

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

3SHAPE A/S and 3SHAPE INC.,
Petitioner,

v.

ALIGN TECHNOLOGY, INC.,
Patent Owner.

IPR2019-00132
Patent 7,112,065 B2

Before BRIAN J. McNAMARA, NEIL T. POWELL, and
ELIZABETH M. ROESEL, *Administrative Patent Judges*.

ROESEL, *Administrative Patent Judge*.

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

3Shape A/S and 3Shape Inc. (“Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting *inter partes* review of claims 1–9 and 11 (“the challenged claims”) of U.S. Patent No. 7,112,065 B2 (Ex. 1001, “the ’065 Patent”). Align Technology, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). On June 3, 2019, we instituted an *inter partes* review as to all claims challenged in the Petition. Paper 8 (“Dec.”).

After institution, Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”), Petitioner filed a Reply (Paper 20, “Reply”), and Patent Owner filed a Sur-reply (Paper 24, “Sur-reply”). An oral hearing was held on March 11, 2020, and a transcript of the hearing is included in the record (Paper 31, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–9 and 11 of the ’065 Patent are unpatentable.

I. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies the real parties in interest as 3Shape A/S, 3Shape Inc., 3Shape Holding A/S, 3Shape Trios A/S, and 3Shape Poland sp. z.o.o. Pet. 1. Petitioner lists additional real parties in interest “[o]ut of an abundance of caution . . . for purposes of compliance with 35 U.S.C. § 312(a)(2).” *Id.* at 1–2, App. B. Patent Owner identifies the real party in interest as Align Technology, Inc. Paper 4, 1 (Mandatory Notices).

B. Related Matter

The parties identify the following civil action as a related matter:
Align Technology, Inc. v. 3Shape A/S, No. 1:17-cv-01646 (D. Del., filed Nov. 14, 2017). Pet. 2; Paper 4, 1.

C. The '065 Patent (Ex. 1001)

The '065 Patent discloses a computer-based prosthodontic method for enabling a dental practitioner to define a finish line¹ of a dental prosthesis of at least one tooth to be fitted over a tooth preparation. Ex. 1001, code (57), 2:18–21. The dental prosthesis is, for example, a crown. *Id.* at 1:15–16.

The '065 Patent describes “current practice” for defining a finish line as follows:

According to current practice, after diagnosing that a patient needs a crown, the dentist cuts the tooth to be reconstructed and prepares two impressions and a wax bite of the patient’s jaws. Based on the impressions, wax bite and on written instructions of the dentist, a technician prepares in a lab the corresponding cast, and the relevant tooth within the preparation is temporarily separated from the plaster so that the area with the anatomic information (the area defining the anatomic contour) and the finish line are exposed. At this point, the finish line is manually marked by the lab technician in ink on the preparation, and this finish line is an important parameter used in constructing the crown. Alternatively, a virtual three-dimensional (3D) image of the working cast is obtained . . . and the lab technician marks the finish line in the three dimensional environment.

Ex. 1001, 1:47–63.

¹ Construction of the term “finish line” is discussed below. For purposes of this overview, its meaning can be understood from the portions of the '065 Patent excerpted below, including Figure 4, which shows finish line 74.

The '065 Patent discloses a method that permits a dental practitioner (e.g. a dentist) to define a finish line on a tooth preparation. *Id.* at 3:50–52. According to the '065 Patent, the finish line is not drawn or marked by a lab technician on a working cast or in a virtual 3D environment. *Id.* at 4:1–3. Instead, “the finish line is generated in [a] service center . . . and is conveyed via [a] computer network . . . to the dentist[’s] computer.” *Id.* at 4:3–5. Figure 4 of the '065 Patent is reproduced below:

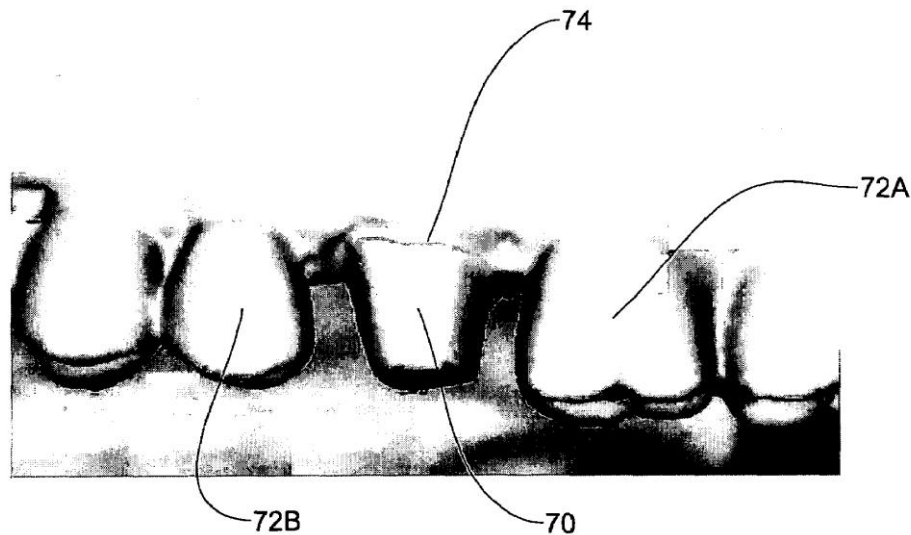


FIG. 4

Figure 4 shows a three-dimensional virtual image of a portion of a patient's dentition, including tooth preparation 70, neighboring teeth 72A and 72B, and finish line 74. *Id.* at 3:38–40, 4:49–51. Finish line 74 is “drawn as a continuous line on the apical² limit of tooth preparation.” *Id.* at 4:51–52.

The '065 Patent discloses steps for defining a finish line in a virtual three-dimensional teeth model. *Id.* at 4:39–48, 4:63–5:3, Figs. 3, 5. The steps include generating a first finish line on the tooth preparation in a

² According to Petitioner, the term “apical” pertains to a direction toward the root of a tooth. Pet. 6–7 (citing Ex. 1017, 1:22–25; Ex.1018, 2:30–31).

manual, semi-automated, or fully automated manner and then superimposing the finish line on the dentition image. *Id.* at 4:44–48. According to the '065 Patent, finish line data can be generated in a known manner, for example, by the method disclosed in Kawai.³ *Id.* at 5:23–46. After receiving input from the dentist, a second finish line is obtained and is used to update the first finish line. *Id.* at 4:63–5:3. The dentist can provide input, for example, by moving a cursor to draw the finish line, by moving a stylus on a touch-sensitive screen or pad, or by indicating a series of dots onto a 3D or 2D image. *Id.* at 5:62–67.

The finish line obtained according to the method of the '065 Patent may be used to construct both a virtual and a physical crown, preferably in a CAD/CAM (Computer-aided-design/Computer-aided-Manufacture) environment utilizing a CNC (Computer Numerical Control) device. *Id.* at 4:9–16, 6:1–8, 6:16–40, Fig. 5.

Figure 6 of the '065 Patent is reproduced below:

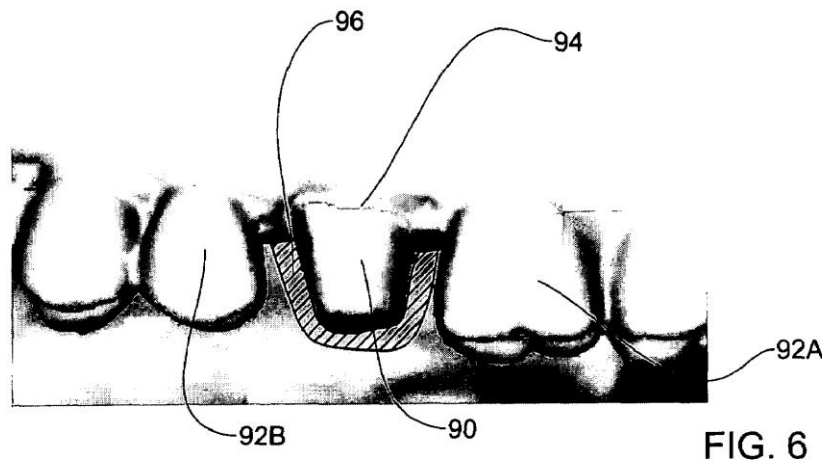


Figure 6 shows a three-dimensional virtual image, similar to Figure 4, with virtual crown 96 fitted on tooth preparation 90. Ex. 1001, 3:44–45, 6:40–44.

³ Kawai is one of the references relied upon in Petitioner's ground of unpatentability. See Section I.E. *supra*.

D. Illustrative Claim

The '065 Patent includes eleven claims. The Petition challenges claims 1–9 and 11, of which claims 1, 7, and 11 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below, with bracketed designations added to correspond with Petitioner's identification of claim elements:

1. [preamble] A computer-based prosthodontic method for enabling a dental practitioner to define a finish line of a dental prosthesis of at least one tooth to be fitted over a tooth preparation, comprising:

[1.1] (One) providing a three-dimensional (3D) digital data relating to the patient's dentition, said 3D data includes data representative of the surface topology of said preparation and its surroundings;

[1.2] (Two) generating first finish line data representative of at least a portion of said finish line and superimposing an image of said finish line on an image of said dentition;

[1.3] (Three) obtaining second finish line data determined on the basis of input received from a dental practitioner; and

[1.4] (Four) using said second finish line data to update said first finish line data and superimposing the updated data on the dentition image.

Ex. 1001, 6:60–7:9; *see* Pet. 28–43 (headings identify elements of claim 1).

E. Prior Art and Asserted Ground

Petitioner asserts that the challenged claims are unpatentable on the following ground:

Claims Challenged	35 U.S.C. §	References
1–9, 11	103(a) ⁴	Kawai, ⁵ Baba ⁶

F. Additional Evidence

In addition to the prior art cited above, Petitioner relies on a Declaration of Dr. Eli Saber. Ex. 1012. Patent Owner cross-examined Dr. Saber and filed a transcript of his deposition as Exhibit 2011.

Patent Owner relies on a Declaration of Dr. Milan Sonka (Ex. 2001) and a Declaration of Dr. Maureen A. Valley (Ex. 2003). Petitioner cross-examined Patent Owner’s declarants and filed transcripts of their depositions as Exhibit 1024 (Dr. Sonka) and Exhibit 1025 (Dr. Valley).

II. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)); *see also* 37 C.F.R. § 42.104(b) (requiring a petition for *inter partes* review to identify how the challenged

⁴ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the ’065 patent issued was filed before this date, the pre-AIA version of § 103 applies.

⁵ US 5,417,572, issued May 23, 1995, Ex. 1003.

⁶ US 6,049,743, issued April 11, 2000, Ex. 1004.

claim is to be construed and where each element of the claim is found in the prior art patents or printed publications relied upon).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and when in evidence (4) objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (*citing In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2016) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)). Furthermore, Petitioner does not satisfy its burden of proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art (“POSITA”) would have at least (1) a bachelor’s degree in electrical and/or computer

engineering, or computer science (or equivalent course work) with two to three years of work experience in computer modelling of physical structures, or (2) a master's degree in electrical and/or computer engineering, or computer science (or equivalent course work) with a focus in computer modelling of physical structures. Pet. 13 (citing Ex. 1012 ¶ 25).

Patent Owner argues that claim 1 of the '065 Patent requires technical understanding from two fields: (1) computer engineering, computer science, or applied mathematics and (2) dentistry. PO Resp. 16. According to Patent Owner, "a POSITA would work as a multi-disciplinary team and would have access to and draw upon knowledge of individuals" in both of these fields. *Id.* at 16–17 (citing Ex. 2001 ¶¶ 28–33; Ex. 2003 ¶¶ 21–27). Patent Owner asserts that the computer engineer, computer scientist, or applied mathematician would possess the same qualifications as proposed by Petitioner. *Id.* at 17. According to Patent Owner, "[i]ndividuals in the field of dentistry would include licensed dentists and dental specialists, licensed dental assistants who possess on the job experience in fixed prosthetics, or certified dental laboratory technicians." *Id.*

Neither party asserts that the definition of a POSITA is a dispositive issue. Petitioner argues that Patent Owner's definition of a POSITA is incorrect, but that the challenged claims are unpatentable even under Patent Owner's definition. Reply 22–24.

We agree with Patent Owner that claim 1 of the '065 Patent requires technical understanding from two fields: (1) computer engineering, computer science, or applied mathematics and (2) dentistry. Our finding is supported by the language of claim 1, which contains numerous terms from the field of dentistry, including "prosthodontic," "finish line," "dental prosthesis," "tooth preparation," and "dentition." Ex. 1001, 6:60–7:9. We

agree with Petitioner, however, that formal dental training or experience is not required, and a sufficient technical understanding of dentistry can be gained by reviewing prior art literature or other written materials.

Reply 23–25; Tr. 23:23–24:13. Accordingly, we determine that a POSITA (A) would have at least (1) a bachelor’s degree in electrical and/or computer engineering, or computer science (or equivalent course work) with two to three years of work experience in computer modelling of physical structures, or (2) a master’s degree in electrical and/or computer engineering, or computer science (or equivalent course work) with a focus in computer modelling of physical structures, and (B) would have at least a working knowledge of dentistry gained from reviewing prior art literature or other written materials. We note, however, that under any of the levels of ordinary skill proposed by the parties, we would reach the same result determined below.

Neither party argues that the other party’s declarants lack sufficient qualifications to provide the testimony he or she has submitted. Furthermore, neither party argues that a declarant’s qualifications affect the weight that should be given to the testimony.

Of the parties’ declarants, only Dr. Saber and Dr. Sonka have provided opinions regarding claim construction and whether the subject matter of the challenged claims would have been obvious to a POSITA. Dr. Valley did not do so. Ex. 2003; Ex.1025, 14:4–10, 44:11–12. Both Dr. Saber and Dr. Sonka have expertise in medical imaging, and neither has formal training or experience in dentistry. Ex. 1012 ¶¶ 5–13; Ex. 1013; Ex. 2001 ¶¶ 8–24; Ex. 2002. We find that Dr. Saber and Dr. Sonka each has sufficient education and experience to be “qualified in the pertinent art” and to offer testimony in the form of an opinion. *Sundance, Inc. v. DeMonte*

Fabricating Ltd., 550 F.3d 1356, 1363–64 (Fed. Cir. 2008); Fed. R. Evid. 702; Consolidated Trial Practice Guide 34 (November 2019), <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

C. *Claim Construction*

Because the Petition was filed before November 13, 2018, and the '065 Patent has not yet expired, claim terms are to be given their broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b) (2017).⁷ Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

The parties propose constructions for the claim terms addressed below. We determine that no other claim term requires express construction for purposes of resolving the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of *inter partes* review).

1. *Petitioner's Proposed Constructions*

Petitioner proposes constructions for three claim terms. Pet. 24–26. Patent Owner does not dispute any of Petitioner's proposed constructions.

⁷ A recent amendment to this rule does not apply here. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (now codified at 37 C.F.R. pt. 42 (2019)).

For the reasons discussed below, we adopt Petitioner’s proposed constructions. Our reasoning is the same as set forth in the Institution Decision. Dec. 7–11.

a) “*finish line*”

Petitioner asserts:

[T]he term ‘finish line’ should be construed as being synonymous with a ‘chamfer line’, a ‘marginal line’, or a ‘margin line’, and refers to the apical limit of the abutment tooth model (the ‘preparation’) and the margin of the reconstruction must end on it, i.e., it represents the point of transition between the biologic and artificial parts.

Pet. 24. Patent Owner does not dispute Petitioner’s proposed construction. See PO Resp. 19 (quoting and relying upon Dr. Sabor’s testimony regarding construction of “finish line”); *id.* at. 33 (quoting and relying on part of Petitioner’s proposed construction).

Petitioner’s proposed construction is consistent with the preamble of the independent claims of the ’065 Patent, which recite a “finish line” as a feature “of a dental prosthesis” (Ex. 1001, 1:61–62, 8:4–5 (claims 1 and 10)) or a feature that may be employed in constructing a crown (*id.* at 7:24–28, 8:30–33 (claims 7 and 11)). Petitioner’s construction is supported by the Specification of the ’065 Patent, which states that the term “finish line” is “also referred to at times by the term ‘chamfer line’ and ‘marginal line.’” *Id.* at 1:35–37. Petitioner’s construction is also supported by the ’065 Patent’s express definition of “finish line” as “the apical limit of the abutment tooth model (the ‘preparation’) and the margin of the reconstruction must end on it, i.e. it represents the point of transition between the biologic and artificial parts.” *Id.* at 1:38–41. Petitioner’s construction is further supported by the ’065 Patent, which equates the term “finish line,” as used in the ’065 Patent,

with the term, “margin line,” as used in Kawai. For example, the ’065 Patent states that Kawai discloses a “computer-based method for extracting a finish line for designing an artificial crown” (*id.* at 1:64–65), which is similar to the title of Kawai, except the ’065 Patent uses the term “finish line” instead of the term “margin line.” See Ex. 1003, code (54) (“Method for extracting a margin line for designing an artificial crown”).

For the foregoing reasons, we adopt Petitioner’s proposed construction and construe the term “finish line” as synonymous with the terms, “chamfer line,” “marginal line,” and “margin line,” and as referring to “the apical limit of the abutment tooth model (the ‘preparation’) and the margin of the reconstruction must end on it, i.e., it represents the point of transition between the biologic and artificial parts.”

b) “dental practitioner”

Petitioner contends the term “dental practitioner” “encompasses, but is not limited to, a dentist.” Pet. 25. Patent Owner does not dispute Petitioner’s proposed construction. See Prelim. Resp. 4 n.1 (“Throughout the POPR,⁸ the use of dentist, dental practitioner, and technician is merely for convenience, but is not a limit on who performs or assists in dentistry or the techniques related to dentistry being discussed, as the parties have previously agreed.”)

Petitioner’s proposed construction is supported by the ’065 Patent, which discloses a dentist as an example of a dental practitioner. Ex.1001, 2:20, 3:51 (“dental practitioner (e.g. a dentist)”).

⁸ Patent Owner’s Preliminary Response (“POPR”).

Accordingly, we adopt Petitioner’s proposed construction and construe “dental practitioner” as “encompasses, but is not limited to, a dentist.”

c) “tooth preparation”

Petitioner asserts “the term ‘tooth preparation’ should be construed as being synonymous with ‘abutment tooth’, and refers to a physical tooth or portion thereof that receives a prosthesis such as a crown.” Pet. 26. Patent Owner does not address the meaning of “tooth preparation” and does not dispute Petitioner’s proposed construction.

Petitioner’s proposed construction is consistent with the preamble of the independent claims of the ’065 Patent, which recite a tooth preparation in the context of a dental prosthesis that is “fitted over a tooth preparation” (Ex.1001, 6:61–63, 8:5–6 (claims 1 and 10)) or a crown that is “fitted on a tooth preparation” (*id.* 7:24–25, 8:30 (claims 7 and 11)). Petitioner’s construction is supported by the specification of the ’065 Patent, which indicates that a “tooth preparation” is synonymous with an “abutment tooth” and refers to a physical tooth or portion thereof that receives a prosthesis, such as a crown. *Id.* at 1:23–24 (“the abutment tooth (hereinafter referred to as the preparation)”); *id.* at 1:38–39 (“the abutment tooth model (the ‘preparation’)”); *id.* at 2:21–22 (“a dental prosthesis . . . to be fitted over a tooth preparation”); *id.* at 2:39–40 (“a crown to be fitted on a tooth preparation”). Petitioner’s construction is further supported by Figures 4 and 6 of the ’065 Patent, which show a virtual image of tooth preparation 70 or 90 and a virtual crown 96 fitted on such an image. *Id.* at 4:49–52, 6:40–44.

For the foregoing reasons, we adopt Petitioner’s proposed construction and construe the term “tooth preparation” as synonymous with “abutment tooth” and as referring to “a physical tooth or portion thereof that receives a prosthesis such as a crown.”

2. *Patent Owner’s Proposed Constructions*

a) *“first finish line data” and “second finish line data”*

Patent Owner argues that “first finish line data” should be construed as “digital 3D data that defines at least a portion of a curved first finish line” and that “second finish line data” should be construed as “digital 3D data that defines a curved second finish line.” PO Resp. 18–20. Petitioner opposes. Reply 1–2.

We agree with Petitioner that “finish line data” is not required to be 3D. Reply 1; Tr. 6:14–7:7. Independent claims 1, 7, and 11 each recite “three-dimensional (3D) digital data relating to the patient’s dentition.” Ex. 1001, 6:64–65, 7:30–31, 8:35–36. In contrast, the claims recite “first finish line data” and “second finish line data” without limiting the finish line data to “three-dimensional” or “3D” data. When read in the context of the claims as a whole, the term “finish line data” is broad enough to encompass both two-dimensional data and three-dimensional data.

Patent Owner relies on the following two passages from the Specification: (1) “the visual representation of the finish line data is associated with the visual representation of the 3D model such that the digital image of the model will include the finish line data” (Ex. 1001, 5:48–51) and (2) “the service center 200 is provided with the 3D data of the patient’s dentition including the definition of the finish line” (*id.* at 4:28–31). PO Resp. 18. In both Specification passages, “3D” is used to describe a

model of a patient's dentition, not a finish line. Patent Owner does not direct us to intrinsic evidence requiring that the "finish line data" be 3D.

We also agree with Petitioner that a "finish line" is not required to be "curved." Reply 1; Tr. 7:7–17. As support for its proposed construction, Patent Owner asserts that "[t]he finish line data makes it possible for a finish line to be drawn as a smooth, or curved, 'continuous line on the apical limit of tooth preparation.'" PO Resp. 18 (quoting Ex. 1001, 4:49–52). The Specification passage quoted by Patent Owner does not describe the finish line as "curved." Patent Owner does not direct us to intrinsic evidence requiring that a finish line be curved.

Turning to extrinsic evidence, Patent Owner argues that "Dr. Saber equates Kawai's 'margin line' to the '065 Patent's 'finish line'" and that "Kawai describes its margin line as being 3D data formed as a curved line." PO Resp. 18–19 (citing Ex. 1003, 4:20–24; Ex. 1012 ¶ 64). Patent Owner also relies on Dr. Saber's deposition testimony where he used the word "curve" when referring to Kawai's margin line. *Id.* at 19 (quoting Ex. 2011, 49:2–6).

As discussed above, the '065 Patent equates the term "finish line," as used in the '065 Patent, with the term "margin line," as used in Kawai. *Compare* Ex. 1001, 1:64–65 (the '065 Patent uses the term "finish line" when discussing Kawai), *with* Ex. 1003, code (54) (Kawai's title uses the term "margin line.")). In describing a preferred embodiment, Kawai discloses that "a curve" as shown in Figure 1B "corresponds to the margin line" and that "three-dimensional data" is used to form the curve. Ex. 1003, 4:20–23. The '065 Patent claims, however, do not require that the finish line be curved or that the finish line data be three-dimensional. Kawai's use of these terms to describe its preferred embodiment is not a justification for

reading such limitations into the claim. The testimony of Dr. Saber relied upon by Patent Owner does not persuade us otherwise.

Regarding “second finish line data,” Patent Owner does not point to any support for a “curved” second finish line requirement. See PO Resp. 19–20 (no discussion of a “curve” or “curved”). Patent Owner asserts that “the software creates digital 3D data that defines a continuous line” (*id.* at 20, citing Ex. 2001 ¶ 69), but does not direct us to any support in the ’065 Patent for a requirement that second finish line data be 3D.

Accordingly, we do not adopt Patent Owner’s proposed constructions for “first finish line data” and “second finish line data.”

b) “virtually drawing a line” (claim 3)

Claim 3 depends from claim 1 and recites: “wherein the second finish line data is generated by virtually drawing a line at the apical limit of the preparation.” Ex. 1001, 7:14–16. Patent Owner contends that “virtually drawing a line” should be construed as “actively drawing a line at the apical limit of the preparation by a dental practitioner in a virtual model space.” PO Resp. 21–22. Petitioner opposes. Reply 4–6.

We agree with Petitioner that “virtually drawing a line” does not require “actively” drawing a line, need not be performed exclusively “by a dental practitioner,” and does not exclude steps performed automatically, e.g., by computer software. Reply 4–5; Tr. 11:1–9. Patent Owner does not direct us to any express definition, disclaimer, or other intrinsic evidence that would justify reading these limitations into claim 3. Patent Owner relies on examples from the Specification (PO Resp. 22 (citing Ex. 1001, 5:62–67)), but Petitioner is correct that these examples are non-limiting. Ex. 1001, 3:25–28; Tr. 10:6–22. Moreover, Patent Owner’s proposed

construction of claim 3 cannot be correct because it would exclude the subject matter of claim 5, which depends from claim 3 and recites: “the line is drawn by marking dots in small intervals and then forming a line by automatically connecting the dots to one another.” Patent Owner does not attempt to reconcile its proposed construction for claim 3 with dependent claim 5.

Accordingly, we do not adopt Patent Owner’s proposed construction for “virtually drawing a line.”

c) *“drawn in a continuous fashion” (claim 4)*

Claim 4 depends from claim 3 and recites: “wherein the line is drawn in a continuous fashion.” Ex. 1001, 7:17–18. Patent Owner contends that “drawn in a continuous fashion” should be construed as “drawn by the dental practitioner in continuous motion, without interruption.” PO Resp. 22–23. Petitioner opposes. Reply 6–7.

We agree with Petitioner that Patent Owner’s proposed construction improperly seeks to read limitations into the claim. Reply 6–7; Tr. 12:12–18, 12:26–13:6. Patent Owner relies on the following disclosures in the ’065 Patent. PO Resp. 22. “For example, the finish line may be drawn by moving a cursor, by moving a stylus on a touch-sensitive screen or pad, etc.” Ex. 1001, 5:24–26. “The dentist can input his instructions for example by moving a cursor to draw the finish line, by moving a stylus on a touch-sensitive screen or pad” *Id.* at 5:62–64. In both cases, the Specification provides non-limiting examples of ways to generate finish line data or to provide a dentist’s input. In neither case is the motion of the cursor or stylus described as “continuous” or “without interruption,” as set forth in Patent Owner’s proposed construction. Moreover, claim 4 makes no

reference to moving a cursor or moving a stylus, and nothing in the claim language limits its scope to these Specification examples.

We agree with Petitioner that the Specification of the '065 Patent uses the word “continuous” to describe the finish line, not the motion used to draw the line. Reply 6; Tr. 12:19–25. “Continuous” appears three times in the Specification, and in each instance, it is used to describe the finish line, not the motion used to draw the line. Ex. 1001, 4:49–52 (Figure 4 shows “finish line 74 drawn as a continuous line on the apical limit of tooth preparation.”); *id.* at 5:26–29 (“[T]he [finish] line may be drawn by indicating a series of dots while the software then automatically connects the dots into one continuous finish line.”); *id.* at 5:64–67 (“[T]he dentist can indicate[] a series of dots onto the 3D or the 2D images, while the software then automatically connects the dots into one continuous finish line.”).

Patent Owner does not direct us to any express definition, disclaimer, or other intrinsic evidence that would justify limiting claim 4 to actions performed exclusively “by the dental practitioner,” as opposed to actions performed, at least in part, automatically by a computer. In fact, in two out of three instances where the word “continuous” appears in the Specification, it is used to describe a line that is drawn automatically by computer software. Ex. 1001, 5:26–29, 5:64–67.

Patent Owner argues that the method of claim 4 “is differentiated from a third, non-continuous, method for generating the finish line data involving a series of dots, as recited in claim 5.” PO Resp. 22 (citing Ex. 1001, 5:64–67). Patent Owner’s argument incorrectly assumes that the subject matter of claims 4 and 5 is mutually exclusive. See Tr. 39:12–14 (“[C]laims 4 and 5 . . . provide two different embodiments as to how claim 3 may operate.”). Patent Owner does not direct us to any claim language or

rule of claim construction that requires that claims 4 and 5 be mutually exclusive. Furthermore, Patent Owner’s argument assumes, without support in the claim language or in the Specification, that claim 5’s method for drawing a finish line is “non-continuous.” *Id.* That assumption is contrary to the Specification’s disclosure that a “continuous finish line” results from that method. Ex. 1001, 5:26–29, 5:65–67.

Turning to the extrinsic evidence, we agree with Petitioner that the dictionary definitions for “continuous” and “fashion” do not require us to adopt Patent Owner’s proposed construction. Reply 6–7. The meaning of “continuous” is not limited to “uninterrupted in time.” Ex. 1027 (defining “continuous” as “1. [u]ninterrupted in time, sequence, substance, or extent. . . . 2. [a]ttached together in repeated units.”). “[U]ninterrupted in . . . extent” is consistent with the manner in which “continuous” is used in the Specification. Ex. 1001, 4:49–52. Furthermore, one meaning of “fashion” is “[m]anner or mode,” and another meaning is “[s]hape or form; configuration.” Ex. 1026 (dictionary definition for “fashion”). Petitioner’s dictionary definitions show that “continuous fashion” can reasonably be interpreted as referring *either* to the process of drawing the line *or* the configuration of the line after it is drawn.

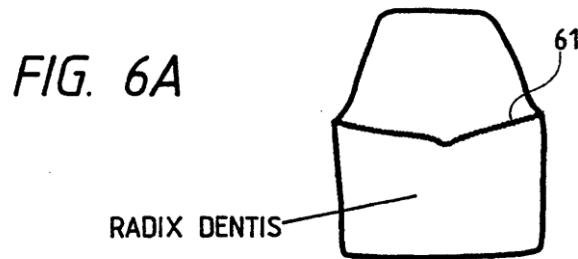
Accordingly, we do not adopt Patent Owner’s proposed construction for “drawn in a continuous fashion.”

D. Overview of Prior Art References

Below we provide an overview of the prior art references relied upon by Petitioner.

1. *Kawai (Ex. 1003)*

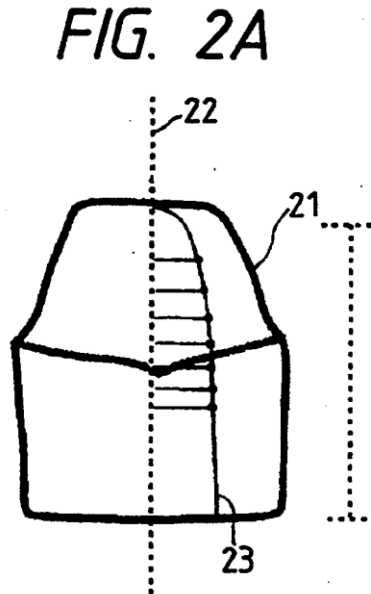
Kawai discloses a method for extracting the margin line for the designing of an artificial crown. Ex. 1003, 1:10–12. Kawai explains that an artificial crown is conventionally prepared by a manual process in which a dental technician draws a margin line on a plaster cast of an abutment tooth, as illustrated in Figure 6A, which is reproduced below. *Id.* at 1:15–25.



Kawai Figure 6A shows a plaster cast of an abutment tooth, including margin line 61 drawn by a dental technician. *Id.* at 1:17–22. Kawai explains how a hand-drawn margin line is used in a manual process for making an artificial crown and why an accurate margin line is important for ensuring a proper fit between the artificial crown and the abutment tooth. *Id.* at 1:24–44; Figs. 6B, 6C.

Kawai discloses that, in the future, artificial crown preparation will depend on CAD/CAM (computer aided design/computer aided manufacturing). Ex. 1003, 1:45–48. In anticipation of such CAD/CAM preparation, Kawai discloses a method for extracting, i.e. calculating, a margin line from data representing the three-dimensional shape of an abutment tooth. *Id.* at 1:51–66. Kawai explains that shape data can be obtained by “known technology,” such as CT (computerized tomography) scanning or a three-dimensional measuring instrument. *Id.* at 2:28–35. Kawai discloses that “[a] train of points in the margin area is extracted from

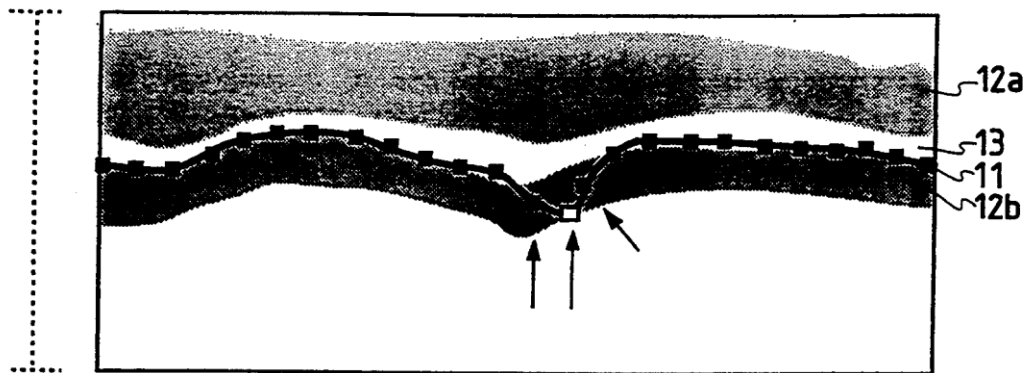
[the] data representing the three-dimensional shape of the abutment tooth.”
Id. at 2:36–38. An example method for extracting, i.e., calculating, a train of points is illustrated in Figure 2A, which is reproduced below.



Kawai Figure 2A illustrates a calculation method for determining a train of points of the margin area. Ex. 1003, 2:6–8. Figure 2A shows three-dimensional shape 21 of the abutment tooth, central axis 22, and crossing line 23 defined by the intersection of a plane through the central axis and the curved surface 21 of the abutment tooth. *Id.* at 2:40–47. Kawai discloses mathematical equations for calculating the margin area, which is defined as where the variation in inclination of crossing line 23 meets defined criteria. *Id.* at 2:47–3:12.

According to Kawai, the train of points representing the margin area is displayed on a display unit as illustrated in Figure 1A, which is reproduced below. *Id.* at 3:13–15, 3:24–28.

FIG. 1A



Kawai Figure 1A shows a display of a train of points superposed on a development view of the shape of an abutment tooth. Ex. 1003, 3:24–28. As shown in Figure 1A and disclosed in Kawai, the “points are connected by straight lines, and such connection can be made by hitting the points with a mouse.” *Id.* at 3:28–30.

With reference to Figure 1A, Kawai discloses a “correction operation” for correcting points that deviate from the actual margin line, as follows:

Subsequently there is executed a correction operation for the point train of the margin area extracted by calculation and the lines connecting the points. Said correction is conducted by hitting a displayed point and moving said point by giving an amount of variation by keys or a dial.

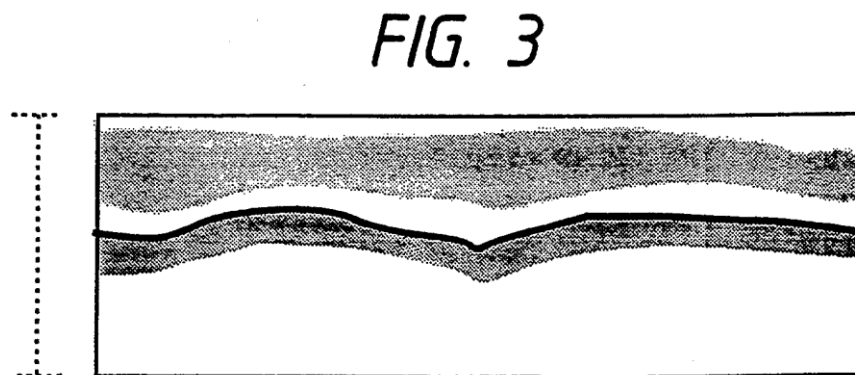
Said correction operation will be explained in the following, with reference to FIG. 1A, in which shaded areas 12a, 12b slope gradually upward to an area 13. The area 13 constitutes a ridge line of a rise. The actual margin line is considered present in the vicinity of the peak of the rise in the developed view, namely in the area 13 in FIG. 1A. The point train 11 in FIG. 1A indicates the margin area determined by the aforementioned calculation. Most of the points of the train 11 are in the area 13, and can be considered close to the actual margin line. The points indicated by arrows are in the area 12b, namely on the sloped portion. These points, are considered

deviated from the actual margin line, having been improperly obtained by the aforementioned calculation method, and have to be corrected in their positions. As explained above, the correction can be achieved by hitting a point to be corrected with a mouse and moving said point to a desired position by setting the amount of movement, for example by keys or a dial.

Ex. 1003, 3:35–60.

Kawai discloses that both a developed view, like Figure 1A, and a three-dimensional view, like Figure 6A, can be displayed simultaneously and that the point train and the connecting lines representing the margin area can be displayed in both views. *Id.* at 3:61–67, Fig. 5. According to Kawai, the correction operation may be conducted in either view and is displayed simultaneously in both views. *Id.* at 3:67–4:10.

Figure 3 of Kawai is reproduced below:



Kawai Figure 3 shows a development view of the shape of an abutment tooth, with corrected points connected by straight lines. Ex. 1003, 4:11–14.

Kawai discloses that the corrected point train is converted into three-dimensional data and formed as a curve that corresponds to the margin line. *Id.* at 4:20–23, Fig. 1B. Kawai explains that the margin line can be registered in the shape data of the abutment tooth and used to design the artificial crown. *Id.* at 4:23–30. According to Kawai, the disclosed method streamlines the extraction of a margin line and provides improved durability

of the dental prosthesis due to improved accuracy of the margin line. *Id.* at 4:31–38.

2. *Baba (Ex. 1004)*

Baba discloses a method of designing a dental prosthesis model, such as a bridge or a crown, using a computer. Ex. 1004, code (57), 1:7–10. Baba establishes that CAD/CAM techniques are known for making dental prostheses. *Id.* at 1:20–30. Baba discloses a method for designing dental prostheses easily and efficiently using a database that stores models of individual teeth, rather than models of each crown, pontic, and bridge. *Id.* at 1:31–47, 2:42–57, 4:9–28.

Baba discloses a method and a corresponding computer program for producing a crown model (Ex. 1004, 1:56–2:10, 2:58–3:28) and a method and a corresponding computer program for producing a bridge model, including both crown and pontic models (*id.* at 2:11–41, 3:29–4:8).⁹

Baba discloses a dental prosthesis model designing program for performing a series of steps, including: (i) displaying a dentition configuration diagram; (ii) reading out pontic model data from a database; (iii) making crown model data indicating a crown region; (iv) displaying a crown model and a pontic model superimposed on the dentition configuration diagram; (v) deforming each of the crown and pontic models

⁹ Baba explains that a “pontic model” refers to “a model of an artificial tooth to fill an intermediate position (i.e., position corresponding to a lost tooth without an abutment tooth) of a bridge.” Ex. 1004, 5:6–9. Baba explains that a “crown model” refers to “a model of a dental prosthesis (artificial crown) to be mounted on a broken tooth (abutment tooth)” and a “bridge model” refers to “a model of an artificial bridge in which at least one pontic model and at least one crown model are connected to each other.” *Id.* at 5:15–20.

so that each forms a desired gap with respect to pairing and adjacent teeth and a gum; and (vi) connecting the crown and pontic models to each other so as to make a bridge model. *Id.* at 6:59–7:22, Fig. 3. Baba discloses that the dentition configuration diagram is produced from dentition configuration data obtained by measuring a three-dimensional configuration of upper and lower jaw dentitions of a subject. *Id.* at 5:21–31, 6:61–67, 8:47–59. Baba explains that “configurations of teeth surrounding the teeth to which the bridge is attached . . . are measured and . . . represented on the display.” *Id.* at 8:59–63.

Baba Figure 8A is reproduced below.

Fig.8A

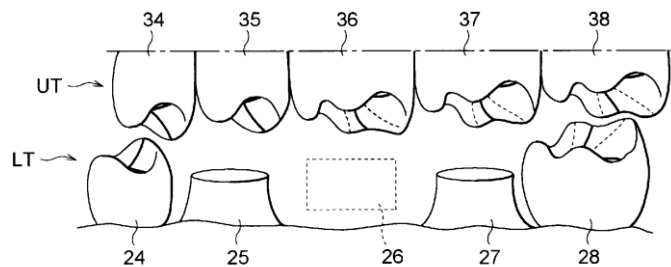
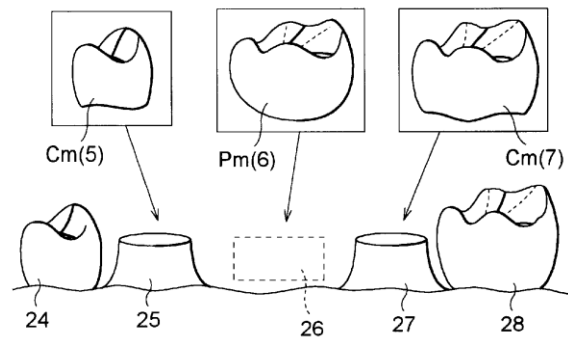


Figure 8A shows an example of a dentition configuration as displayed according to Baba’s method. Ex. 1004, 6:5–8. Figure 8A shows upper jaw UT with teeth 34–38 and lower jaw LT with abutment teeth 25 and 27 adjacent to lost tooth 26 and teeth 24 and 28 adjacent to the abutment teeth. *Id.* at 8:59–67. A bridge can be attached to the abutment teeth. *Id.* at 8:65-67, Fig. 8B.

Figure 9 of Baba is reproduced below:

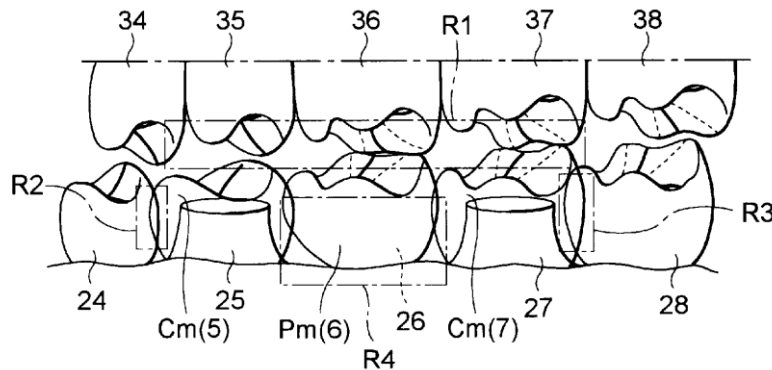
Fig.9



Baba Figure 9 shows an example of pontic and crown models and a dentition to which they are attached. Ex. 1004, 6:10–12. Baba explains that pontic model $P_{m(6)}$ is used to replace lost tooth 26 and crown models $C_{m(5)}$ and $C_{m(7)}$ are attached to the abutment teeth 25 and 27. *Id.* at 9:5–9. According to Baba, crown models $C_{m(5)}$ and $C_{m(7)}$ are generated by deforming pontic model data $P_{m(5)}$ and $P_{m(7)}$ corresponding to teeth 25 and 27. *Id.* at 9:9–19. Baba discloses that “[t]his deformation is effected by eliminating the base region $B_{(n)}$ below the margin line ML in each of the pontic models $P_{m(5)}$ and $P_{m(7)}$.” *Id.* at 9:13–15; see also *id.* at Fig. 4A (showing pontic model P_m with base region $B_{(n)}$ and margin line ML).

Figure 10 of Baba is reproduced below:

Fig.10



Baba Figure 10 shows an example of upper and lower jaw dentitions to which pontic and crown models are attached according to the superimposition displaying step of Baba's method. Ex. 1004, 6:13–16.

Baba Figure 10 shows crown models $C_{m(5)}$ and $C_{m(7)}$ superimposed on their respective abutment teeth 25 and 27 and pontic model $P_{m(6)}$ superimposed in place of lost tooth 26. *Id.* at 9:20–30. In this state, each model can be deformed to avoid interference with the pairing and adjacent teeth and to align the margin lines of the crown models with the margin lines of the corresponding abutment teeth. *Id.* at 9:30–62, Figs. 11, 12.

According to Baba, the disclosed method can be used to design a bridge model on a computer, and the model can be used to manufacture a bridge. *Id.* at 10:16–20.

E. *Petitioner's Obviousness Ground*

Petitioner contends that claims 1–9 and 11 of the '065 Patent are unpatentable as obvious under 35 U.S.C. § 103(a) over Kawai in view of Baba. Pet. 27–73. Patent Owner opposes, arguing that certain claim

limitations are not taught or suggested by Kawai. PO Resp. 23–52. We address the parties’ arguments on a claim-by-claim basis below.

1. *Claim 1*

a) *Preamble*

The claim 1 preamble recites: “[a] computer-based prosthodontic method for enabling a dental practitioner to define a finish line of a dental prosthesis of at least one tooth to be fitted over a tooth preparation.”

Petitioner contends that Kawai discloses the preamble of claim 1. Pet. 28–30. Patent Owner does not dispute Petitioner’s contention.

We find that Petitioner has shown by a preponderance of the evidence that Kawai discloses the preamble of claim 1. Pet. 28–30; Ex. 1012 ¶¶ 68–73; *see, e.g.*, Ex. 1003, 1:10–13 (“a method for extracting the margin line for the designing of an artificial crown” to be fitted over an abutment tooth);¹⁰ *id.* at 3:35–60 (describing a “correction operation” that enables a dental practitioner to provide input for defining a finish line).

b) *Element 1.1*

Claim element 1.1 recites: “(One) providing a three-dimensional (3D) digital data relating to the patient’s dentition, said 3D data includes data representative of the surface topology of said preparation and its surroundings.”

Petitioner contends that Kawai discloses providing 3D digital data relating to the patient’s dentition, including data representative of the surface topology of an abutment tooth. Pet. 31–32 (citing Ex.1003, 2:28–35, Fig.

¹⁰ As discussed above, the “abutment tooth,” as disclosed in Kawai, is synonymous with “the preparation,” as used in the ’065 Patent. *See* Section II.C.1.c, *supra*.

2A). Petitioner relies on Baba to disclose providing 3D digital data of not only a tooth preparation, but also its surroundings. *Id.* at 32–34, 59, 64–66 (citing, *e.g.*, Ex. 1004, 8:47–67, Fig. 8A). Petitioner contends that it would have been obvious to modify Kawai to provide 3D data of the abutment tooth together with the surrounding teeth. *Id.* at 66–70. Petitioner contends that a POSITA would have been motivated to combine the references “because Baba virtually models the crown $C_{m(n)}$ in relation to the adjacent virtual teeth and gum(s) to beneficially allow the user to easily view and adjust the interferences and desired gaps between the virtual crown model $C_{m(n)}$ and adjacent virtual teeth and gum.” *Id.* at 67 (citing, *e.g.*, Ex. 1004, 8:60–63).

Patent Owner does not dispute Petitioner’s contention that claim element 1.1 is disclosed by the combination of Kawai and Baba. Nor does Patent Owner dispute that it would have been obvious to modify Kawai in view of Baba in the manner proposed by Petitioner.

Relying on Petitioner’s arguments and evidence, as summarized above, we find that a preponderance of the evidence establishes that Kawai in view of Baba teaches or suggests claim element 1.1, including providing 3D data representative of the surface topology of a tooth preparation and its surroundings, and that it would have been obvious to a POSITA to combine the teachings of Kawai and Baba in the manner recited in claim element 1.1. Pet. 31–34, 64–70; Ex. 1012 ¶¶ 75–80, 144–153; *see, e.g.*, Ex. 1003, 2:33–35, (“[T]he data indicating the three-dimensional shape of the abutment tooth are obtained from the measurement data.”); Ex. 1004, 8:60–63 (“[C]onfigurations of teeth surrounding the teeth to which the bridge is attached . . . are measured . . .”).

c) Element 1.2

Claim element 1.2 recites: “(Two) generating first finish line data representative of at least a portion of said finish line and superimposing an image of said finish line on an image of said dentition.”

Petitioner contends that Kawai discloses a method for obtaining the finish line using a “train of points” and displaying the finish line superimposed on a 2D or 3D image of the abutment tooth. Pet. 34–35 (citing Ex. 1003, 2:40–3:17, 3:26–30, 3:61–4:3, Fig. 1A). Petitioner relies on Baba to disclose superimposing an image of a dental prosthesis model (such as a crown model), including a margin line, on a 3D image of dentition that includes not only a tooth preparation, but also its surroundings. Pet. 36–37, 59, 64–66 (citing, *e.g.*, Ex. 1004, 7:8–13, 9:20–27, 9:56–67, Figs. 9, 10, 12). Petitioner contends that it would have been obvious to modify Kawai to superimpose the prosthesis model (including the finish line) on a 3D image of the abutment tooth and its surrounding teeth. Pet. 66–70. Petitioner contends:

A POSITA would have been motivated to modify Kawai’s virtual modelling to show the abutment tooth in relation to other dental structures such as neighboring teeth at least because virtually modelling the crown $C_{m(n)}$ in relation to the adjacent virtual teeth and gum would have beneficially allowed the user to easily view and adjust the interferences and desired gaps between the virtual crown model $C_{m(n)}$ and adjacent virtual teeth and gum(s).

Id. at 68 (citing, *e.g.*, Ex. 1004, 9:28–40).

Patent Owner does not dispute Petitioner’s reliance on Baba to teach the “superimposing” limitation of claim element 1.2 as it pertains to a tooth’s surroundings. Nor does Patent Owner dispute that it would have been obvious to modify Kawai in view of Baba in the manner proposed by

Petitioner. Relying on Petitioner’s arguments and evidence regarding claim element 1.2 and Baba, as summarized above, we find that Petitioner has shown that it would have been obvious to modify Kawai to superimpose the prosthesis model (including the finish line) on a 3D image of the abutment tooth and its surrounding teeth.

Patent Owner argues that “Kawai’s ‘train of points representing the margin area’ does not teach or suggest first finish line data.” PO Resp. 34–39. We disagree.

Relying on Petitioner’s arguments and evidence, as summarized above, we find that a preponderance of the evidence establishes that Kawai discloses a method for obtaining the finish line using a “train of points” and displaying the finish line superimposed on a 2D or 3D image of the abutment tooth. Our finding is supported by Kawai, which discloses a method for calculating a margin line from data representing the three-dimensional shape of an abutment tooth. Ex. 1003, 1:51–66. More specifically, Kawai discloses that “[a] train of points in the margin area is extracted from [the] data representing the three-dimensional shape of the abutment tooth” and that the train of points is displayed superposed on a 2D or 3D image of an abutment tooth. *Id.* at 2:36–38, 3:13–30, 3:61–4:3, Figs. 1A, 5.

We agree with Petitioner that Kawai’s train of points teaches or suggests “first finish line data representative of at least a portion of said finish line,” as recited in claim element 1.2. Reply 8; Pet. 34–35; Tr. 13:22–14:24. Our finding is supported by the ’065 Patent, which acknowledges that Kawai “discloses a computer-based method for extracting a finish line for designing an artificial crown.” Ex. 1001, 1:64–66. Furthermore, the ’065 Patent relies on Kawai as disclosing one way to carry

out the step of generating first finish line data. *Id.* at 5:30–32 (“The finish line data can be also obtained in a fully automated manner, for example as described in [Kawai].”). Patent Owner’s argument that Kawai does not disclose “first finish line data” is belied by the disclosure of the ’065 Patent, which relies on Kawai to disclose the very same thing. *See* Reply 9 (“The ’065 Patent itself discloses that the finish line is determined by plotting a train of points in the margin area.” (emphasis omitted)).

Patent Owner advances “two reasons” for arguing that Kawai does not teach or suggest “first finish line data.” PO Resp. 34–39.

First, Patent Owner argues that “Kawai’s train of points is **not** an actual margin line that a dental practitioner could use to prepare a crown,” but is merely “**close** to the actual margin line.” PO Resp. 34. After considering the parties’ arguments, we agree with Petitioner that the claims do not require any particular degree of accuracy for “first finish line data.” Reply 9–10; Tr. 14:25–15:25. In fact, the claims contemplate that “first finish line data” may not be accurate or usable to prepare a crown **until it is updated** using “second finish line data.” Ex. 1001, 7:7–8 (claim element 1.4 recites “using said second finish line data to update said first finish line data”). Indeed, Patent Owner concedes that “first finish line data” is “either something that needs or doesn’t need correction.” Tr. 37:1–6. Patent Owner additionally concedes that the ’065 Patent does not contemplate that the “first finish line data” would ever be used to produce a prosthesis. *Id.* at 42:14–26.

Second, Patent Owner argues that “Kawai’s point train **does not** become a margin line until Kawai’s final disclosed conversion steps when the point train is ‘**converted** into three-dimensional data,’ ‘formed as a curve,’ and ‘is registered in the shape data of the abutment tooth.’” PO

Resp. 37 (citing Ex. 1003, 4:20–24). In other words, Patent Owner argues that Kawai’s point train is not “first finish line data” because Kawai’s point train is not three-dimensional and is not curved.

Patent Owner’s argument relies on its proposed construction for “first finish line data” as “digital 3D data that defines at least a portion of a curved first finish line.” PO Resp. 18. For the reasons stated above, we do not adopt Patent Owner’s proposed construction.

We agree with Petitioner that Kawai’s “train of points” is a margin line corresponding to the claimed “first finish line data,” even before it is converted to 3D data and formed as a curve. Reply 12; Tr. 16:22–17:23. Our finding is supported by Kawai’s disclosure that “the margin line can be easily determined by plotting said train of points.” Ex. 1003, 1:66–68; see *also id.* at 1:55–63 (Kawai’s method includes “determining the margin line based on said train of points,” without mention of conversion.). Patent Owner’s argument is contrary to the disclosure of the ’065 Patent, which admits that Kawai discloses a method for obtaining finish line data. Ex. 1001, 5:30–32. See *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1339 (Fed. Cir. 2020) (“[I]t is appropriate to rely on admissions in a patent’s specification when assessing whether that patent’s claims would have been obvious.”).

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai in view of Baba teaches or suggests claim element 1.2.

d) Element 1.3

Claim element 1.3 recites: “(Three) obtaining second finish line data determined on the basis of input received from a dental practitioner.”

Petitioner contends that claim element 1.3 is taught or suggested by Kawai’s “correction operation” whereby the point train can be corrected “by hitting a displayed point and moving said point by giving an amount of variation by keys or a dial.” Pet. 38 (quoting Ex. 1003, 3:35–40). Petitioner contends that it would have been obvious for the user in Kawai’s method to be a dental practitioner. *Id.* at 60–64.

Patent Owner does not dispute that Kawai’s user could be a dental practitioner, but argues that Kawai’s “correction operation” does not teach or suggest “obtaining second finish line data determined on the basis of input received from a dental practitioner,” as recited in the claim. PO Resp. 39–45.

We find that Petitioner has shown by a preponderance of the evidence that the step of “obtaining second finish line data determined on the basis of input received from a dental practitioner” is taught or suggested by Kawai’s “correction operation.” Pet. 38–39. Our finding is supported by Kawai’s disclosure of “a correction operation for the point train.” Ex. 1003, 3:35–36. Kawai explains that the correction “is conducted by hitting a displayed point and moving said point by giving an amount of variation by keys or a dial.” *Id.* at 3:38–40. Kawai describes the correction operation with reference to Figure 1A, which shows a point train “superposedly displayed” on an image of the abutment tooth. *Id.* at 3:12–16, 3:26–30, 3:341–60. Figure 1A shows several points that “are considered deviated from the actual margin line” and “have to be corrected in their positions.” *Id.* at 3:51–56. According to Kawai, “the correction can be achieved by hitting a point to be corrected

with a mouse and moving said point to a desired position by setting the amount of movement, for example by keys or a dial.” *Id.* at 3:56–60.

We agree with Petitioner that hitting a displayed point with a mouse and moving the point to correct its position, as disclosed in Kawai, correspond to the claimed “input received from a dental practitioner” and are analogous to the ways input is obtained from a dental practitioner according to the ’065 Patent, including moving a cursor or indicating a series of dots. Pet. 39 (citing Ex. 1001, 5:23–67; Ex. 1003, 3:35–40). We also agree with Petitioner that “[t]he new positions of the points after being moved in [Kawai’s] ‘correction operation’ constitute new, ‘second’ finish line data.” *Id.*

As further support for our determination, we reiterate the following preliminary findings from the Institution Decision:

At this stage and for purposes of institution, we are persuaded Petitioner has sufficiently supported its contention that Kawai teaches or suggests “second finish line data determined on the basis of input received from a dental practitioner.” Pet. 38–39. At this stage and before considering any evidence from Patent Owner, we are persuaded that Petitioner has demonstrated sufficiently that this claim limitation is taught or suggested by Kawai’s “correction operation” and that Petitioner’s evidence sufficiently supports its contention that “[t]he new positions of the points after being moved in the ‘correction operation’ constitute new, ‘second’ finish line data.” Pet. 39 (citing Ex. 1003, 3:35–40). Based on the record before us, it is not clear how the claim limitation can encompass a dentist indicating a series of dots onto a 2D image, which the software connects into a continuous finish line (Ex. 1001, 5:64–67) and at the same time exclude Kawai’s “correction operation” in which a user moves existing points to new positions in a 2D developed view (Ex. 1003, 3:35–60). Because the ’065 patent discloses the former as an example of “second finish line data determined on the basis of input received from a dental

practitioner,” Kawai’s “correction operation” seemingly would likewise fall within the scope of the claim limitation, absent contrary evidence or persuasive explanation in the record. In both instances, user input is provided in the form of dots or points in a graphical user interface, and the user input is used to determine second finish line data. Patent Owner argues: “the end result of a dentist’s input in the ’065 Patent is not merely a series of dots, but rather, a new, second finish line automatically generated before it is used to update the first finish line.” [Pet. 30.] On this record, Patent Owner’s argument appears to read an extraneous requirement into the claim, which recites “second finish line data determined on the basis of input received from a dental practitioner,” not a new, second finish line automatically generated.

Dec. 24–25. After considering the full record developed during trial, we determine that the foregoing preliminary findings are established by the preponderance of the evidence. Patent Owner does not explicitly address these findings, nor persuasively identify any error in them.

Patent Owner advances two arguments to counter Petitioner’s contention that Kawai teaches claim element 1.3. PO Resp. 39–45.

First, Patent Owner argues that Kawai’s “point train” does not teach or suggest “first finish line data” and therefore any correction of that point train cannot teach or suggest “second finish line data.” PO Resp. 39. We disagree with Patent Owner’s argument for the same reasons as discussed above with respect to “first finish line data” and claim element 1.2. As discussed above, there is no requirement that first or second “finish line data” be 3D or define a curved line. See Section II.C.2.a, *supra*. Nor is Patent Owner’s argument that Kawai’s point train “is a mere approximation of the . . . margin line” sufficient to distinguish the point train from the claimed “first finish line data.” PO Resp. 40; see Section II.E.1.c, *supra*.

Second, Patent Owner argues that Kawai's correction operation is limited, inefficient, inaccurate, and inflexible as compared with the '065 Patent's methods for obtaining second finish line data determined on the basis of input from a dental practitioner. PO Resp. 40–45. Patent Owner identifies several limitations of Kawai's method, including that it is “limited to **correcting** its train of points and does not have the capacity to **create** new points based on a user's input” (*id.* at 41), that it is “limited to moving the points up and down along one axis,” (*id.*) and that Kawai is “silent with respect to any ‘dragging’ functionality” (*id.* at 42). *See also id.* at 44 (reiterating alleged limitations of Kawai's method).

Patent Owner's arguments regarding limitations of Kawai are not persuasive for two reasons.

First, although Patent Owner attempts to distinguish the claimed invention from Kawai, Patent Owner's distinctions are not based on the language of the claims nor any claim construction proposed by the parties. The claims simply do not impose any requirements regarding efficiency, accuracy, or flexibility with respect to obtaining input from a dental practitioner. Although Patent Owner touts the benefits of the '065 Patent as compared with Kawai (PO Resp. 44–45), Patent Owner makes no attempt to tie the supposed advantages to limitations of the challenged claims.

We agree with Petitioner that the claims do not distinguish between enabling a dental practitioner “to **create** new points,” as argued by Patent Owner (PO Resp. 41), and enabling her to **correct** existing points by moving them to new positions, as disclosed by Kawai. Ex. 1003, 3:35–40, 3:56–60 (“[T]he correction can be achieved by hitting a point to be corrected with a mouse and moving said point to a desired position by setting the amount of movement, for example by keys or a dial.”). Both are ways of obtaining

input from a dental practitioner encompassed by claim element 1.3. Even if we accepted Patent Owner’s claim construction argument that “the second finish line data is newly created data that is used to update the first finish line data” (PO Resp. 19–20), we agree with Petitioner that “newly created data” encompasses new positions for existing points and there is no claim requirement for additional points. Reply 4, 14; Tr. 19:4–16.

Furthermore, the claims do not specify how input is obtained from a dental practitioner. There is no claim requirement for freedom of movement in two axial directions using, e.g., a mouse, cursor, or stylus. Nor is there any requirement for any dragging functionality. *Cf.* PO Resp. 41–42. The methods of obtaining input from a dental practitioner relied upon by Patent Owner (PO Resp. 40) are merely examples disclosed in the Specification, not limitations recited in claims. Ex. 1001, 5:62–66 (“The dentist can input his instructions **for example** by moving a cursor to draw the finish line, by moving a stylus on a touch-sensitive screen or pad, etc. **By another example**, the dentist can indicate[] a series of dots onto the 3D or the 2D images” (emphasis added)).

Second, Patent Owner’s arguments distinguishing claim element 1.3 from Kawai’s “correction operation” are based on an overly narrow and speculative interpretation of Kawai’s teachings. Patent Owner’s argument that Kawai’s method “is limited to moving the points up and down along one axis” is undercut by its concession that Kawai’s keys “may allow a user to provide directional control along two axes.” PO Resp. 41. Patent Owner’s attempt to rehabilitate a narrow reading of Kawai is unconvincing. According to Patent Owner, “Kawai’s software would not support” moving the points in a side-to-side manner, and “such movements would likely lose the cylindrical coordinate information that allows the train of points to be

converted into a margin line.” *Id.* at 41–42. Patent Owner’s argument is entirely speculative. Patent Owner provides no factual basis for its assertion about functionality not supported by Kawai’s software. Patent Owner also provides no explanation for why “the cylindrical coordinate” (*id.* at 42) would be lost when a point is moved in both the x and y directions, but preserved when a point is moved in only the y direction. Patent Owner faults Kawai for failing to teach “how to overcome” the alleged lost coordinate issue (*id.*), but does not explain how the ’065 Patent overcomes any such issue.

Patent Owner’s argument that “the ’065 patent discloses a method that is consistently more accurate than could be achieved under Kawai” is also speculative. PO Resp. 43 (citing Ex. 2001 ¶ 124). The cited testimony of Dr. Sonka merely parrots the Patent Owner Response, with no further explanation or factual basis. Patent Owner does not persuade us that using keys or a dial to input positional information, as disclosed in Kawai, is any less accurate than using a cursor or stylus, as disclosed in the ’065 Patent. *Compare* Ex. 1003, 3:35–40, 3:56–60, *with* Ex. 1001, 5:62–67. For example, Patent Owner presents no evidence that keys or a dial are inherently inaccurate user input devices, as compared with a mouse, cursor, or stylus. Furthermore, Patent Owner’s comparative accuracy argument is undercut by its admission that Kawai’s points are placed “in small intervals” (PO Resp. 42) which would allow for numerous fine adjustments and a high degree of precision when correcting the position of points in Kawai’s train of points.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests claim element 1.3.

e) Element 1.4

Claim element 1.4 recites: “(Four) using said second finish line data to update said first finish line data and superimposing the updated data on the dentition image.”

Petitioner contends that Kawai discloses using the second finish line data (the new positions of moved points) to update the first finish line data (the train of points before correction) and superimposing the updated data (the corrected point train) on a 3D image of an abutment tooth. Pet. 40–41 (citing Ex. 1003, 3:35–4:12, Fig. 5). Petitioner relies on Baba to disclose superimposing modified virtual dental model components, including a margin line, on an image of a dentition that includes not only the tooth preparation, but also its surroundings. Pet. 42–43, 59, 64–66 (citing, *e.g.*, Ex. 1004, 9:20–27, 9:56–67, Figs. 9, 10, 12). Petitioner contends that it would have been obvious to modify Kawai to superimpose the prosthesis model (including the finish line) on such 3D data of the abutment tooth and its surrounding teeth. Pet. 66–70.

Patent Owner makes no argument regarding claim element 1.4 and its updating and superimposing limitations separate from its arguments regarding claim elements 1.2 and 1.3. See PO Resp. 34–45 (addressing claim elements 1.2 and 1.3).

Relying on Petitioner’s arguments and evidence, as summarized above, we find that Petitioner has shown by a preponderance of the evidence that Kawai in view of Baba teaches or suggests claim element 1.4, including using “second finish line data” (the new positions of moved points according to Kawai) to update the “first finish line data” (Kawai’s train of points before correction) and superimposing the updated data on a 3D image of the dentition, and that it would have been obvious to a POSITA to combine the

teachings of Kawai and Baba in the manner recited in claim element 1.4. Pet. 40–45, 64–70; Ex. 1012 ¶¶ 91–94, 144–153; *see, e.g.*, Ex. 1003, 4:5–10 (“The amount of movement of the point for correction is reflected both on the developed data and on the three-dimensional data. Consequently, when the point is moved on the developed view, the corresponding point in the display of the three-dimensional shape may also be moved in corresponding manner.”); Ex. 1004, 7:8–13 (“a superimposition displaying program 404 for displaying . . . the crown model and pontic model . . . superimposed on the dentition configuration diagram”).

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai in view of Baba teaches or suggests all limitations of claim 1, including claim element 1.4.

2. *Claim 2*

Claim 2 depends from claim 1 and recites: “wherein the updating of the first finish line data comprises defining a portion of the finish line not defined in said first finish line data or changing a portion of said first finish line data.” Ex. 1001, 7:10–13.

Petitioner contends that Kawai’s “correction operation” discloses the subject matter of claim 2. Pet. 43–44 (citing Ex.1003, 3:35–60, Fig. 1A).

Patent Owner presents no argument regarding dependent claim 2 separate from its arguments regarding independent claim 1. *See, generally*, PO Resp. 34–52.

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches the limitation of claim 2. Pet. 43–44. Our finding is supported by Kawai’s disclosure of executing “a correction operation for the point train of the

margin area extracted by calculation and the lines connecting the points,” where the “correction is conducted by hitting a displayed point and moving said point by giving an amount of variation by keys or a dial.” Ex. 1003, 3:35–40; *see also id.* at 3:56–60 (similar explanation of how correction is made). We agree with Petitioner that clicking and moving a displayed point to correct its position falls within claim 2’s recitation of updating the first finish line data by “changing a portion of said first finish line data.” Pet. 44.

3. *Claim 3*

Claim 3 depends from claim 1 and recites: “wherein the second finish line data is generated by virtually drawing a line at the apical limit of the preparation.” Ex. 1001, 7:14–16.

Petitioner contends that Kawai’s corrected “point train 11” is a virtually drawn line at the apical limit of the tooth abutment, as recited in claim 3. Pet. 44–45 (citing Ex. 1003, 2:36–3:12, 3:47–49, 3:52–60, Figs. 1A, 6A). In the Reply Brief, Petitioner argues that Kawai satisfies claim 3 even under Patent Owner’s claim construction, citing Kawai’s disclosure of connecting points by hitting them with a mouse. Reply 18 (citing Ex. 1003, 3:26–30, 4:58–61).

Patent Owner argues that Kawai’s “correction operation” does not teach or suggest the limitation of claim 3. PO Resp. 45–47. According to Patent Owner, a “POSITA would have understood that ‘virtually drawing a line,’ as recited in claim 3, is the input provided by the dental practitioner.” *Id.* at 46. Patent Owner argues that moving a point up or down using keys or a dial, as disclosed by Kawai, is not the same as the claimed “drawing a line.” *Id.* at 46–47 (citing Ex. 1003, 3:37–40).

For the reasons discussed above, we do not adopt Patent Owner’s proposed construction for “virtually drawing a line” as requiring “actively drawing a line . . . by a dental practitioner.” See Section II.C.2.b, *supra*. Patent Owner presents no argument for claim 3 that does not rely on its proposed construction for “virtually drawing a line.” See, *generally*, PO Resp. 45–47.

We find that Kawai teaches or suggests generating second finish line data (corrected points of Kawai’s point train) by “virtually drawing a line at the apical limit of the preparation.” Our finding is supported by Kawai’s disclosure of a method for determining a “margin line,” which is undisputedly synonymous with the “finish line” and “the apical limit of the preparation.” Ex. 1001, 1:38–41; Ex. 1003, code (57), 1:10–13, 1:21–25, Fig. 6A (showing margin line 61). Kawai’s method includes calculating a “train of points” representing the margin area (Ex. 1003, 2:36–3:11), displaying the “train of points” superposed on an abutment tooth (*id.* at 3:12–28, Fig. 1A), connecting the points with straight lines “by hitting the points with a mouse” (*id.* at 3:28–30), correcting the positions of the points “by hitting a displayed point and moving said point by giving an amount of variation by keys or a dial” (*id.* at 3:35–40), and again connecting the points with straight lines after the positions of the points are corrected (*id.* at 4:11–12). Under a broadest reasonable interpretation, “virtually drawing a line,” as recited in claim 3, is suggested by Kawai’s disclosure of hitting points with a mouse, moving them to desired positions, and then hitting the points again with a mouse in order to connect the points with straight lines and produce a line as shown in Kawai Figure 3. *Id.* at 3:28–30, 3:56–60, 4:11–14. In our view, “virtually drawing a line” is broad enough to encompass producing a line as shown in Kawai Figure 3 by means of user

actions, such as hitting points with a mouse, turning a dial, and/or hitting arrow keys, and does not require mimicking the action of drawing a line on paper with a pen or pencil.

In the alternative, we find that Kawai teaches or suggests the subject matter of claim 3 under Patent Owner’s claim construction. Patent Owner argues that moving a point up or down using keys or a dial, as disclosed by Kawai, is not the same as the claimed “drawing a line.” PO Resp. 46–47. We agree with Petitioner, however, that Kawai suggests “virtually drawing a line” by disclosing that, after adjusting the positions of the points, the user (e.g., a dental practitioner) virtually draws a line by actively hitting the points with a mouse to connect the points with straight lines. Reply 18; Ex. 1003, 3:28–20, 4:11–12. There is no dispute that Kawai teaches executing this procedure again after correcting the positions of the points. Ex. 1003, 4:11–12; PO Resp. 50. This procedure is summarized in Kawai claim 4, which discloses: “the margin line is determined by adjusting positions of points in said train and connecting the points in said train again with straight lines in the display.” *Id.* at 4:58–61.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests the limitation of claim 3.

4. *Claim 4*

Claim 4 depends from claim 3 and recites: “wherein the line is drawn in a continuous fashion.” Ex. 1001, 7:17–18.

Petitioner contends that Kawai’s finish line (point trail 11) is connected in a continuous fashion, citing Kawai’s disclosure that “[a]fter the points are corrected in position, they are again connected with straight

lines.” Pet. 45–47 (quoting Ex. 1003, 4:11–19; citing Ex. 1003, 3:27–29, Figs. 1A, 3, 4, 5).

Patent Owner argues that Kawai’s “correction operation” does not teach or suggest the “second finish line [being] data generated by virtually drawing a line” where “the line is drawn in a continuous fashion.” PO Resp. 48 (quoting Ex. 2001 ¶ 139). Patent Owner relies on its proposed construction for “drawn in a continuous fashion” as “drawn by the dental practitioner in continuous motion, without interruption.” *Id.* at 22, 48. Patent Owner argues that Kawai discloses a “multi-step process,” including “hitting points, moving them, and hitting them to connect them with straight line,” which “is not the claimed ‘virtually drawing a line’ ‘**in a continuous fashion**’ as the input provided by the dental practitioner.” *Id.* at 50.

For the reasons discussed above, we do not accept Patent Owner’s construction for “drawn in a continuous fashion” as “drawn by the dental practitioner in continuous motion, without interruption.” *See* Section II.C.2.c, *supra*. Both the Specification of the ’065 Patent and the dictionary definitions for “continuous” and “fashion” support that the meaning of “drawn in a continuous fashion” may be reasonably interpreted as describing **either** the manner of drawing the line **or** the configuration of the line after it is drawn. Ex. 1001, 4:49–52, 5:26–29, 5:64–67; Ex. 1026, Ex. 1027. Patent Owner presents no argument for claim 4 that does not rely on its proposed construction for “drawn in a continuous fashion.” *See, generally*, PO Resp. 48–50.

We find that Kawai Figure 3 discloses “the line drawn in a continuous fashion” in the same way as Figure 4 of the ’065 Patent discloses such a line. *Compare* Ex. 1003, 4:12–13 (“FIG. 3 shows a state in which the corrected points are again connected by the lines . . .”), *with* Ex. 1001, 4:49–52 (FIG.

4 shows “a finish line 74 drawn as a continuous line on the apical limit of tooth preparation.”). Our finding is supported by the quoted passages from Kawai and the Specification, as well as Patent Owner’s concession that “Kawai’s train of points and the connecting straight lines [can be] construed to be a single continuous line.” PO Resp. 50. Patent Owner’s argument that Kawai’s multi-step process “is not the claimed ‘virtually drawing a line’ ‘**in a continuous fashion**’” (*id.*) improperly crops the claim language and relies on an unduly narrow claim construction that we do not adopt.

In the alternative, we find that Kawai teaches or suggests the subject matter of claim 4, even under Patent Owner’s claim construction. We agree with Petitioner that Kawai teaches or suggests drawing a line “in continuous motion, without interruption” by disclosing that points of the point train may be connected to one another by hitting the points with a mouse.

Reply 19–20; Ex. 1003, 3:28–30. Each instance of hitting a point with a mouse suggests “a continuous motion, without interruption.” *See* Reply 19–20. Kawai’s disclosure of multiple such instances falls within the scope of Patent Owner’s claim construction. PO Resp. 23 (“If multiple corrections are to be made, each is drawn in a continuous fashion.”).

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests the limitation of claim 4.

5. *Claim 5*

Claim 5 depends from claim 3 and recites: “wherein the line is drawn by marking dots in small intervals and then forming a line by automatically connecting the dots to one another.” Ex. 1001, 7:19–21.

Petitioner contends that Kawai discloses or suggests the subject matter of claim 5. Pet. 48–49 (citing Ex. 1003, 3:13–30, 4:11–14, Fig. 1A). Patent

Owner disagrees, arguing that “Kawai’s dots are not drawn by a dental practitioner and a line is not automatically formed.” PO Resp. 51.

We find that Kawai discloses or suggests “marking dots in small intervals” in three ways: first, when the user hits the points with a mouse to connect the points with straight lines (Ex. 1003, 3:26–30); second, when the user hits a point with a mouse to select it as a point whose position is to be corrected (*id.* at 3:37–40, 3:56–60); and third, when (after the positions of the points have been corrected) the user hits the points with the mouse to again connect them with straight lines (*id.* at 3:26–30, 4:11–12, 4:56–61). We agree with Petitioner that Kawai’s disclosure that “such connection **can be** made by hitting the points with a mouse” (*id.* at 3:29–30 (emphasis added)) suggests that the connection could also be made automatically. Pet. 49; Ex. 1012 ¶ 105. Our finding is supported by Kawai’s dependent claims 3 and 4, which recite steps of connecting points with straight lines, without requiring the action of a user. Ex. 1003, 4:56–61.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests the limitation of claim 5.

6. *Claim 6*

Claim 6 depends from claim 1 and recites: “wherein the defined finish line is used as an input in constructing a crown.” Ex. 1001, 7:22–23.

Petitioner contends that Kawai discloses or suggests the subject matter of claim 6. Pet. 49–50 (citing Ex. 1003, 4:25–30).

Patent Owner presents no argument regarding dependent claim 6 separate from its arguments regarding independent claim 1. *See, generally*, PO Resp. 34–52.

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches the limitation of claim 6. Pet. 49–50. Our finding is supported by the Kawai’s disclosure that:

The designing of the artificial crown can be made based on the shape data of the abutment tooth, in which thus determined margin line is registered. The margin line of the artificial crown to be designed can be made to coincide with the margin line registered in said shape data of the abutment tooth.

Ex. 1003, 4:25–30. Kawai thus teaches that the margin line determined according to Kawai’s calculation and correction procedure is used as an input for designing and constructing an artificial crown. *Id.*

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests the limitation of claim 6.

7. *Claim 7*

Claim 7 is an independent claim. The preamble of claim 7 recites:

A computer-based method for constructing a crown to be fitted on a tooth preparation in a subject, the method comprising defining a finish line on said preparation to obtain finish line data and employing said data in constructing the crown; the method being characterized in that defining the finish line comprises:

Ex. 1001, 7:24–29. The body of claim 7 is substantively the same as the body of claim 1. *Compare id.* at 7:30–42 (claim 7), *with id.* at 6:64–7:9 (claim 1).

Petitioner contends that the combination of Kawai and Baba discloses the preamble of claim 7, relying on Kawai for most of the preamble’s recitations and relying on both Kawai and Baba for the recitation of “employing [finish line] data in constructing the crown.” Pet. 50–52. For

the limitations in the body of claim 7, Petitioner relies on the same contentions as it presented for claim 1. *Id.* at 52–53.

Patent Owner presents no argument regarding independent claim 7 separate from its arguments regarding independent claim 1. PO Resp. 34–45 (presenting the same arguments for claims 1, 7, and 11).

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that Kawai discloses or suggests the preamble of claim 7, including “[a] computer-based method for constructing a crown to be fitted on a tooth preparation” (see, e.g., Ex. 1003, 1:45–48, 1:51–54, 3:13–15, 3:30, 3:57–58); “defining a finish line on said preparation” (*id.* at 1:15); “to obtain finish line data” (*id.* at 2:36–3:17, 3:35–60 (disclosing calculation of train of points and correction operation to obtain finish line data)); and “employing said data in constructing the crown” (*id.* at 4:25–30). We find that Baba also discloses employing finish line data in constructing a crown. Ex. 1004, code (57), 1:8–10, 1:20–30, 4:65–5:5, 7:63–8:3, 9:9–30, 10:19–20, Figs. 9, 10, 12.

We find that Kawai in view of Baba discloses or suggests the limitations in the body of claim 7 for the same reasons as discussed above for claim 1.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai in view of Baba teaches or suggests all limitations of claim 7.

8. Claim 8

Claim 8 depends from claim 1 and recites: “wherein a virtual image of the preparation with a defined finish line is presented on a suitable display medium.” Ex. 1001, 7:43–45.

Petitioner contends that Kawai discloses the subject matter of claim 8. Pet. 53 (citing Ex. 1003, 3:13–17).

Patent Owner presents no argument regarding dependent claim 8 separate from its arguments regarding independent claim 1. *See, generally*, PO Resp. 34–52.

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches the limitation of claim 8. Our finding is supported by the Kawai’s disclosure as follows: “[T]he train of points representing the margin area, determined in the above-explained manner, is displayed on a display unit. In this state, a development view of the shape of the abutment tooth is displayed, and said point train of the margin area is superposedly displayed.” Ex. 1003, 3:13–17.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai teaches or suggests the limitation of claim 8.

9. *Claim 9*

Claim 9 is reproduced below:

A method according to claim 7, comprising:
constructing a virtual crown and virtually fitting said crown on said preparation in said virtual teeth;
generating digital data representing the three dimensional structure of the virtual crown;
employing said digital data to construct a physical crown for fitting on a tooth preparation in a patient.

Ex. 1001, 7:46–8:2.

Petitioner contends that Baba discloses the subject matter of claim 9. Pet. 54–56 (citing Ex. 1004, code (57), 1:8–10, 1:20–30, 6:14–17, 10:19–20, Fig. 10).

Patent Owner presents no argument regarding dependent claim 9 separate from its arguments regarding independent claim 1. *See, generally*, PO Resp. 34–52.

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that Baba teaches the limitations of claim 9. The step of “constructing a virtual crown and virtually fitting said crown on said preparation in said virtual teeth” is taught, for example, by Baba Figure 10, which shows virtually fitting virtual crowns $C_{m(5)}$ and $C_{m(7)}$ onto virtual tooth preparations 25, 27, respectively. Ex. 1004, 6:14–17, Fig. 10. The step of “generating digital data representing the three dimensional structure of the virtual crown” is taught, for example, by Baba’s disclosure of making “crown model data” where “‘crown model’ refers to a model of a dental prosthesis (artificial crown) to be mounted on a broken tooth (abutment tooth)” and the “crown model data” is derived from three-dimensional “pontic model data.” *Id.* at code (57), 2:3–4, 4:65–5:20, 7:4–7, 7:46–58, 9:9–19, Fig. 9. The step of “employing said digital data to construct a physical crown for fitting on a tooth preparation in a patient” is taught, for example, by Baba’s discussion of a known method of machining a dental prosthesis on the basis of a computer-made model using a “CAD/CAM (computer aided design/computer aided manufacture) technique” (*id.* at 1:20–30) and Baba’s teaching that “a bridge can be manufactured easily” using the disclosed bridge model to machine the bridge (*id.* at 10:19–20).

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Baba teaches or suggests the limitations of claim 9.

10. Claim 11

Claim 11 is an independent claim. The preamble of claim 11 is the same as the preamble of claim 7, except that claim 11 additionally recites: a “program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform . . . steps.” *Compare* Ex. 1001, 8:27–34 (claim 11), *with id.* at 7:24–29 (claim 7). The body of claim 11 is substantively the same as the body of claim 1. *Compare id.* at 8:35–47 (claim 11), *with id.* at 6:64–7:9 (claim 1).

Petitioner contends that “[t]he computer-based methods of Kawai and Baba are executed by a computer-based program storage device readable by machine, tangibly embodying a program of instructions executable by the machine.” Pet. 57 (citing Ex. 1003, 1:45–54; Ex.1004, 1:44–57, 2:58–67, 5:46–49, 6:45–58, 7:24–36, 10:32–40). For the remaining recitations of the claim 11 preamble, Petitioner relies on the same contentions as it presented for claim 7. *Id.* For the limitations in the body of claim 11, Petitioner relies on the same contentions as it presented for claim 1. *Id.* at 58–59.

Patent Owner presents no argument regarding independent claim 11 separate from its arguments regarding independent claim 1. PO Resp. 34–45 (presenting the same arguments for claims 1, 7, and 11).

Relying on Petitioner’s arguments and evidence, we find that Petitioner has shown by a preponderance of the evidence that the combination of Kawai and Baba discloses or suggests the preamble of claim 11, including a “computer-based program storage device readable by machine, tangibly embodying a program of instructions executable by the

machine to perform method steps for constructing a crown.” *See, e.g.*, Ex. 1003, 1:45–54 (disclosing the use of “CAD/CAM (computer aided design/computer aided manufacturing)” for the preparation of an artificial crown); Ex. 1004, 2:58–67 (disclosing a “computer program product for designing a dental prosthesis model”), *id.* at 6:45–58 (disclosing “a medium driving device 6 which can accommodate and drive a dental prosthesis model designing storage medium (computer program product) 5 storing a dental prosthesis model designing program 4”).

We find that Kawai in view of Baba discloses or suggests the remaining recitations of the claim 11 preamble for the same reasons as discussed above for claim 1. We find that Kawai in view of Baba discloses or suggests the limitations in the body of claim 11 for the same reasons as discussed above for claim 1.

Accordingly, we find that Petitioner has shown by a preponderance of the evidence that Kawai in view of Baba teaches or suggests all limitations of claim 11.

III. CONCLUSION

Petitioner has shown by a preponderance of the evidence that claims 1–9 and 11 are unpatentable as obvious under 35 U.S.C. § 103(a) based on Kawai and Baba.¹¹

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–9, 11	103(a)	Kawai, Baba	1–9, 11	

¹¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice*

Overall Outcome			1–9, 11	
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IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, Petitioner has shown by a preponderance of the evidence that claims 1–9 and 11 of the '065 Patent are *unpatentable*;

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

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

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