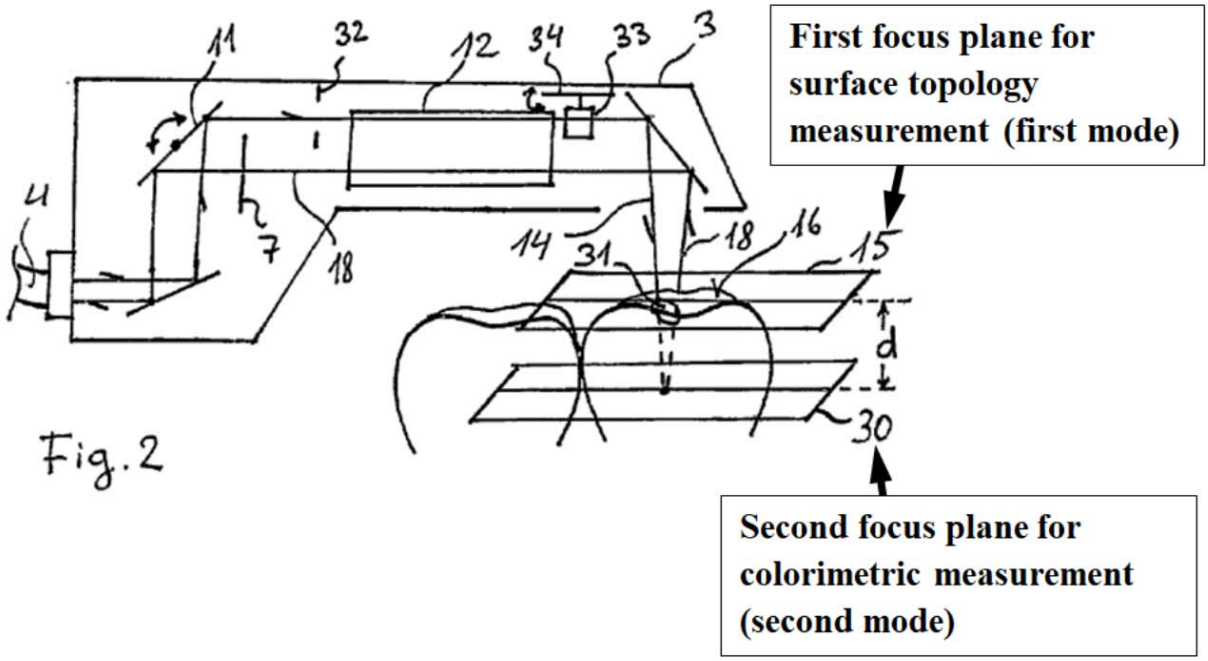

Fig. 2 of Thiel576 (Annotated)

In order to switch between the two modes, Thiel576's device adjusts its current focus plane from the first plane 15 to the second plane 30, or vice-versa. *Id*. at ¶ [0017], Fig. 2. The adjustment may be performed by mechanically adjusting the position of a diaphragm, switching objectives, adjusting the focal length of an objective, switching handhelds, etc. *Id*. at ¶¶ [0072], [0106]-[0110]. In short, Thiel576 uses two different focus planes – one to measure the 3D depth and a different one to measure color. *Id.* Thus, the image data captured from the first focus plane to measure 3D surface topology is not the same as the image data captured from the second focus plane to measure color. *Id.* Because Thiel576 relies on a first set of image data to measure surface topology that is entirely

distinct from a second set of image data to measure color, Thiel576's device does not measure both surface topology and color from the same at least one 2D image.

2. It would not have been obvious to combine Thiel425 and Thiel576 to arrive at the claimed subject matter

It would not have been obvious to combine Thiel425 and Thiel576 to arrive at the claimed subject matter for two reasons. First, Petitioner and its expert cite to no evidence, underlying facts, or data which demonstrate that the claim limitation missing from Thiel425 and Thiel576 would have been obvious. Second, Petitioner fails to explain how and why a POSITA would have combined Thiel425 with Thiel576 to arrive at the claimed invention.

a. Petitioner and its expert cite to no evidence, underlying facts, or data which demonstrate that the missing claim limitation would have been obvious

Petitioner asserts that:

> it would have been obvious to a POSITA to enhance the spectral analysis and imaging processing methods of Thiel425's device to derive surface color measurements a color information ***simultaneous to its deriving surface geometry information*** in view of Thiel576, since Thiel425's device already operates on the stack of 2D color images (at least one of the 2D images used to derived the surface geometry information) derived from different focal depths (Ex.1003, ¶463). [Emphasis added.]

Pet. at 77. However, as explained above, neither Thiel425 nor Thiel576 disclose or suggest the "simultaneous" measurement of surface geometry and surface color

information proposed by Petitioner in its alleged combination. Rather, Thiel576 explicitly teaches obtaining surface geometry information and surface color information in ***two distinct modes (and at two different focus planes) which results in two distinct sets of image data***. Ex.1013 at Abstract; Fig. 2; ¶¶ [0105]-[0106].

None of the cited references (Thiel425, Thiel576, Szeliski, and Matsumoto) teach deriving both surface geometry information and surface color information from the same at least one 2D image. The cited references are completely silent concerning this claimed feature. Petitioner baldly asserts that a POSITA would have found it obvious to derive color measurements "simultaneous to its deriving surface geometry information." Pet. at 77. ***The only support for this assertion provided by Petitioner is a citation to paragraph 463 of Petitioner's expert's declaration (Ex.1003).*** *Id.* However, Petitioner's expert merely repeats the conclusory assertion in the Petition without citing to any documentary evidence, underlying facts, or data. Ex.1003 at ¶ 463. Such testimony should be given no weight. 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."). Petitioner's expert's unsupported and conclusory testimony cannot take the place of a claim limitation missing from the applied art, and thus should be given no weight. *See* Office Patent Trial Practice Guide, August 2018 Update, 83

Fed. Reg. 39989 (Aug. 13, 2018) (available at https://go.usa.gov/xU7GP) at 4-5 ("Expert testimony, however, cannot take the place of a disclosure in a prior art reference, when that disclosure is required as part of the unpatentability analysis."; "[C]onclusory assertions from a third party about general knowledge in the art cannot, without supporting evidence of record, supply a limitation that is not evidently and indisputably within the common knowledge of those skilled in the art.").

b. Petitioner fails to explain how and why a POSITA would have modified Thiel425 with the teachings of Thiel576 to arrive at the claimed invention

Petitioner asserts that it would have been obvious to modify Thiel425 by "[e]nhancing Thiel'425's imaging processing methods with Thiel576's imaging processing methods." Pet. at 77. Petitioner asserts that "a POSITA would have understood how and why to enhance Thiel425's image processor with the image processing techniques of Thiel576." *Id.* at 78. Petitioner is mistaken. Petitioner does not adequately explain how or why a POSITA would have modified Thiel425's device with the features disclosed by Thiel576 to arrive at the ***specific claimed feature*** of deriving ***both*** surface geometry information ***and*** surface color information ***from the same at least one 2D image***.

Petitioner asserts that "both Thiel425 and Thiel576 permit adjustment of the objective" and "Thiel425's illuminating beam can be utilized to derive surface

color, e.g., as in Thiel576." Pet. at 77-78. Petitioner appears to be suggesting that the structure of Thiel425 is ***capable of*** performing certain functions (adjusting the objective, illuminating an object to derive surface color) common to the system of Thiel576. *Id.* Assuming *arguendo* that a POSITA would have understood Thiel425's system as being capable of obtaining color information in the manner taught by Thiel576 (*i.e.*, by using two modes of operation where the first mode obtains 3D measurement and the second mode obtains colorimetric measurement), this would not have led a POSITA to modify Thiel425 to arrive at the specific claimed feature of deriving ***both*** surface geometry information ***and*** surface color information ***from the same at least one 2D image***. At best, a POSITA, when considering Thiel576, would have merely modified Thiel425 to arrive at the two separate modes of operation of Thiel576 which, as explained above in Section V.D.1.b., do not result in deriving both surface geometry information and surface color information from the same at least one 2D image.

In this regard, Petitioner asserts that it would have been obvious to modify Thiel425 in view of Thiel576's use of "out-of-focus images" to generate color information. Pet. at 76-77. However, Thiel576's use of out-of-focus images to generate color information is made possible by Thiel576's two distinct modes of operation (wherein the first mode obtains 3D measurement and the second mode obtains color information). Ex.1013 at ¶¶ [0016], [0038], [0086], [0106]. Use of

two distinct modes in Thiel576 allows for out-of-focus images to be obtained in the second mode. *Id.* Assuming (incorrectly) that Thiel425 and Thiel576 are combinable, in order to realize the benefit of using such "out-of-focus" images to generate color information taught by Thiel576 and as proposed by Petitioner, a POSITA would have modified Thiel425 to make use of Thiel576's two distinct modes of operation for obtaining 3D measurement and color information. As explained above in Section V.D.1.b., however, Thiel576's two distinct modes of operation do not result in deriving both surface geometry information and surface color information from the same at least one 2D image.

Petitioner provides several purported reasons for combining the disclosures of Thiel425 and Thiel576. Pet. at 69-72, 77-78. None, however, provide a reason why a POSITA would have modified Thiel425's device with the features disclosed by Thiel576 to arrive at the specific claimed feature of deriving both surface color information and surface topology information from the same 2D image. Specifically, Petitioner asserts that: (a) Thiel425 and Thiel576 share the same inventor and assignee (*Id*. at 69); (b) Thiel425 and Thiel576 are both directed to perform optical 3D measurements of teeth (*Id*. at 69-70); (c) Thiel425 and Thiel576 have similar confocal measuring apparatuses (*Id*. at 70); (d) Thiel425 and Thiel576 disclose a processing means, and a POSITA would have enhanced Thiel425's processing software using routine coding and engineering practices (*Id*.

at 71); (e) Thiel425 and Thiel576 obtain stacks of 2D images (*Id*. at 70-71, 77-78); and (f) Thiel425 and Thiel576 disclose light sources with overlapping wavelength ranges (*Id*. at 78). Such purported reasons merely relate to general similarities between the systems disclosed by Thiel425 and Thiel576. None of Petitioner's assertions provide a reason as to why a POSITA would have combined Thiel425 and Thiel576 to arrive at the specific claimed feature of deriving both surface geometry information and surface color information from the same at least one 2D image. Again, at best, the alleged similarities between Thiel425 and Thiel576 would have led a POSITA to modify Thiel425 to employ the two modes of operation disclosed by Thiel576 which, as explained above in Section V.D.1.b., do not result in deriving both surface geometry information and surface color information from the same at least one 2D image.

Further, for the reasons discussed above, Petitioner has not demonstrated that a POSITA would have had a reasonable expectation of success in modifying Thiel425 in view of Thiel576 to arrive at deriving both surface geometry information and surface color information from the same at least one 2D image.

Petitioner engages in impermissible hindsight by divorcing Thiel576's disclosure of a second mode for colorimetric measurement from its first mode for measuring surface geometry, and combining the divorced disclosure of Thiel576's second mode with Thiel425 which measures surface geometry. Other than

impermissible hindsight, there is simply no reason to take Thiel576's second mode that uses a focus plane that is ***different*** from the focus plane used for depth measurement completely out of context, only to impose it upon the ***same*** focus plane for measuring surface geometry of Thiel425. Pet. at 77. This is because Thiel576 teaches the importance of obtaining surface geometry and color in two different modes by obtaining two distinct sets of image data at different focus planes (*i.e.*, to obtain a "fuzzy circle" in the second mode for measuring color). Ex.1013 at ¶ [0016] ("beam is thus not bundled to a point but to a fuzzy circle"), ¶ [0038] ("[a]dvantageously, … for colorimetric measurement … beam is focused onto a second plane other than the first plane…, and an out-of-focus image of the illuminating beam is formed on the surface of the object … in the form of a fuzzy circle…."), ¶ [0086], Fig. 2. Thus, modifying Thiel425/Thiel576 to do away with obtaining surface geometry and color at two different focus planes would have been contrary to the intended purpose and principle of operation of Thiel576.

3. Szeliski and Matsumoto fail to cure the deficiencies of Thiel425 and Thiel576

Szeliski and Matsumoto each fail to remedy the above-described deficiencies of Thiel425 and Thiel576. Petitioner relies on Szeliski and Matsumoto solely for allegedly disclosing the feature of "wherein determining the object color comprises computing a weighted average of sub-scan color values derived for corresponding points in overlapping sub-scans at that point of the

object surface" recited in claim 1.[9] Pet. at 81-82. That is, Petitioner does not rely on either Szeliski or Matsumoto for disclosing "the data processing system also configured to derive surface color information from at least one of the 2D images used to derive the surface geometry information." Szeliski and Matsumoto (like Thiel425 and Thiel576) do not disclose or suggest such claimed subject matter. Further, Szeliski and Matsumoto provide no reason for combining Thiel425 and Thiel576 to arrive at the claimed invention.

4. Dependent claims 22 and 24 would not have been obvious over the alleged combination of Thiel425 and Thiel576 with either Szeliski or Matsumoto

Each of claims 22 and 24 directly or indirectly depend from claim 1. Petitioner has not met its burden concerning the dependent claims for at least the same reasons discussed above in Sections V.D.1-3. concerning independent claim 1.

[9] Patent Owner does not concede that Szeliski or Matsumoto discloses or suggests this feature.

E. Petitioner Fails to Establish that It Is More Likely than Not that Thiel425, Thiel576, and Yamada (Ground 11) and Thiel425, Thiel576, and Suzuki (Ground 12) Render Claim 29 Obvious

Petitioner challenges independent claim 29 in Grounds 11 and 12.[10] Pet. at 88-92. Independent claim 29 would not have been obvious for at least the same reasons discussed above with respect to independent claim 1. Yamada and Suzuki each fail to remedy the above-described deficiencies of Thiel425 and Thiel576. Thus, Petitioner fails to establish that it is more likely than not that the combinations of Thiel425, Thiel576, and Yamada (Ground 11) and Thiel425, Thiel576, and Suzuki (Ground 12) would have rendered claim 29 obvious.

1. Claim 29 would not have been obvious for at least the same reasons discussed above with respect to claim 1

Independent claim 29 recites several of the same features as independent claim 1 discussed above. Like independent claim 1, independent claim 29 recites the claim feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the

[10] Petitioner's table provided on p. 4 of the Petition includes a typographical error. Pet. at 4. Specifically, Grounds 11 and 12 have been switched with Grounds 13 and 14, respectively. *Compare* Pet. at 4 *with* vi-vii.

2D images used to derive the surface geometry information."[11] Ex.1001 at 19:48-52, 22:21-25. Further, like independent claim 1, independent claim 29 recites the claim feature of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object."[12] *Id.* at 19:33-35, 22:6-8.

Concerning features [29.P] to [29.4b] of independent claim 29, Petitioner relies on its arguments concerning features [1.P] to [1.4b] of claim 1. Pet. at 88 ("the Thiel425/Thiel476 combination teaches or suggests limitations [29.P]-[29.4.b.] for at least the reasons described above."). Thus, for the same reasons discussed above in Sections V.D. (discussing identical recitations in independent claim 1), Petitioner fails to demonstrate that Thiel425 and Thiel576 discloses or suggests the independent claim 29 feature of "the data processing system also configured to derive surface color information for the block of said image sensor

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[11] This claim recitation is designated as element [1.4.b] and element [29.4.b] in the Petition. *See* Pet. at Appendix A.

[12] This claim recitation is designated as element [1.1] and element [29.1] in the Petition. *See* Pet. at Appendix A.

pixels from at least one of the 2D images used to derive the surface geometry information."

2. Yamada and Suzuki each fail to cure the deficiencies of Thiel425 and Thiel576

Yamada and Suzuki each fail to remedy the above-described deficiencies of Thiel425 and Thiel576. Petitioner relies on Yamada and Suzuki solely for allegedly disclosing the independent claim 1 feature of "where the data processing system further is configured to detecting saturated pixels in the captured 2D images and for mitigating or removing the error in the derived surface color information or the sub-scan color caused by the pixel saturation."[13] Pet. at 88-92. That is, Petitioner does not rely on either Yamada or Suzuki to show the independent claim 1 features of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object, [and] … the data processing system also configured to derive surface color information from at least one of the 2D images used to derive the surface geometry information." Ex.1001 at 22:6-25. Yamada and Suzuki (like Thiel425 and Thiel576) do not disclose or suggest such claimed subject matter. Further, Yamada and Suzuki

[13] Patent Owner does not concede that Yamada or Suzuki discloses or suggests this feature.

provide no reason with rational underpinnings for combining Thiel425 with Thiel576 to arrive at the claimed invention.

For at least the foregoing reasons, Petitioner has not met its burden with respect to independent claim 29.

F. Petitioner Fails to Establish that It Is More Likely than Not that Thiel425, Thiel576, Szeliski, and Fisker (Ground 13) and Thiel425, Thiel576, Matsumoto, and Fisker (Ground 14) Render Claims 2-5, 7-10, 15, 16, 18, 21, 26, and 28 Obvious

Petitioner challenges claims 2-5, 7-10, 15, 16, 18, 21, 26, and 28 in Grounds 13 and 14.[14] Pet. at 92-96. Claims 2-5, 7-10, 15, 16, 18, 21, 26, and 28 would not have been obvious for at least the same reasons discussed above with respect to independent claim 1, from which claims 2-5, 7-10, 15, 16, 18, 21, 26, and 28 directly or indirectly depend. For the same reasons discussed above in Section V.D., Petitioner fails to demonstrate that Thiel425 and Thiel576 discloses or suggests the feature of "the data processing system also configured to derive surface color information for the block of said image sensor pixels from at least one of the 2D images used to derive the surface geometry information." Further,

[14] Petitioner's table provided on p. 4 of the Petition includes a typographical error. Pet. at 4. Specifically, Grounds 13 and 14 have been switched with Grounds 11 and 12, respectively. *Compare* Pet. at 4 *with* vi-vii.

for the same reasons discussed above in Section V.D., Petitioner fails to provide a reason why a POSITA would have combined Thiel425 and Thiel576 to somehow arrive at the claimed invention.

Szeliski, Fisker, and Matsumoto each fail to remedy the above-described deficiencies of Thiel425/Thiel576. In Grounds 13 and 14, Petitioner relies on Szeliski, Fisker, and Matsumoto solely for allegedly disclosing the subject matter explicitly recited in dependent claim 2-5, 7-10, 15, 16, 18, 21, 26, and 28.[15] Pet. at 92-95. That is, Petitioner does not rely on Szeliski, Fisker, or Matsumoto to show the independent claim 1 features of "a multichromatic light source configured for providing a multichromatic probe light for illumination of the object, [and] … the data processing system also configured to derive surface color information from at least one of the 2D images used to derive the surface geometry information." Ex.1001 at 22:6-25. Szeliski, Fisker, and Matsumoto (like Thiel425 and Thiel576) do not disclose or suggest such claimed subject matter. Further, Szeliski, Fisker, and Matsumoto provide no reason with rational underpinnings for combining Thiel425 and Thiel576 to somehow arrive at the claimed invention.

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[15] Patent Owner does not concede that Szeliski, Yamada, Suzuki, or Matsumoto discloses or suggests this feature.

Thus, Petitioner fails to establish that it is more likely than not that the combinations of Thiel425, Thiel576, Szeliski, and Fisker (Ground 13) and Thiel425, Thiel576, Matsumoto, and Fisker (Ground 14) would have rendered claim 12 obvious.

VI. DISCRETION TO INSTITUTE

The Board should exercise its discretion and deny institution of this Petition. 35 U.S.C. § 324(a), § 325(d); *Cuozzo*, 136 S. Ct. at 2140 ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion.").

A. The Petition Should Be Denied in View of the Virtually Identical IPRs Filed by Petitioner

Petitioner has filed an additional PGR petition (PGR2018-00104) and two additional IPR petitions (IPR2019-00117, -00118) challenging the '244 Patent. Petitioner admits that "Petitioner has purposely filed nearly identical prior art Grounds against the claims in the PGRs and IPRs knowing that one of the two types of proceedings must fail under the law." Pet. at 6. Petitioner admits that "there are identical issues [in the PGRs and IPRs] except which proceeding type is proper." *Id.* The Board should not institute both the PGRs and IPRs because doing so would be judicially inefficient, particularly in light of Petitioner's admission that the prior art issues in the PGRs and IPRs are virtually identical. *Id.* Instituting both the PGRs and IPRs, when Petitioner admits that "one of the

two…must fail under the law," would place unnecessary burden on Patent Owner and be an inefficient use of Patent Office resources.

Further, allowing petitioners to file PGR and IPR petitions taking equivocating positions concerning PGR eligibility unfairly places the burden of adjudicating such additional proceedings upon the Patent Office and patent owners. Petitioner is the party seeking review and therefore should bear the burden of determining whether a PGR or IPR is the procedurally appropriate vehicle to challenge a patent. Petitioner should not be permitted to pass this burden off to the Patent Office and Patent Owner, as Petitioner attempts here. Allowing such practice would invite the filing of parallel PGRs and IPRs challenging the same claims on the same grounds and thus adversely impact the integrity of the patent system and efficient administration of the Office. Thus, the Board should exercise its discretion and deny institution. *See* Office Patent Trial Practice Guide, August 2018 Update, 83 Fed. Reg. 39989 (Aug. 13, 2018) (available at https://go.usa.gov/xU7GP) at 10 ("There may be other reasons besides the 'follow-on' petition context where the 'effect…on the economy, the integrity of the patent system, the efficient administration of the Office, and the ability of the Office to timely complete proceedings,'…favors denying a petition even though some claims meet the threshold standards for institution"); 35 U.S.C. § 324(a), § 326(b).

B. The Petition Should Be Denied Under § 325(d)

The Petition should be denied under § 325(d) for two reasons. First, Petitioner overlooks the examiner's reasons for allowance citing features common to the independent claims. Second, the Patent Office previously determined that pre-AIA law applies to the application which issued as the '244 Patent.

1. Petitioner overlooks the examiner's reasons for allowance citing features common to the independent claims

Fisker was considered by the Examiner and applied in a rejection during prosecution of the '244 Patent. Ex.1002 at 0873-74. In the Examiner's statement of reasons for allowance, the Examiner determined that the art of record (including Fisker) does not disclose the claimed "multichromatic light source", "color image sensor", and "data processing system", *i.e.*, the features common to independent claims 1, 29, 31, 32, and 34:

> Regarding claims 1-2, 4-12, 14-24, and 26-39, the prior art fails to disclose or make obvious a focus scanner for recording surface geometry and surface color of an object comprising, in addition to the other recited features of the claim, the details and functions of ***a multichromatic light source, a color image sensor, a data processing system*** in the manner recited in claim 1, 33, 35, 36 or 38. [Emphasis added.]

Ex.1002 at 0921. Petitioner now requests the PTAB to readjudicate the same cited art (Fisker) and the same issue (whether Fisker discloses "a multichromatic light

source", "color image sensor", and "data processing system"). Pet. at 8-9. Petitioner admits that the Petition relies on Fisker in the same way Fisker was applied during prosecution. *Id.* Petitioner's argument that § 325(d) should not apply is premised on the assumption that the examiner allowed the claims based on the subject matter added to the claims during prosecution. *Id.* at 7-8. What Petitioner fails to recognize, however, is that in the examiner's reasons for allowance, the examiner ultimately determined that the features common to the independent claims—"a multichromatic light source, a color image sensor, a data processing system"—were not found in Fisker and constituted reasons for allowing the claims of the '244 Patent. Ex.1002 at 0921. In fact, Petitioner completely overlooks the examiner's reasons for allowance, incorrectly asserting that the examiner "provided no substantive reasons for allowance."[16] Pet. at 16.

Petitioner provides no explanation why the PTAB should "readjudicate substantially the same prior art and arguments as those presented during

[16] Petitioner asserts that "the Examiner (and 3Shape) agreed color and geometry detection was an unpatentable concept." Pet. at 1. Petitioner is mistaken. During prosecution, Patent Owner explicitly stated that it did not acquiesce to the rejection based on Fisker. Ex.1002 at 0907 ("[w]ithout acquiescing to this rejection, the rejection has been rendered moot by the amendments to claim 1.").

prosecution and considered by the Examiner," thus, the PTAB should exercise its discretion under § 325(d) and deny institution. *See Unified Patents Inc. v. Berman*, IPR2016-01571, Paper 10, at 12 (PTAB Dec. 14, 2016) (informative). Grounds 1-8 are based on obviousness, whereas the rejection during prosecution was based on anticipation. Pet. at 3-4; Ex.1002 at 0873-74. However, Petitioner provides no obviousness rationale for modifying Fisker to arrive at the claimed features of the multichromatic light source, a color image sensor, a data processing system—the features common to the independent claims. Petitioner admits its allegations concerning Fisker correspond to the initial rejection made by the examiner. Pet. at 8-9.

Petitioner's reliance on additional art (Suzuki, Szelinski, Yamada, Suzuki, and Matsumoto) is not a reason to institute trial. This is because the additional art is not being relied on by Petitioner to address the deficiencies of Fisker ultimately found by the examiner during prosecution and noted in the reasons for allowance—the claimed multichromatic light source, color image sensor, data processing system common to the independent claims. *See Kayak Software Corp. v. Int'l Business Machines Corp.*, CBM2016-00075, Paper 16, at 10 (PTAB Dec. 15, 2016) (informative).

2. The Patent Office previously determined that pre-AIA law applies

Post-grant reviews ("PGRs") are available only for patents that issue from applications that, at one point, contained at least one claim with an effective filing date (as defined by 35 U.S.C. § 100(i)) on or after March 16, 2013. *See* AIA § 6(f)(2)(A). The '244 Patent claims unbroken lineage to U.S. Provisional Appl. No. 61/764,178 (the "'178 Provisional Application") filed February 13, 2013, which is before March 16, 2013 (the effective date of AIA). Ex.1001. During prosecution, the Patent Office previously considered whether the '244 Patent is subject to pre-AIA law, and determined that pre-AIA law applies.[17] Ex.1002 at 0870 ("[t]he present application is being examined under the pre-AIA first to invent provisions."). Thus, the Patent Office previously determined that the '244 Patent has an effective filing date prior to March 16, 2013. *Id.* Given such previous consideration, the Board should not revisit the issue of whether the '244

[17] The Application Data Sheet filed in U.S. Application No. 14/764,087 ("the '087 Application"), from which the '244 Patent issued, did ***not*** include a statement that the "application … contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013." Ex.1002 at 0477.

Patent is subject to pre-AIA law in this proceeding. *See, e.g., Merck Sharp & Dohme Corp. v. Wyeth LLC*, PGR2017-00016, Paper 9 at 14 (PTAB Oct. 20, 2017); *Prism Pharma Co., Ltd. v. Choongwae Pharma Corp.*, IPR2014-00315, Paper 14 at 12-13 (PTAB Jul. 8, 2014); *Hospira, Inc. v. Genentech, Inc.*, IPR2017-00739, Paper 16 (PTAB July 27, 2017) (informative). The Board should exercise its discretion and deny institution because the Patent Office has already determined that the '244 Patent is subject to pre-AIA law and, as such, the '244 Patent is not eligible for post-grant review.

VII. CONCLUSION

Petitioner fails to demonstrate that any of the challenged claims of the '244 Patent are unpatentable. Thus, the Petition for Post-Grant Review of the '244 Patent should be denied.

Respectfully submitted,

February 19, 2019

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APPENDIX A - LIST OF EXHIBITS

EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 9,962,244 to Esbech *et al*. ("the '244 patent")
1002	Prosecution File History for the '244 patent ("'244 patent file history
1003	Second Corrected Declaration of Dr. Chandra Bajaj, Ph.D. ("Bajaj Decl.") [*served with Second Corrected Petition on October 30, 2018*]
1004	Curriculum vitae of Dr. Chandra Bajaj, Ph.D.
1005	U.S. Patent Application Publication No. 2012/0092461 to Fisker et al. (filed June 17, 2009; published: April 19, 2012)
1006	U.S. Patent No. 6,097,854 to Szeliski et al. (filed August 1, 1997; issued August 1, 2000)
1007	U.S. Patent No. 7,106,348 B2 to Matsumoto et al. (filed November 28, 2001; issued: September 12, 2006)
1008	U.S. Patent Application Publication No. 2007/0035641 to Yamada et al. (filed April 25, 2005; published: February 15, 2007)
1009	U.S. Patent Application Publication No. 2013/0070128 to Suzuki et al. (filed September 10, 2012; published March 21, 2013)
1012	U.S. Patent Application Publication No. 2012/0075425 to Thiel ("Thiel425") (filed August 19, 2011; published: March 29, 2012)
1013	U.S. Patent Application Publication No. 2011/0080576 to Thiel et al. ("Thiel576") (filed October 1, 2010; published: April 7, 2011)
2001	WIPO International Publication No. 2010/145669 to Fisker, filed June 17, 2010

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that the word count for the foregoing Patent Owner Preliminary Response totals 11,614 words, excluding the parts which are exempted by 37 C.F.R. § 42.24(a)(1).

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CERTIFICATE OF FILING AND SERVICE

I hereby certify that a true and correct copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE TO THE PETITION FOR POST-GRANT REVIEW OF U.S. PATENT NO. 9,962,244** is being filed via PTAB E2E and served on counsel for Petitioner by electronic mail this 19th day of February, 2019 as follows:

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