

IPR2023-01315
Patent No. 10,695,151

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIT CORPORATION,

Petitioners,

v.

3SHAPE A/S,

Patent Owner.

Case No.: IPR2023-01315
U.S. Patent No. 10,695,151

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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LIST OF EXHIBITS

Ex. No.	Description
Ex. 1001	U.S. Patent No. 10,695,151
Ex. 1009	U.S. Patent No. 10,028,810 (“Korten”)
Ex. 1010	U.S. Patent No. 6,206,691 (“Lehmann I”)
Ex. 1011	U.S. Publication No. 2011/0188086 (“Lehmann II”)
Ex. 1018	Supplemental Declaration of Hassan Foroosh
Ex. 1019	Deposition Transcript of Eli Saber 08-08-2024
Ex. 1020	Comparison of (“Lehmann I”) and (“Lehmann II”)
Ex. 2008	Substitute Declaration of Dr. Eli Saber, Ph.D.

I. INTRODUCTION

Patent Owner's arguments against Petitioner's primary reference ("Korten") suffer from fundamental flaws. Most glaringly, Patent Owner argues that Korten requires a specific order of operation, as illustrated in Figure 2 of the Response. But on cross-examination, Patent Owner's expert admitted that the order of performing the relevant steps does not matter, thus negating Patent Owner's primary argument. Patent Owner's other argument opposing Korten, centered around the "certainty score" limitation, also fails because Patent Owner's expert confirmed that Korten discloses determining the closeness between the measured color and the tooth shade value, thus satisfying this limitation.

Patent Owner's arguments related to Grounds 3 and 4 are even less persuasive because Patent Owner analyzed the wrong secondary reference. Petitioner relied upon Lehmann II for these grounds, but Patent Owner analyzed the Lehmann I reference, which was the basis of a different ground in the Petition. Patent Owner submitted no evidence that these two references have overlapping disclosures. In fact, their disclosures are sufficiently different such that analysis of one cannot substitute as analysis of the other. Petitioner's analysis regarding the Korten - Lehmann II combination, which stands unrebutted, establishes that each challenged claim is unpatentable.

Patent Owner's final argument opposing the combinations proposed by

Petitioner rests on a fundamental misapplication of the law because it examines each limitation and reference separately, regardless of the disclosures of the cited references as a whole. The parties do not dispute that Korten discloses limitation 1[a], *i.e.*, a 3D representation that includes shape and texture data. The proposed combinations must be read in light of this undisputed disclosure; accordingly, the methods used for determining the tooth shade value are incorporated into the existing 3D structure disclosed in Korten that includes color data. Even Patent Owner's expert agrees that a POSITA would use the same process to determine the closest matching reference shade, regardless of whether the color is stored in a 2D or 3D structure. Because the claim limitations and disclosures in the prior art must be considered as a whole, Patent Owner's arguments that narrowly focus upon specific limitations in isolation should be rejected.

II. ARGUMENT

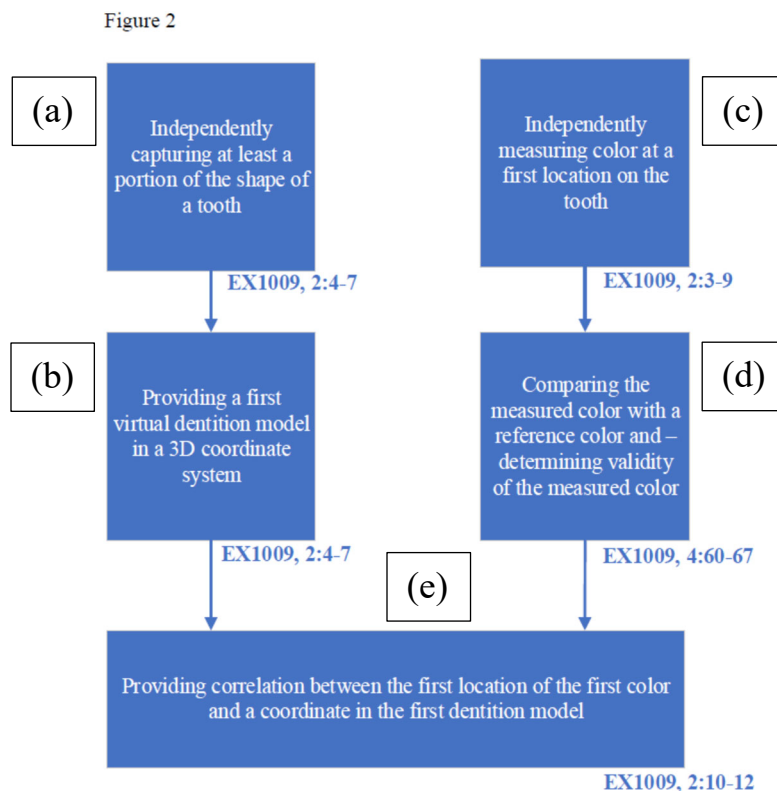
A. Korten Anticipates Claims 1, 12, 14, and 15 (Ground 1)

1. Korten Discloses Determining a Tooth Shade Value Using a First Color that Is Associated with a Coordinate in the First 3D Dentition Model as Required by Limitations 1[b] and 14[b]

Patent Owner argues that Korten fails to disclose the limitations 1[b] and 14[b] because Korten allegedly does not “determin[e] a tooth shade value based on data of the corresponding point of the digital 3D representation.” *See* Paper 10, Patent

Owner Response (“POR”), 8 (underlining in original), 20. Further according to Patent Owner, determining shade value using data in the digital 3D representation provides additional advantages, but these purported advantages arise only if the color data in the 3D representation is derived from color measured during multiple sub-scans, such that the color measurements “are not as sensitive to errors.” *Id.* at 8-9. This argument suffers from a fundamental flaw: the claims *do not recite* any limitations related to sub-scans nor do they require that the texture data be derived from multiple measurements. *See* Ex. 1001 (“151 patent”), claims 1, 14. Patent Owner’s expert agrees that these limitations do not require that the 3D representation be generated through sub-scans, or that the color data be captured in any specific manner. *See* Ex. 1019 (“Saber Cross”), 89:1-11; 90:7-17. Patent Owner did not seek a construction of “3D representation,” and in any event, Patent Owner cannot import limitations from the specification into the claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005).

Stripped of these improper “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. According to Patent Owner, this contrived figure, not present in Korten, requires that the step for comparing the measured color with the reference shade occurs before the measured color is associated/correlated with a point in the first 3D dentition model:



See POR, 13 (annotations added). The error in this flow chart becomes apparent when considering that Patent Owner and its expert strategically inserted step (d) from column 4 into the flow chart, even though the rest of the steps come from column 2. Korten does **not require** the specific ordering shown in this chart, see Ex. 1009 (“Korten”), 4:60-67, and 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. See Saber Cross, 152:1-12; 158:19-159:8 (noting that “you can associate it [the first color] before you match it or you can match it before you associate it in Korten”).

This admission by Patent Owner’s expert is consistent with Korten’s

disclosures. In particular, Korten discloses an embodiment in which the first 3D dentition model has shape data and color data. *See* Korten, 4:41-59. The color data in the first 3D dentition model is associated with specific XYZ coordinates in this embodiment. *Id.* Korten then discloses another embodiment in which the same color data (called “first color”) is used to determine a reference color, such as tooth shade. *Id.* at 4:60-64. Thus, a plain reading of Korten indicates that this further embodiment builds upon the first 3D dentition model described in the first embodiment; importantly, Korten does not use the further embodiment to describe a different method for constructing the first 3D dentition model but instead adds steps to what was previously disclosed. *See* Ex. 1018, Supplemental Declaration of Hassan Foroosh (“Foroosh Supp. Decl.”), ¶¶6-8. Further 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. *Id.*, ¶9; Korten, 6:56-65.

Patent Owner’s argument that Korten does not disclose limitation 1[b] because it “discloses comparing a directly measured tooth color with reference tooth shade values” holds no weight because Korten discloses that the first color used to determine the tooth shade value (Patent Owner’s supposed “directly measured tooth color”) is the same first color previously associated with a location in the first 3D

dentition model. *See* Paper 1(“Petition”), 25-26. Thus, Korten discloses obtaining a 3D representation having shape and color data and using that same color data to determine the tooth shade value, as required by the claims.

Patent Owner’s further argument that “Korten specifically describes the separate optical arrangement that is used to independently obtain the shape of the tooth from measuring color” and “[t]his allows Korten to compare the measured color with a reference color without any need to reference the 3D model” (*see* POR, 14) also fails because the claims do not impose any limitation on how the shape and color data are obtained,¹ and Korten expressly discloses generating a first 3D model having shape data and the associated first color followed by comparing the first color with a reference color.

2. Korten Discloses Determining the Degree of Similarity Between the First Color and Tooth Shade Value as Required by Claim Limitation 1[c]

Patent Owner’s primary argument that Korten does not disclose limitation 1[c] is inextricably linked to its argument that Korten does not disclose limitation 1[b]. *See, e.g.*, POR, 16 (arguing that “Korten does not disclose obtaining a tooth shade value based on data in a 3D representation containing both shape and color data”); 17 (arguing that “Korten discloses comparing color with a reference shade

¹ Patent Owner tacitly concedes this point by arguing that Korten “*allows*” the order of operation it describes without arguing that such order is required.

before there is a correlation of the color and location of the dentition model”); 18-19 (same). 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 dentition model and the color data that is compared against the reference colors. *Compare* Korten, 4:56-59, with 4:60-64, and 5:28-34. Accordingly, Korten is clear that the color data (*i.e.*, “first color”) associated with a specific coordinate in the first 3D dentition model is the same color data used to determine the matching tooth shade value *and* derive the certainty score, as required by claim 1.

Patent Owner’s secondary argument that Korten discloses that the score determined is associated with the first color and not with the reference shade value fares no better. *See* POR, 15 (arguing that Korten does not disclose “expressing the certainty or accuracy of the determined tooth shade value as opposed to the measured tooth color” (underlining in original)). Korten discloses that the determined closeness measure applies to both the measured color and the tooth shade value. *See* Korten, 4:60-64 (noting measuring “the degree of similarity or the match ***between*** the measured first color and the reference color” (emphasis added)). Patent Owner’s expert further confirmed that, when comparing a first color to a tooth shade value, determining the closeness (*i.e.* validity) of the first color necessarily results in determining the closeness of the tooth shade value; it is the same determination and results in the same value. *See* Saber Cross, 178:8-180:14 (testifying that “if you

were to say how close the measured color to the reference color is, it would obviously be how close the measured color – the reference color to the measured color”). Patent Owner’s expert also confirmed that a POSITA would use a set of well-known equations to make this determination. *Id.* at 180:21-181:22. The testimony by Patent Owner’s expert confirms that Korten discloses this limitation.

Patent Owner does not attempt to otherwise address the inherency determination made by the Board in its Decision. In particular, the Board observed that “Korten’s system to determine if the measured color data is valid as compared to the referenced tooth shade values, or in order to generate an error signal based on the validity determination” necessarily requires determining an accuracy value. *See* Paper 6 (“Decision”), 24. Patent Owner failed to address this observation other than to argue that Korten does not disclose “obtaining a certainty score of a tooth shade value that is based on data in a digital 3D representation.” *See* POR, 17, 18-19. This argument merely rehashes Patent Owner’s earlier argument that Korten does not disclose a digital 3D representation having color data, addressed above.

3. Patent Owner’s Argument for Limitation 14[c] Relies on Incorporating Additional Limitations into the “Sub-scan” Element

The Board requested that the parties further develop the record on “whether limitation 14[c] requires the at least one sub-scan to collect shape and color data simultaneously.” *See* Decision, 29. In response, Patent Owner admits that claim 14

“does not require collection of the shape and color data at the same instance,” *see* POR, 25, thus walking back the argument in its Preliminary Response that prompted the Board’s inquiry, *see* Decision, 28 (noting that Patent Owner “appears to be arguing that limitation 14[c] requires shape and color data to be collected in a single sub-scan at the same time”). Regardless, the issue of whether limitation 14[c] requires simultaneous capture of shape and color data is immaterial here because Korten makes that disclosure: “In a further embodiment the positioning of the first sensor and the second sensor is performed simultaneously Thus the first color may be measured simultaneously with capturing of the shape” *See* Korten, 4:14-18.

Korten further discloses that the color data captured by the second sensor has a known association with the shape data captured by the first sensor. Korten discloses that “the correlation is provided by a known, for example fixed, geometric relationship between the first and second sensor or between the first and second optical input.” *Id.* at 7:4-7. Accordingly, “an image captured from a certain direction and distance from the dentition may be ***automatically correlated*** with the position at which the first color is measured.” *Id.* at 7:13-16 (emphasis added). As Patent Owner’s expert recognized, Korten must record some relationship between the color data and the shape data when capturing that data; otherwise, the color as applied to the 3D representation would not be accurately placed. *See* Saber Cross,

161:4-14.

Post-institution, Patent Owner shifted its arguments, and now relies on Korten's alleged disclosure of obtaining shape and color data "independently" to argue that Korten fails to disclose this limitation. *See* POR, 21, 24. However, the disclosures regarding "independently" obtaining data are irrelevant to the sub-scan limitation because nothing in claim 14 requires that shape and color data be obtained not "independently." *See* '151 Patent, 22:48-53 (reciting only that the sub-scan "comprises both texture information and geometry information").

Even accepting this argument, Patent Owner fails to acknowledge that Korten further explained that "[t]he independency of the capturing of the shape and the measuring of the color may for example be provided by the first and second sensor being based on different technical principles." *See* Korten, 4:20-23. In this sense, the '151 Patent also discloses that the color and shape data may be captured "independently" because the color data may be captured using Bayer color filters whereas the shape data may be captured by focusing optics using the focus scanning technique. *See* '151 Patent, 15:28-30; 11:9-26 (focus scanning); *see also* Foroosh Supp. Decl., ¶¶ 12-13.

Patent Owner supports its argument by introducing new terminology and attempting to import limitations into limitation 14[c]. *See* POR, 25 (introducing "sub-scanning process" and "sub-scanning period"). The claims do not recite these

terms, and the specification does not use, much less define, them. Patent Owner's resort to unused, undefined terms only leads to confusion as to the scope of limitation 14[c].

Limitation 14[c] only requires that the 3D representation be "generat[ed]" from a recorded series of sub-scans and that at least one of the sub-scans includes texture information and geometry information. '151 Patent, claim 14. Petitioner previously established that Korten discloses such a series of sub-scans. In particular, Korten discloses performing a first scan and a second scan, both of which include geometry and color information. *See* Korten, 2:1-12; 5:7-27. These two scans are further used to generate the updated 3D dentition model, in which the color data from the second scan is incorporated into a tooth previously captured by the first scan. *See id.* at 5:17-19. The parties do not dispute that the 3D dentition model constitutes a 3D representation. Korten thus discloses the updated 3D dentition model (*i.e.*, 3D representation) and a series of sub-scans used to generate that 3D dentition model, as recited in limitation 14[c].

Because Patent Owner relies upon terminology absent from the '151 Patent and seeks to incorporate limitations into element 14[c], its arguments should be rejected.

B. Korten and Lehmann II Render Obvious Claims 1, 2, 4, 5, 9 and 12-16 (Ground 2)

1. Patent Owner Analyzed the Wrong Reference, and Provided No Analysis Regarding Lehmann II

Although Patent Owner purports to provide argument with respect to Ground 2 in the Petition, Patent Owner analyzed the Lehmann I reference listed as Exhibit 1010. Ground 2 relies upon a different reference, the Lehmann II reference, Exhibit 1011. This error by Patent Owner becomes clear when considering that Patent Owner 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. Patent Owner’s expert made the same error. Simply put, Patent Owner and its expert analyzed the wrong reference.

Patent Owner cannot now argue that its mistaken reliance on Lehmann I suffices as an analysis of Lehmann II. It provided no comparison of the two references to indicate what, if any, overlap exists between the two that would justify citing Lehmann I. In fact, the two references, beyond sharing a first-named inventor, are not related to each other, and the disclosures provided by each are different. *See* Ex. 1020 (illustrating differences). If Patent Owner had wanted to use its Lehmann I arguments as its arguments for Lehmann II, it was incumbent on Patent Owner to provide analysis demonstrating the similarities between these two references. Patent Owner made no such showing, and the references have significant differences.

Patent Owner already submitted a supplemental declaration from its expert to rectify an omission of a sentence. *See* Ex. 2008 (“Substitute Saber Decl.”). Petitioner did not oppose this substitute declaration because of the minor nature of the change. In his deposition, Patent Owner’s expert confirmed that he had reviewed his original declaration while preparing the substitute and he did not want to make any further changes. *See* Saber Cross, 52:3-12. Patent Owner’s expert also testified that he prepared for his deposition for at least 10 hours and following that extensive review, he did not have any further changes to his supplemental declaration, which provided the full extent of his opinion. *See id.* at 11:19-13:4; 65:13-66:1.

Petitioner respectfully submits that Patent Owner’s Ground 2 arguments are fatally flawed and should be disregarded.

2. Patent Owner’s Arguments Related to the “Best Fit” Tooth Shade Technology Ignore the Fact that Korten Already Discloses a 3D Representation Having Shape and Color Data

Patent Owner provides a lengthy discussion in Section V.B related to the disclosures in “Lehmann II,” asserting that this reference does not disclose limitations 1[b] and 1[c], and further asserting that there is no motivation to combine this reference with Korten. To the extent that the Board entertains these arguments despite the fact that Patent Owner analyzed the wrong reference, these arguments fail to recognize that Korten already discloses a 3D representation having shape and color data. Indeed, Patent Owner does not dispute that Korten discloses limitation

1[a] (reciting “obtaining a digital 3D representation of the tooth, where the digital 3D representation comprises shape data and texture data for the tooth”). *See* Saber Cross, 137:15-17. Thus, the only portion of Lehmann II being incorporated into Korten involves the process for determining the “best fit” tooth shade value, and even Patent Owner’s expert admits that the same processes for finding the best fit color measurement are used for both 2D and 3D representations. *See id.* at 211:16-212:13.

a. Patent Owner Improperly Argues on a Reference-by-Reference Basis that the Combination of Korten and Lehmann II Does Not Disclose Limitations 1[b] and 1[c]

Patent Owner’s arguments related to limitations 1[b] and 1[c] rely upon its failure to acknowledge the uncontested disclosures in Korten. In particular, Patent Owner argues that Lehmann II fails to disclose these limitations because it “makes no reference to a digital 3D representation containing shape and texture data.” *See* POR, 27-29. Patent Owner’s argument, however, requires a single prior art reference to disclose each element in these limitations without considering what the combined references, as a whole, would teach a POSITA. *See id.* at 7, 15 (Korten fails to disclose elements 1[b] and 1[c]); 26, 27 (“Lehmann II” fails to disclose

elements 1[b] and 1[c]).²

Patent Owner errs. “In determining obviousness, references are read not in isolation but for what they fairly teach in combination with the prior art as a whole.” *See Banner Eng’g Corp. v. Tri-Tronics Co., Inc.*, 29 U.S.P.Q.2d 1389, 1993 WL 432383, *3 (Fed. Cir. Oct. 27, 1993) (unpublished); *see also Neenah, Inc. v. Schwendimann*, IPR2020-00915, 2021 WL 5203293, *10 (Pat. Tr. & App. Bd. Nov. 1, 2021) (citing *Banner Eng’g*). Thus, an “attack on the prior art – reference by reference – is not persuasive.” *Banner Eng’g*, 1993 WL 432383, *3. Yet, this unpersuasive tactic is exactly what Patent Owner deploys in asserting that neither Korten nor Lehmann II individually disclose limitations 1[b] and 1[c].

The analysis for limitations 1[b] and 1[c] should start from the undisputed foundation laid by Korten in disclosing a 3D representation having shape and color data. *See Saber Cross*, 137:15-17; 139:13-141:22. Limitation 1[b] adds the element of “determining a tooth shade value” using texture data already present in Korten; limitation 1[c] recites the further limitation of “deriving a certainty score.” Lehmann II discloses these additional elements. *See Petition*, 30-31. Even if Patent Owner

² Although the Petition states in this subsection that Lehmann II discloses limitation 1[b], the arguments in that section are clearly addressed to the additional limitation present in 1[b] of determining a tooth shade value based on the previously discussed, undisputed disclosures in Korten of obtaining a 3D representation having color and shape data. The same is true for the arguments related to limitation 1[c].

had analyzed the correct reference (it did not), its attempt to attack the prior art on a reference-by-reference basis should be rejected. The prior art, considered as a whole, discloses these limitations.

b. Patent Owner's Attempt to Treat Limitations 1[b] and 1[c] as Unrelated Technical Features to Argue No Motivation to Combine Korten and Lehmann II Should Also Be Rejected

A similar fallacy infects Patent Owner's argument that there is no motivation to combine the "best fit" technology disclosed in Lehmann II with the technology disclosed in Korten because it treats these limitations as separate technical features. *See* POR, 29. However, claim limitations 1[b] and 1[c] involve the interrelated steps of determining a tooth shade value and deriving an associated certainty score for that value. As explained above, Korten already discloses a 3D representation having both shape and color data; Korten further discloses obtaining the tooth shade value for a location on the tooth given the color data associated with that location. The part of Lehmann II being combined with the technology of Korten is the process of determining a tooth shade value (claim limitation 1[b]) that provides the closest match to the measured color value (claim limitation 1[c]). In this case, the motivation to combine the teachings of Lehmann II related to limitation 1[c] with Korten also provide the motivation to combine the teachings of Lehmann II related to limitation 1[b] because of the interrelated nature of the process disclosed in

Lehmann II. *See* Foroosh Supp. Decl., ¶¶ 16-17.³

In its Decision, the Board noted a possible weakness in Petitioner’s argument, specifically that based on Patent Owner’s arguments, “[l]imitation 1[b] seems to require implementing teachings concerning *two-dimensional color data* from Lehmann II with *three-dimensional color data* collected at the step of limitation 1[a] by Korten’s system.” *See* Decision, 31 (emphasis added). However, Patent Owner’s expert confirmed that once color data is collected, there is no difference in how that color data is further processed to determine the tooth shade value, regardless of whether the color data is associated with a 2D or a 3D representation. *See* Saber Cross, 211:16-212:13. Moreover, Korten explicitly discloses that its first 3D dentition model *already incorporates* color data, as the Board’s statement acknowledges in referencing the “three-dimensional color data collected . . . by Korten’s system,” and Patent Owner’s expert provided no opinion that Korten was not enabling on this point. *Id.* at 180:15-20. The arguments provided by Patent Owner detailing the difficulties in combining *2D color* with a *3D image* (*see* POR, 31-32)⁴ are irrelevant to the combination of Korten and Lehmann II because Korten

³ The specific reasoning provided by Patent Owner is further flawed because Patent Owner relies upon disclosures in Lehmann I, *see* POR, 30, not the technology disclosed in Lehmann II related to determining a tooth shade reference on a pixel-by-pixel basis, as discussed in the Petition. *See* Petition, 30.

⁴ These supposed difficulties include (i) registering 2D color image of Lehmann II

already discloses including the color data as part of the 3D representation, and Patent Owner's expert admitted that further processing of the color data would not differ regardless of whether it is included in a 2D or a 3D representation. *See id.*, 211:16-212:13; *see also* Foroosh Supp. Decl., ¶¶ 18-22.

The experts do not dispute that a POSITA would use the same methods in both the 2D and 3D instances to find the tooth shade value that most closely matches the measured color value. *See* Saber Cross, 211:16-212:13; *see also* Foroosh Supp. Decl., ¶ 19. Thus, there are no discrete concepts of 2D color data or 3D color data; instead, there is simply color data associated with a location, and this color data is further used to determine a matching tooth shade value for that location employing well-known methods. Foroosh Supp. Decl., ¶¶ 19-20. Having developed the record on this issue, as the Board requested, Petitioner respectfully submits that the motivation to combine limitation 1[c], provided in the Petition, also provides the motivation to combine the teachings in Lehmann II related to limitation 1[b] with the uncontested technology disclosed in Korten.

with 3D representation of Korten; (ii) associating Z-coordinate of Korten with 2D color data from Lehmann II; and (iii) registering 2D color image areas (a disclosure from Lehmann I) with Korten's 3D entity. *See* POR, 31-32. The last purported difficulty of associating a shade guide finds no support in the claims, and in any event would be easily addressed by a POSITA based on the teachings of Lehmann II. *See* Foroosh Supp. Decl., ¶¶ 23-24.

3. Patent Owner Failed to Independently Address the Other Claims Subject to This Ground

Patent Owner did not provide any independent analysis for claims 2, 4, 5, 9, and 12-16 in this section, but instead incorporated by reference arguments made with respect to Ground 1 or other portions of Ground 2, including for independent claims 13 and 14. *See* POR, 34-37. Accordingly, Petitioner respectfully submits that these claims should also be found unpatentable under Ground 2 for the reasons discussed above and in the Petition.

Relatedly, Patent Owner addresses only the motivations to combine the teachings of Lehmann II with Korten provided for each of the independent claims in its Response. *See* POR, 29, 35, 36. Petitioner, however, provided additional, independent motivations to combine various teachings in Lehmann II with Korten for certain dependent claims. *See* Petition, 34 (claim 4); 35 (claim 5). Because Patent Owner did not address these motivations to combine in its Response, the reasoning provided by Petitioner stands unrebutted. Accordingly, to the extent the Board determines that Petitioner has shown that Korten alone discloses all the elements of claim 1, Petitioner respectfully submits that it would also be appropriate to find these additional dependent claims as being rendered obvious based on a combination of Korten and Lehmann II regardless of the Board's findings with respect to obviousness of claim 1.

C. Korten, in light of Lehmann II and Babayoff, Renders Obvious Claims 10, 16, and 17 (Ground 3)

Patent Owner does not provide any further arguments for Ground 3 beyond those provided for Ground 2. *See* POR, 37. Accordingly, claims 10, 16, and 17 also would have been obvious in light of the prior art for the reasons discussed above.

D. Korten and Lehmann I Render Obvious Claims 1, 2, 9, 12, and 14-16 (Ground 4)

1. Petitioner Commits the Same Error as in Ground 2 by Attempting to Perform an Improper Reference-by-Reference Analysis to Argue Non-obviousness

Patent Owner commits the same error as it does for Ground 2, namely performing a reference-by-reference analysis to argue that Korten and Lehmann I do not disclose the limitations of elements 1[b] and 1[c]. *See* POR, 7, 15 (Korten fails to disclose elements 1[b] and 1[c]); 38-42 (Lehmann I fails to disclose elements 1[b] and 1[c]). As noted above, Patent Owner's argument improperly requires a single prior art reference to disclose each limitation without considering what these references, as a whole, would teach a POSITA. *See supra*, § II.B.2.a. For the same reasons discussed with respect to Ground 2, these arguments should be rejected.

2. Petitioner Identified a Sufficient Motivation to Combine the Teachings of Lehmann I and Korten

In its Decision, the Board noted that Patent Owner may have identified a

weakness in the Petition based on the motivation to combine.⁵ As the Board noted, “Patent Owner . . . itemizes a list of technical challenges with respect to combining a two-dimensional system with a three-dimensional system.” *See* Decision, 30. As discussed above, the “challenges” Patent Owner identified, however, are directed toward incorporating color data captured by a 2D system into a system that provides a 3D representation. *See id.*; *see also* Foroosh Supp. Decl., ¶¶21-23. Korten provides a 3D representation that *already has color data* incorporated on a point-by-point basis and thus already addresses this supposed difficulty. *See supra*, § II.B.2.b. The combination proposed in the Petition takes this existing 3D model of Korten that contains color data and combines it with Lehmann I’s “best fit” *accuracy features* to determine the tooth shade value. Petition, 52-54. Patent Owner’s technical feasibility argument, which has nothing to do with these accuracy features, is irrelevant to the combinations proposed in the Petition.

The Board noted in discussing Ground 4⁶ that “[l]imitation 1[b] seems to require implementing teachings concerning two-dimensional color data from

⁵ To the extent not already made, Medit’s arguments made in reply apply equally to Lehmann II.

⁶ Although this quote references Lehmann II, and not Lehmann I, it was made in connection with Ground 4. *See* Decision, 31. Further, Patent Owner incorporated by reference its no-combination arguments for Lehmann II into the section discussing Lehmann I. *See* POR, 43. Patent Owner did not provide any further arguments opposing the combination of Korten with Lehmann I.

Lehmann II with three-dimensional color data collected at the step of limitation 1[a] by Korten's system." *See* Decision, 31. Thus, as the Board recognizes, Korten's system ***has already collected*** color data and associated it with points in the 3D representation. Limitation 1[b] only requires the additional step of determining the tooth shade value given this existing color data. *See* '151 Patent, claims 1, 13, 14. Patent Owner's expert confirmed that there is no difference in finding the closest matching tooth shade value for a given color regardless of whether the color data is stored in a 2D or 3D representation. *See supra* § II.B.2.b. Moreover, Patent Owner provided no specific arguments against combining the "composite match number" teachings from Lehmann I into Korten. Petitioner submits that a sufficient motivation would have existed for a POSITA to combine the "composite match number" teachings in Lehmann I with Korten's 3D representation. *See* Petition, § IX.D.1.e.

E. Korten and Pye Render Obvious Claim 13 (Ground 5)

Notably, Patent Owner did not contest that Pye discloses limitation 13[d], the only limitation of the claim the Petition relies on Pye to teach. Petition, 58-59. Instead, Patent Owner's arguments against this ground are that (1) Korten does not disclose limitation 13[b], and (2) there is no motivation to combine Korten with Pye. POR, 45. Because limitation 13[b] is identical to 1[b], Petitioner addressed argument (1) above in connection with limitation 1[b] and incorporates those

arguments here by reference. *See supra*, § II.A.1.

As for the motivation to combine, Patent Owner errs because it focuses on a combination the Petition did not propose: the incorporation of 2D color measurement techniques from Pye with 3D measurement systems from Korten. As noted above, Korten discloses a system in which the color data has already been obtained and associated with specific coordinates in a 3D representation. *See supra*, § II.B.2.b. Each of the relevant entries⁷ in Patent Owner’s bullet point list is directed towards supposed difficulties in incorporating data from “2D color image in Pye” with “the 3D representation of Korten.” *See* POR, 48-49. As previously explained, these criticisms are misplaced given the uncontested disclosures in Korten, which discloses a 3D representation with color data.

Patent Owner’s assertions that a POSITA would not know how to “associate the areas or regions described in Pye with a point base system” are also misplaced because they seek to physically incorporate the technology from Pye into the system of Korten. *See* POR, 48. Patent Owner’s expert makes the same mistake and indeed, merely repeats the arguments in the POR, complete with the same typo. *Compare* Ex. 2008, ¶125, *with* POR, 48. However, “[c]laims may be obvious in view of a combination of references, even if the features of one reference cannot be substituted

⁷ Petitioner notes that the third bullet point relates to a supposed difficulty in combining Korten with Lehmann II, which is not relevant to Ground 5.

physically into the structure of the other reference,” *Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1013 (Fed. Cir. 1983), because “the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *In re Keller*, 642 F.2d 413, 425 (C.C.P.A. 1981).

Here, the teachings of Pye as incorporated into Korten render claim 13 obvious. Patent Owner admitted that Pye discloses obtaining average values for color characteristics over specified regions of a tooth. *See* POR, 47. Patent Owner also included a diagram of Pye showing those specified regions separated using a line, *see id.*, and Patent Owner’s expert admitted that it would be a matter of geometry to define lines and planes using points, *see* Saber Cross, 216:11-16. It is also undisputed that Korten discloses a 3D representation of a tooth that is comprised of a set of points. Accordingly, a POSITA would be able to use the points disclosed in Korten, along with elemental geometry, to divide Korten’s 3D representation of a tooth into regions, separated using lines or planes, so that the color characteristics for those regions could be averaged, as taught by Pye. *See* Foroosh Supp. Decl., ¶27. Patent Owner’s arguments opposing Ground 5 should be rejected.

F. Korten and Babayoff Render Obvious Claims 10, 16, and 17 (Ground 6)

Patent Owner incorporates by reference previous arguments to oppose Ground 6. *See* POR, 50. Petitioner previously addressed these arguments in this Reply and

incorporates its arguments by reference.

III. CONCLUSION

The challenged claims should be found unpatentable.

Respectfully Submitted,

Dated: September 12, 2024

/s/ Douglas F. Stewart

Douglas F. Stewart
doug.stewart@bracewell.com
(Reg. No. 51,060)
Jeffrey E. Danley
jeff.danley@bracewell.com
(Reg. No. 57,228)
Jared D. Schuettenhelm
Jared.schuettenhelm@bracewell.com
(Reg. No. 59,539)
Patrick Connolly
patrick.connolly@bracewell.com
(Reg. No. 69,570)
Bracewell LLP
701 Fifth Avenue, Suite 3420
Seattle, WA 98104-7018
(206) 204-6200 (t)
(800) 404-3970 (f)

Counsel for Petitioners

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing Petitioner's Reply to Patent Owner's Response contains 5,594 words excluding the caption, table of contents, table of authorities, table of exhibits, certificate of service, and certificate of word count. Petitioner has relied on the word count feature of the word processing system used to create this paper in making this certification.

Dated: September 12, 2024

/s/ Douglas F. Stewart

doug.stewart@bracewell.com

(Reg. No. 51,060)

Bracewell LLP

701 Fifth Avenue, Suite 3420

Seattle, WA 98104-7018

(206) 204-6200 (t)

(800) 404-3970 (f)

Counsel for Petitioner

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Patent No. 10,698,151

CERTIFICATE OF SERVICE

I hereby certify that on September 12, 2024, I caused a true and correct copy of the foregoing PETITIONER’S REPLY TO PATENT OWNER’S RESPONSE to be served electronically via e-mail upon the following counsel.

PATENT OWNER:

Todd R. Walters

Roger H. Lee

Mythili Markowski

Andrew R. Cheslock

BUCHANAN INGERSOLL & ROONEY PC

todd.walters@bipc.com

roger.lee@bipc.com

mythili.markowski@bipc.com

andrew.cheslock@bipc.com

Dated: September 12, 2024

/s/Andrea Kato

Andrea Kato, Bracewell LLP