

Filed on behalf of Patent Owner

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIT CORPORATION
Petitioner

v.

3SHAPE A/S
Patent Owner

Case No. IPR2023-01315
Patent 10,695,151

PATENT OWNER'S SUR-REPLY

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APPENDIX A – LIST OF EXHIBITS

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

CERTIFICATE OF SERVICE

I. INTRODUCTION

Patent Owner (“PO”) submits this Sur-Reply to Petitioner’s Reply (“PR”).

II. ARGUMENT

A. Korten Does Not Anticipate Claims 1, 12, 14, and 15 (Ground 1)

1. Korten Does Not Disclose Determining a Tooth Shade Value Based on the Texture Data of the Corresponding Point of the Digital 3D Representation as Required by Limitations 1[b] and 14[b]

Petitioner suggests that PO improperly imported limitations from the specification into the claims when it recited advantages of the claimed invention. PR, 2-3. This is an incorrect argument. PO has established that Korten fails to disclose the limitations 1[b] and 14[b] (as well as 13[b]), because Korten does not “determin[e] a tooth shade value based on data of the corresponding point of the digital 3D representation.” PO’s Response (“POR”), 8. Simply put, the Petition failed to make out a *prima facie* case of anticipation or obviousness.

In all instances in the Petition wherein it referred to limitation 1[b], 13[b], or 14[b], Petitioner failed to describe where this feature of the claim is found in Korten or any other reference. *See* Petition 25, 30, 37, 51, 56, and 58. Now, confronted with these failures, Petitioner is belatedly raising new unpatentability arguments and presenting new evidence that it could and should have presented earlier. Such

evidence and arguments should be ignored. Consolidated Trial Practice Guide (Nov. 2019) at 73.¹

Korten makes no mention of determining a tooth shade value based on any data in a 3D representation. POR, 9, EX2008 *passim*. There is no disclosure of using texture data (comprising at least color or surface roughness) in a 3D representation for determining a tooth shade. *Id.* There is no mention of using color data from a 3D representation for determining a tooth shade value. *Id.*; *see also* EX2008, ¶40. In fact, Petitioner itself specifically stated that Korten discloses “matching the color data from a point on the patient’s tooth to the color data from the standard tooth shades from a tooth shade guide.” Petition, 32.

¹ It is highly prejudicial to allow Petitioner to present with its Reply new arguments and evidence in support of its *prima facie* case of unpatentability. PO is not permitted to present rebuttal evidence in the form of testimony or new documents with its sur-reply. 37 C.F.R. §42.23(b). To the extent any new argument identified herein is considered, PO requests permission to submit testimony and other evidence in rebuttal to the new argument.

a. Petitioner Failed to Demonstrate that Korten Discloses the Claim Limitations 1[b] and 14[b]

Petitioner asserts that stripped of the “sub-scan” arguments, “Patent Owner’s position on limitation 1[b] is reduced to a bald assertion that Korten requires a strict ordering of steps, shown in Figure 2 of the POR.” PR, 3. However, Petitioner never argued in the Petition that a particular order of steps in Korten necessarily results in a disclosure of limitation 1[b] (or for that matter 13[b] or 14[b]). And, it was Petitioner’s initial burden to establish in the Petition that the prior art discloses the features of limitation 1[b], either expressly or inherently.

Indeed, Petitioner’s expert agreed on cross-examination that Korten does not disclose first associating the color with a first 3D coordinate before determining tooth shade. EX2010, 75:11-14 (“As I said, Korten does not disclose that you have to do it in a specific order. There is no disclosure of that.”). When asked whether Korten discloses the order asserted by Petitioner, Petitioner’s expert stated that there is “motivation” or “encouragement” for performing the process in a particular order. EX2010, 75:11-14, 75:18-20. But, this is a new argument that should be ignored because it was not presented in the Petition. Moreover, it was founded on the expert’s unsupported belief that there was evidence “probably” in Korten’s specification. EX2010, 75:15-18. Further, a “claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of*

California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Petitioner's assertions of encouragement and motivation are not a substitute for an express or inherent disclosure of a claimed feature.

b. Petitioner Ignores How Color is Measured in Korten

Petitioner's new assertions about the order of measuring color, correlating the color with a virtual dentition, and matching are simply wrong. As Dr. Saber stated during his cross-examination:

Well, as I mentioned to you, I mean, the color is associated with a virtual dentition model of Korten, but the color is measured with a separate instrument. It's not derived from the 3D -- from the virtual dentition model of Korten. It's -- the measured color with a spectrometer is being matched to whatever's going on with your scale. That's totally different from the '151 process.

EX1019, 153:5-12. In Korten, that separate instrument used to measure color is preferably a spectrometer. EX1009 2:41-42. But Petitioner's expert has not used a spectrometer, does not know how it captures color, and couldn't remember any details pertaining to the underlying technology. EX2010, 15:4-17:18.

Korten describes "independent from capturing the shape, measuring the color at a location on the tooth, and providing a correlation between the location of the color and a coordinate in the captured shape." EX1009, 2:1-12; *see also* Abstract; Field of Invention. As admitted by Petitioner's expert, one must first measure the

color before providing a correlation between the location of the color and a coordinate in the captured shape. EX2010, 84:9-21 (“If you have not done the measurement of the color, you cannot associate it with the 3D ... representation.”).

Further, Korten explicitly states that “the measurement of the color may involve determination of a color according to a color scheme, like RGB, L*a*b or VITAPAN™.” EX1009, 2:26-30. That is, the measured color may be the color that is measured by the spectrometer or it may be determined according to a color scheme such as VITAPAN™. In Korten, it is that color, *i.e.*, the measured first color or determined color (including determination according to a color scheme such as VITAPAN™) that is correlated with a coordinate in the first virtual dentition. EX1009, 2:10-12. Korten *does not disclose* the use of color data from the virtual dentition and matching that data to a reference tooth shade.

**c. Petitioner’s Expert Contradicts His Own
Understanding of Korten’s Embodiments to Arrive at
Petitioner’s Preferred Understanding of Korten**

Petitioner’s expert refers to the description in Korten at 2:1-12 as a first embodiment. EX1018, ¶6. Then, Petitioner’s expert states that Korten describes a matching step in a later embodiment. EX1018, ¶7. Then, Petitioner’s expert states that this further embodiment builds upon the capabilities of the first embodiment. According to Petitioner’s expert:

You know, in my supplemental declaration, I go through a set of them.

One of them, for instance, Korten does not say reverse the order.

Korten say – has no mention of in what order this is done. So I think the logical assumption is that you assume that the second embodiment is building upon the first embodiment.

EX2010, 88:6-14. However, as indicated above, Korten describes its process at 2:1-12 as requiring the measuring and matching of color to occur before correlation of that color with a location on the 3D model (measuring of color is defined as including the determination of color through the use of a color scheme such as VITAPAN™). EX1009, 2:8-12, 26-30. Further, Korten describes that the measure of color is independent from the capturing of shape. EX1009, 2:8-9. As a result, Petitioner’s understanding of Korten’s process does not logically flow and is likely based on its expert’s complete lack of familiarity with spectrometers.

Petitioner cites to 4:41-59 of Korten, which describes an embodiment in which the first virtual dentition has shape data and color data. PR, 5. There is no mention in 4:41-59 of determining a tooth shade value, let alone determining a tooth shade value based on the corresponding point of the digital 3D representation. There is not even a mention of a comparison of the measured color with a reference tooth shade. Petitioner’s expert agrees. EX2010, 109:21-22 (“It has nothing to do with VITAPAN correlation or matching.”).

Petitioner further cites to Korten at 4:60-64, which states that “[i]n an embodiment the method further comprises the step of comparing the measured first color with a reference color, and—depending on the degree of similarity or match

between the measured first color and reference color—determining the validity of the measured first color.” EX1009, 4:60-64. According to Petitioner, a “plain reading of Korten indicates that this further embodiment builds upon the first 3D dentition described in the first embodiment.” PR, 5. This is incorrect. There is no mention in 4:60-64 of correlating a measured color with shape prior to matching. Petitioner’s expert agrees. EX2010, 111:8-15 (“Whatever I said in my supplemental declaration, it doesn’t say or give any order of how to do this.”).

d. How Korten Deals With Color Mismatches Undercuts Petitioner’s Understanding of Korten’s Ordered Process

Korten further discloses that a mismatch between the measured first color and the reference color may trigger an error signal or message and/or may cause skipping of the measured first color. EX1009, 5:1-5. It makes no sense to put faulty colors into the virtual dentition and then skip over them (leaving the virtual dentition with incomplete color data) if one is going to the effort of determining a tooth shade value.

e. PO’s Expert Confirmed That Korten Measures Color on the Tooth with a Spectrometer, Matches That Color With a Scale, and Thereafter Associates Color With a Virtual Dentition

Petitioner asserts that “Patent Owner’s expert confirmed that a POSITA would not consider Korten to require this specific order, contrary to the order shown in Figure 2.” PR, 4. This is incorrect. Petitioner failed to provide appropriate context of the statements made by Dr. Saber during the deposition. At the outset, Petitioner’s

counsel when asking those questions never directed Dr. Saber to the portion of Korten that states that “the measurement of the color may involve determination of a color according to a color scheme, like RGB, L*a*b or VITAPAN™....” EX1009, 2:26-30. Likewise, Petitioner’s counsel did not refer Dr. Saber to the portions of Korten indicating that the measuring of color is independent from the capturing of shape and occurs before providing a correlation of shape and color. EX1009, 2:8-12.

Further, when citing to page 152 of Dr. Saber’s transcript, Petitioner failed to mention the point that Dr. Saber clearly made. PR, 4. “But the point I think that needs to be clear is the color that's being measured by the instrument is what's being matched, not what's coming – what’s into the virtual dentition model.” EX1019, 152:14-17. When referring to Korten at 5:28, Dr. Saber stated that the paragraph “doesn’t say anything about it has to be measured first or –or matched first, then associated.” EX1019, 159:5-7. Then, Dr. Saber states that “[i]t’s a totally separate process.” And, Dr. Saber clearly stated the following:

So let’s be 100 percent clear. So Korten measures a color on the tooth, let's call that the first color, which is also the measured first color. Korten measures that with a spectrometer on the tooth, uses that measured first color to do a matching with a scale, and then associates that measured first color with the virtual dentition model of Korten.

EX1019, 158:9-15. This is entirely consistent with Korten's disclosure that "although generally referred to as 'color' herein, the measurement of the color may involve determination of a color according to a color scheme, like RGB, L*a*b or VITAPAN™..." EX1009, 2:26-30. It is also consistent with Korten's disclosure indicating that the measuring of color is independent from the capturing of shape and occurs before providing a correlation of shape and color. EX1009, 2:8-12.

f. Petitioner Advances a New "Inclination" Argument to Support its Understanding of Korten's Ordered Process

Petitioner further argues that "a POSITA would understand that performing the steps in this order would advantageously allow the validity of the color information to be confirmed based on the inclination measurement before determining the associated tooth shade." PR, 5 (citing EX1018, ¶9; EX1009, 6:56-65.) This is yet another new argument. The Petition makes no reference to this limitation being obvious. In every instance wherein limitations 1[b], 13[b], and 14[b] are mentioned, it is stated that the limitation is "disclosed." *See, e.g.*, Petition, 25 ("Korten discloses this limitation."). This argument should be ignored as it is clearly being relied upon to make out a *prima facie* case of obviousness and was not presented in the Petition.

Moreover, Petitioner's arguments are misguided for at least the following reasons. First, Petitioner's assertions are based on unsupported expert testimony that

should be given little weight. Second, Korten refers to the “step of capturing the inclination of the second optical input relative to the tooth surface on which the second optical input measures the first color.” EX1009, 6:56-59. There is no mention of a calculation of inclination from the 3D virtual dentition after the 3D virtual dentition is obtained. Third, if the measurement of color involved capturing inclination and the measure of inclination involved determination of the geometry of the 3D virtual dentition then the measurement of color *would not be* independent from capturing the shape—which would be contrary to the teachings of Korten. EX1009, 2:8-9. Fourth, Korten specifically states that measuring color occurs before correlation. EX1009, 2:1-12. Fifth, like the paragraphs referenced above relating to color, this paragraph makes no reference to adding inclination data to the virtual dentition and then taking the combined data from the virtual dentition to determine a tooth shade value. EX1009, 6:59-61. Sixth, to establish anticipation of a claimed invention under 35 U.S.C. §102, Petitioner must identify where in a single reference each and every element of the claimed invention is disclosed in the prior art. The alleged assertion that a POSITA would understand how a process could be performed cannot take the place for an explicit or inherent disclosure of the process.

2. Korten Does Not Disclose Determining the Degree of Similarity Between the First Color and Tooth Shade Value as Required by Claim Limitation 1[c]

Petitioner argues that PO’s argument “that Korten does not disclose limitation 1[c] is inextricably linked to its argument that Korten does not disclose limitation 1[b].” PR, 6. Petitioner is correct that PO’s position is that Korten does not disclose obtaining a tooth shade value based on data in a 3D representation containing both shape and color data. Since Korten does not disclose obtaining a tooth shade value as described Claim limitation 1[b], it also cannot disclose deriving a certainty score as described in Claim limitation 1[c].

Petitioner argues that “Patent Owner errs because Korten uses the same terminology—‘first color’—to describe the color data associated with an XYZ coordinate in the first 3D virtual dentition and the color data that is compared against the reference colors.” PR, 7 (comparing EX1009, 4:56-59 with 4:60-64 and 5:28-34). However, as described above and agreed to by Petitioner’s expert with reference to Claim limitation 1[b], none of the cited passages from Korten state that one should place data into a virtual dentition and then use that data from the virtual dentition to obtain a tooth shade value or obtain a certainty score.

3. Patent Owner’s Argument for Limitation 14[c] Does Not Rely on Incorporating Additional Limitations into the “Sub-scan” Element

Petitioner argues that “Petitioner previously established that Korten discloses such a series of sub-scans.” PR, 11. According to Petitioner, Korten discloses performing a first scan and a second scan, both of which include geometry and color information. *Id.* (citing EX1009, 2:1-12; 5:7-27). But, Petitioner has apparently confused 3D representations of a tooth, sub-scans of a tooth, images, and the capabilities of a spectrometer.

On cross-examination, Petitioner’s expert explained that a 3D representation is made up of a series of sub-scans. EX2010, 61:8-11 (“That’s what the specifications and that claim is referring to, that the 3D representation is made of ... sub-scans”). Claim 14 recites that the digital 3D representation of the tooth comprises a recorded series of sub-scans of the tooth. EX2010, 60:17-21 (“if you are taking more than one scan of, ... the same tooth, the first scan would be one sub-scan, the second one would be the second sub-scan.”). Each sub-scan is made of multiple images. EX2010, 56:10-12 (“And that’s the scanning process. You take multiple of these images by moving these one or more lenses inside your probe.”). A spectrometer measures color, not shape. EX2010, 106:4-5 (“Spectrometer is measuring color, not shape.”). 3D scanning cannot occur with a spectrometer alone.

EX2010, 106:5-7 (“It’s not a 3D scanning. Unless you combine it with a 3D scanner”).

Petitioner continues to miss the point that Korten does not disclose recording a series of sub-scans of a tooth, at least one sub-scan that obtains both texture (comprising at least color or surface roughness) information and geometry information for a tooth, or generating the digital 3D representation of the tooth from a recorded series of sub-scans. POR, 21-22. EX2008, ¶¶65-67. Korten 2:1-12 makes no reference to recording sub-scans of a tooth, recording a sub-scan containing both texture and geometry information, or generating a 3D representation from the recorded sub-scans of a tooth. This portion of Korten merely describes the independent capture of shape and measured color, and the subsequent correlation of that data. There is no mention of a recorded series of sub-scans of a tooth that are used to generate a digital 3D representation of the tooth.

Korten 5:12-16 describes “in case of measuring the second color on the further tooth, capturing via the first optical sensor at least a portion of the shape of that further tooth and based thereon updating the first virtual dentition model by the shape of the further tooth.” Thereafter, Korten 5:17-19 describes “providing a correlation between the second location of the second color and a further coordinate in the (updated) first virtual dentition model.” This disclosure does not recite recording a series of sub-scans of a tooth, recording a sub-scan having both texture

(comprising at least color or surface roughness) and geometry information, or using those sub-scans to generate a digital 3D representation of the tooth. Korten discloses adding a further tooth to the virtual dentition, which is not what Claim 14 requires.

Korten 5:19-24 describes “further colors may be measured on the same tooth or further teeth and the first virtual dentition model may be further updated by the shape of any further teeth.” Korten 5:24-27 describes that the “measured colors may be mapped relative to the first virtual dentition model at coordinates which correspond to the location at the dentition.” Measurement of further colors on the same tooth and updating the virtual dentition model is not a disclosure of a series of sub-scans of a tooth. At best, it is a disclosure of a single scan and the addition of color. The further measurement of color is not a sub-scan.

As Petitioner’s expert indicated, a spectrometer does not provide 3D scanning. EX2010,106:4-7. Further, Petitioner’s expert does not dispute PO’s and Dr. Saber’s explanation of sub-scans. POR, 20-25; EX2008, ¶¶64-75; EX2010, 40:1-41:1. Furthermore, updating a model with further teeth is not a series of sub-scans of a single tooth. Korten discloses adding a further tooth to the virtual dentition, which is not what Claim 14 requires.

Petitioner asserts that “Patent Owner supports its argument by introducing new terminology and attempting to import limitations into limitation 14[c].” PR, 10-11. Petitioner is mistaken. In the ID at page 29, the panel states that “the parties

should develop whether limitation 14[c] requires the at least one sub-scan to collect shape and color data simultaneously.” PO has responded to this inquiry by stating that Claim 14 does not require collection of the shape and color data at the same instance within the sub-scanning period, but it does require a sub-scan to have collected shape and color data through the sub-scanning process and within the sub-scanning period. POR, 25. That is, it is the sub-scan process that collects both color and shape, not separate and independent data collection processes as in Korten. Korten discloses scanning for shape. *Id.* Korten does not collect color within that scanning process. Instead, Korten discloses measuring color on a point of the tooth and then correlating that data with the shape data. *Id.* (citing EX2008, ¶¶74-75). EX2010, 106:4-5 (“Spectrometer is measuring color, not shape.”), 106:5-7.

B. The Combination of Korten and Lehmann II Does Not Render Obvious Claims 1, 2, 4, 5, 9 and 12-16 (Ground 2)

Petitioner argues that the “only portion of Lehmann II being incorporated into Korten involves the process for determining the ‘best fit’ tooth shade value.” PR, 14. However, this argument is not correct. The Petition states, under headings B.1.c. and B.1.d, that Lehmann II discloses the entirety of limitations 1[b] (“Lehmann II discloses this limitation”) and 1[c] (“Lehmann II discloses this limitation”). Petition, 30 (addressing Ground 2). Thus, once again, Petitioner is presenting an entirely new argument and presenting new evidence in support of its purported *prima facie* case of unpatentability. These arguments should be ignored.

Petitioner does not refute PO's statement that "Lehmann II makes no reference to determining a tooth shade value based on the texture (comprising at least one of color or surface roughness) data of the corresponding point of a digital 3D representation." POR, 27; PR, 14. Petitioner also does not refute PO's statement that "Lehmann II makes no reference to a digital 3D representation containing shape and texture data at all." *Id.* Petitioner does not refute PO's statement that "Lehmann II does not disclose obtaining a certainty score or accuracy value of the tooth shade based on data on the texture of a digital 3D representation continuing shape and texture data." POR, 28; PR, 15. Thus, Petitioner has waived any argument that Lehmann II discloses limitation 1[b], 1[c], 13[b], or 14[b].

Petitioner states that "Patent Owner and its expert analyzed the wrong [Lehmann] reference." PR, 12. This is not correct. PO acknowledges that its citations to Lehmann I (EX1010) in place of Lehmann II (EX1011) were inadvertent citation errors but did address the correct underlying Lehmann reference. Petitioner admits that the inadvertent citation errors were readily apparent. Indeed, it is apparent that the underlying arguments are the same regardless of whether PO cited to Lehmann I or Lehmann II. Both references relate to the use of a camera to take 2D images and neither reference discloses application of color from the 2D images to a 3D representation. Petitioner's expert does not dispute that both Lehmann I and II disclose cameras for obtaining color, and that neither reference discloses the use

of a spectrometer or the formation of a 3D representation. EX2010, 117:10-124:4. Accordingly, Petitioner's own expert admits that neither Korten nor Lehmann I nor Lehmann II disclose elements 1[b], 1[c], 13[b] or 14[b].

Petitioner recognized that the citation errors were "clear when considering that [PO] cites column and line numbers in discussing 'Lehmann II,' but Lehmann II is a published U.S. patent application, and any citations would be to paragraph numbers." PR, 12. Petitioner also cannot deny that the relevant text from Lehmann I is also found in Lehmann II. The citation to Lehmann I was in connection with PO's statement that "Lehmann II discloses the use of a digital camera connected to a tooth shade analyzer subsystem." POR, 27. For example, PO cited to the Abstract of Lehmann I that recites "[a] digital camera connects to a tooth shade analyzer subsystem" and col. 3, lines 27-30 that recites that "[t]he camera captures digital color images of the tooth ... and then compared to images of tooth shades relating to reference shade guides."

Despite Petitioner's red-line comparison of the two Lehmann references (PR, 12; EX1020), PO's statement is nevertheless still supported by Lehmann II. *See, e.g.,* EX1011, Title, ¶[0027], ¶[0042] ("A shade analyzer sub-system is in electrical communication with the intraoral camera..."). In any event, this argument is a red herring designed to take attention away from the fact that Petitioner's arguments still

do not address the fact that Lehmann II does not disclose limitations 1[b] or 1[c] (or 13[b] or 14[b]).

Moreover, the sole paragraph relied upon by Petitioner (Pet., 30-31) and its expert (EX1015, paragraph 142) in Lehmann II for a description of the “best fit” process is paragraph 62. But all that is stated in that paragraph is that “a comparison of the RGB values made between the tooth image data **52** and the several shade values to find a best fit or match.” EX1011, ¶[0062]. Petitioner’s expert could not even explain the “best fit” process to any significant extent other than to say, “if you go throughout the document, Lehmann II goes through the process of describing, saying that this is the computation we use and these are the equations that you use.” EX2010, 129:8-12. But on further examination, Petitioner’s expert could not find any computations or equations for calculating best fit. EX2010, 129:15-130:6. At best, Petitioner’s expert identified one single equation (found in Lehman II ¶[0107]) pertaining to exclusion of pixels found in an image of a camera. *Id.*

Of course, not knowing what exactly the “best fit” process is or the calculations needed to arrive at a best fit makes it that much more difficult for anyone, let alone a POSITA, to understand exactly how Petitioner is combining Lehmann II with Korten. More importantly, while Lehmann II describes the process as having advantages over the prior art, it further states “as long as the same camera **30** captures the data of the tooth shades and the patient’s tooth shade data, it does

not matter that the stored image color within the processor 34 match the perceived color or hue observed by a typical human.” EX1011, ¶[0063]. “That is, as long as the data captured by the system 29 correlates to the same reference, e.g., the same camera 30, the match between the image 52 and the plurality of tooth shades will be calibrated automatically.” *Id.* Importantly, the process requires the use of the same camera for the image of the tooth and the reference shade or some calibration is required.

Neither Petitioner nor its expert have attempted to explain how one might obtain such calibrations in the Korten system when Korten does not use a camera, there is no explanation of how to calibrate a camera to a spectrometer, and Korten does not describe using the same spectrometer to measure a tooth as is used to generate a reference guide. This leaves PO and the Board to guess as to how the “best fit” process of Lehmann II could be implemented in Korten.

Petitioner’s citation at PR, 17-18 to Dr. Saber’s deposition testimony does not cure Lehmann II’s lack of disclosure. Petitioner’s counsel discussed using “a 2D image in which the color data has been *measured* by a spectrometer [that relies on] an L*, a*, b* value” without requiring that same *measured* color data to first be incorporated into a 3D representation, and asks whether one could “use the same ... equations that [one] would use in a 3D instance [emphasis added].” EX1019, 211:16-212:3. This question and Dr. Saber’s answer does nothing to demonstrate

that Lehmann II discloses deriving a certainty score expressing the certainty of a tooth shade value that was determined based on data in a 3D representation containing shape and color data, *i.e.*, limitation 1[c].

Petitioner asserts that “the difficulties in combining **2D color** with a **3D image** (*see* POR, 31-32) are irrelevant to the combination of Korten and Lehman II because Korten already discloses including the color data as a part of the 3D representation.” PR, 17-18. Petitioner is not correct because the “best fit” technology described in Lehmann II is based on images obtained with a camera. Korten discloses obtaining color with a spectrometer. Petitioner fails to provide any evidence that one could incorporate the color data or “best fit” obtained with a camera (as in Lehmann II) in the 3D model of Korten with a reasonable expectation of success. *See* POR, 29-34.

Lehmann II also recognizes that (i) “lighter shades ... gave the poorest cross sample correlation, possibly due to the sample color being closer to white with ambient lighting and reflection causing interferences”, (ii) “varying lens distance [of the camera] from the sample still gave images of varying quality”, and (iii) there were problems with the hue of images. EX1011, ¶¶[0102]-[0103]. For Lehmann II, these recognized inaccuracies in color data may be permissible as Lehmann II envisions a singular porcelain tooth product completely painted in one color. *Id.*, ¶[0013], ¶[0050], ¶[0045], ¶[0046] (“the system can (i) associate each of the tooth

shades in the combination with at least one standardized shade corresponding to a particular manufacturer's porcelain product").

However, the claimed invention is directed to deriving a certainty score for a determined tooth shade value "for at least one point on the tooth." As such, there is no reason to combine the "best fit" matching methods of Lehmann II—that serve to provide a porcelain tooth product having only one color—with Korten, which has individual spectrometer measurements at each coordinate of its virtual dentition model. *See* POR, 29-34.

C. Petitioner Fails to Demonstrate That the Art Asserted in Ground 3 Would Have Rendered Claims 10, 16, and 17 Obvious

As discussed in Patent Owner's Response, none of Korten, Lehmann II, or Babayoff either alone or in combination disclose each of the features of independent Claims 1 and 14. POR, 37. Since Claims 1 and 14 would not have been obvious as discussed above, Claims 10, 16 and 17 would not have been obvious.

D. Petitioner Fails to Demonstrate That the Art Asserted in Ground 4 Would Have Rendered Claims 1, 2, 9, 12, and 14-16 Obvious

As discussed in Patent Owner's Response, neither of Korten nor Lehmann I either alone or in combination disclose each of the features of independent Claims 1 and 14. POR, 37-45. Lehmann I suffers from the same deficiencies as Lehmann II, discussed above. Since Claims 1 and 14 would not have been obvious as discussed above, Claims 2, 9, 12, and 14-16 would not have been obvious.

E. Petitioner Fails to Demonstrate That the Art Asserted in Ground 5 Would Have Rendered Claim 13 Obvious

As discussed in Patent Owner’s Response, neither Korten nor Pye disclose limitation 13[b]: “determining a tooth shade value for at least one point on the tooth based on the texture data of the corresponding point of the digital 3D representation and on known texture values of one or more reference tooth shade values.” POR 45-46. Petitioner’s expert agreed on cross-examination that Korten does not disclose first associating the color with a first 3D coordinate before determining tooth shade. EX2010, 75:11-14 (“As I said, Korten does not disclose that you have to do it in a specific order. There is no disclosure of that.”). Further, Petitioner does not dispute that Pye fails to disclose this limitation of the Claim 13.

Moreover, there is no motivation to combine Korten with Pye. Pye suffers from the same deficiencies as Lehmann II, *i.e.*, Pye discusses using averaging techniques for tooth regions and not deriving a certainty score for a determined tooth shade value “for at least one point on the tooth” as claimed. Thus, there is no reason to combine the averaging techniques of Pye—that serve to provide a porcelain tooth product having only one color (EX1012, 5:48-53; 2:43-45)—with Korten, which has individual spectrometer measurements at each coordinate of its virtual dentition model.

Petitioner further asserts that that PO’s “assertions that a POSITA would not know how to ‘associate the areas or regions described in Pye with a point based

system’ are also misplaced because they seek to physically incorporate the technology from Pye into the system of Korten.” PR, 23. It is Petitioner’s assertions that are misplaced. Limitation 13[b] requires “determining a tooth shade value for at least one point on the tooth based on the texture data of the corresponding point of the digital 3D representation and on known texture values of one or more reference tooth shade values.” Thus, the limitations of limitation 13[d] also require determining the shade profile based on based on texture data of the corresponding point of the digital 3D representation and on known reference tooth shade values. And as explained in the POR, neither Petitioner nor its expert provide any explanation how one might associate the areas or regions described in Pye with a point based system requiring the use of an X, Y, and Z coordinate system. POR, 48. Further, without such coordinates, one skilled in the art would not be able to obtain a virtual array defining associated data fields for storing colors and their associated coordinates. This is so because areas and regions are not points in an X, Y, and Z coordinate system. POR, 45-48.

F. Petitioner Fails to Demonstrate That the Art Asserted in Ground 6 Would Have Rendered Claims 10, 16, and 17 Obvious

As discussed in Patent Owner’s Response, neither of Korten nor Babayoff either alone or in combination disclose each of the features of independent Claims 1 and 14. POR, 50. *See also* §C, *supra*. Since Claims 1 and 14 would not have been obvious as discussed above, Claims 10, 16, and 17 would not have been obvious.

III. CONCLUSION

Petitioner fails to demonstrate that any of the challenged claims of the '151 Patent are unpatentable.

Date: October 24, 2024

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APPENDIX A - LIST OF EXHIBITS

Exhibit No.	Description
1009	U.S. Patent No. 10,028,810 (“Korten”)
1010	U.S. Patent No. 6,206,691 (“Lehmann I”)
1011	U.S. Publication No. 2011/0188086 (“Lehmann II”)
1012	U.S. Patent No. 7,341,450 (“Pye”)
1015	Expert Declaration of Hassan Foroosh, Ph.D.
1018	Supplemental Declaration of Hassan Foroosh
1019	Deposition Transcript of Eli Saber 08-08-2024
1020	Comparison of (“Lehmann I”) and (“Lehmann II”)
2008	Declaration of Dr. Eli Saber, Ph.D.
2010	Deposition Transcript of Hassan Foroosh (October 18, 2024)

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. §42.24(d)

I hereby certify that the word count for the foregoing Patent Owner's Response totals 5,587 words, excluding the parts which are exempted by 37 C.F.R. §42.24(a).

Date: October 24, 2024

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **PATENT OWNER'S SUR-REPLY** is being served on counsel for Petitioner by electronic mail this 24th day of October, 2024 as follows:

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