

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIGN TECHNOLOGY, INC.,
Petitioner,

v.

DENTAL MONITORING SAS,
Patent Owner.

IPR2024-00110
Patent 11,109,945 B2

Before JEAN R. HOMERE, MICHAEL R. ZECHER, and
KARA L. SZPONDOWSKI, *Administrative Patent Judges*.

SZPONDOWSKI, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Align Technology, Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting institution of an *inter partes* review of claims 1, 2, and 4–6 of U.S. Patent No. 11,109,945 B2, issued on Sept. 7, 2021 (Ex. 1001, “the ’945 patent”). Dental Monitoring SAS (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

Institution of an *inter partes* review is authorized when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Based on the current record, and for the reasons explained below, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one challenged claim, and we institute an *inter partes* review.

II. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies itself as the real party-in-interest. Pet. 49. Patent Owner identifies itself as the real party-in-interest. Paper 5, 1 (Mandatory Notices of Patent Owner).

B. *Related Matters*

Petitioner and Patent Owner identify *Dental Monitoring SAS v. Align Technology, Inc.*, No. 3:22-cv-07335-WHA (N.D. Cal.) (“the California litigation”). Pet. 49; Paper 5, 1.

C. *The ’945 Patent (Ex. 1001)*

The ’945 patent is titled “Method of Evaluating an Orthodontic Aligner” and generally relates to a method for evaluating the shape of an

orthodontic aligner “worn by a patient, particularly so as to evaluate how well the shape of the orthodontic aligner conforms to the positioning of the teeth of said patient.” Ex. 1001, code (54), 1:5–9.

The ’945 patent describes that, conventionally, an aligner is in the form of a removable monobloc appliance made of a transparent polymer, that comprises a tray shaped in such a way to house teeth. Ex. 1001, 1:24–28. “The shape of the aligner is tailored to hold the aligner in position on the teeth while at the same time applying an action towards correcting the positioning of certain teeth.” *Id.* at 1:29–31. Conventionally, at the start of treatment, the shapes of the aligners at various stages are determined and manufactured, and the patient changes the aligner at predetermined times. *Id.* at 1:32–36. Then, at regular intervals, the patient visits the orthodontist for a visual inspection so that the orthodontist can check whether the aligner worn by the patient is still suitable for treatment. *Id.* at 1:42–45. One of the goals of the invention claimed in the ’945 patent is to reduce the number of visits to the orthodontist, which may be burdensome for the patient. *Id.* at 1:53–61.

The method described in the ’945 patent “is aimed at detecting situations in which the free end 22 of a tooth is no longer in contact with the bottom of the tray, and at measuring the amplitude of this separation.”¹ Ex. 1001, 5:43–45. Figure 9, reproduced below, shows a method according to the invention.

¹ The “tray” refers to the interior surface of the aligner. Ex. 1001, 5:1–2.

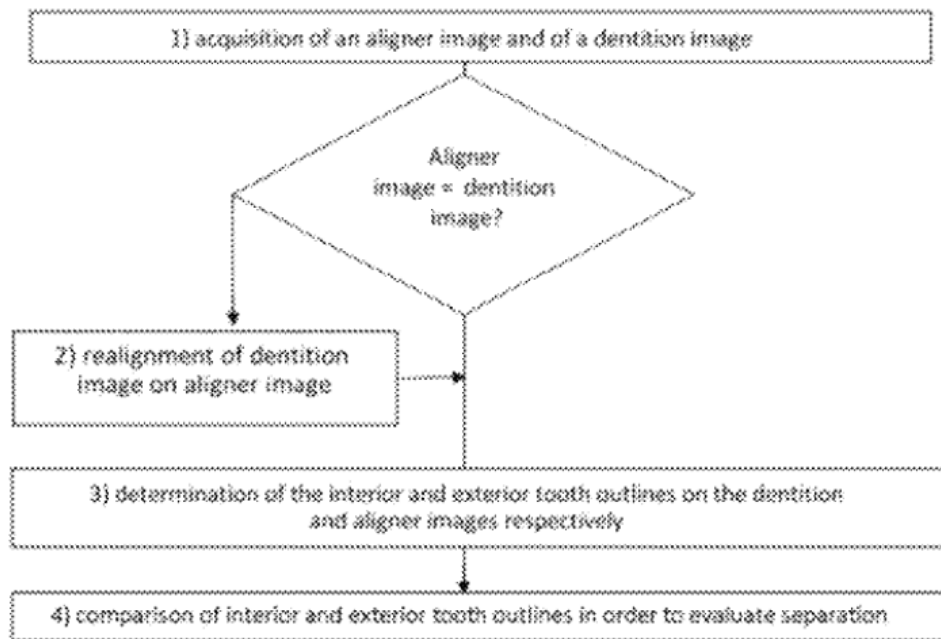


Fig. 9

Figure 9, above, shows steps 1 through 4 of the method in a block diagram.

Step 1 states “acquisition of an aligner image and of a dentition image.” Step 1 is performed “at the instant that the evaluation of the shape of an aligner is desired.” Ex. 1001, 5:58–60. The images are preferably captured by the patient or someone close to the patient on a mobile phone. *Id.* at 5:61–66. The images allow for the “shape of the aligner[to be] evaluated by comparing an outline of[the] aligner, in its service position, with an outline of the teeth wearing it.” *Id.* at 6:7–9. An “aligner image” refers to an image of the aligner in its service position, and a “dentition image” refers to an image of teeth bearing the aligner in the service position. *Id.* at 6:11–14. If the dentition image is the aligner image, then step 2 does not need to be performed. *Id.* at 6:15–21.

Step 2 states “realignment of dentition image on aligner image,” and is performed if the dentition image and the aligner image are different, in order to make them comparable. Ex. 1001, 6:22–10:18.

Step 3 states “determination of the interior and exterior tooth outlines on the dentition and aligner images respectively.” An “interior tooth outline” delimits the free end of the tooth, while an “exterior tooth outline” delimits part of the aligner. *Id.* at 5:10–15. The ’945 patent states that “[a] person skilled in the art knows how to process an image in order to isolate an outline,” and the processing “involves the well-known application of masks or filters, which come with image processing software.” *Id.* at 10:22–25; *see also id.* at 10:28–11:34 (providing a list of “known and preferred methods”).

Step 4 states “comparison of interior and exterior tooth outlines in order to evaluate separation.” The ’945 patent describes two embodiments for comparing the tooth outlines, including, for example determining an “offset score” that can be used to indicate whether there is separation between the tooth and the tray. Ex. 1001, 11:35–13:34.

D. *Illustrative Claim*

Among the challenged claims, claim 1 is independent. Independent claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A method for evaluating the shape of an orthodontic aligner worn by a patient, said method comprising the following steps:

1) acquisition of at least one two-dimensional image of teeth of said patient, referred to as “updated image”, under actual acquisition conditions; at least one updated image referred to as “aligner image”, at least partially representing the aligner in a service position in which it is worn by said teeth; and at least one updated image referred to as “dentition image”, identical to or different from the aligner image, representing said teeth,

- 2) if the dentition image is different from the aligner image, conversion of the dentition image so that it represents said teeth as seen under the acquisition conditions used during the acquisition of the aligner image in step 1);
- 3) determination, by means of image processing software, for each of a plurality of teeth represented on the dentition and aligner images, of interior and exterior tooth outlines representing the outline of the free end of said tooth on the dentition and aligner images, respectively;
- 4) comparison of the interior and exterior tooth outlines, so as to determine at least one score according to said comparison.

Ex. 1001, 13:59–15:17.

E. Prior Art and Asserted Challenges to Patentability

Petitioner asserts that claims 1, 2, and 4–6 are unpatentable based on the following challenge (Pet. 13):

Claims Challenged	35 U.S.C. § ²	Basis/References
1, 2, 4–6	103	Kim, ³ Invisalign, ⁴ Salah ⁵

² Because the '945 patent issued from a patent application that was filed after March 16, 2013 (Ex. 1001, codes (21), (22)), patentability is governed by the version of 35 U.S.C. § 103 of the Leahy-Smith America Invents Act ("AIA"), Pub L. No. 112–29, 125 Stat. 284 (2011).

³ Kim, US 2017/0281313, published Oct. 5, 2017 ("Kim," Ex. 1005). Petitioner contends that Kim is prior art to the '945 patent under 35 U.S.C. § 102(a)(2). Pet. 6.

⁴ *The Invisalign Clinical Monitoring Guide*, Align Technology, Inc. (2003) ("Invisalign," Ex. 1006). Petitioner contends that Invisalign is prior art to the '945 patent under 35 U.S.C. § 102(a)(1). Pet. 7.

⁵ Salah et al., WO 2016/066651 A1, published May 6, 2016 ("Salah," Ex. 1008). Petitioner contends that Salah is prior art to the '945 patent under 35 U.S.C. § 102(a)(1). Pet. 8.

In support of its proposed challenges, Petitioner relies on the Declaration of Dr. Hassan Foroosh. *See* Ex. 1002.

III. DISCRETIONARY DENIAL

A. *Discretion to Deny Institution Under 35 U.S.C. § 325(d)*

Patent Owner asserts that the Director should exercise her discretion under 35 U.S.C. § 325(d) to deny institution. Prelim. Resp. 41–44. We decline to exercise discretion to deny institution under § 325(d) for the reasons discussed below.

1. *Standards of Law*

In evaluating the exercise of discretion to deny institution under § 325(d), the Board uses a two-part framework: (1) determining whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of the first part of the framework is satisfied, determining whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). In applying the two-part framework, we consider several non-exclusive factors, including:

- (a) the similarities and material differences between the asserted art and the prior art involved during examination;
- (b) the cumulative nature of the asserted art and the prior art evaluated during examination;
- (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;

(d) the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art or patent owner distinguishes the prior art;

(e) whether petitioner has pointed out sufficiently how the examiner erred in its evaluation of the asserted prior art; and

(f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments.

Becton, Dickinson & Co. v. B. Braun Melsungen AG, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to Section III.C.5, first paragraph) (“*Becton, Dickinson*”). *Becton, Dickinson* factors (a), (b), and (d) relate to whether the art or arguments presented in the Petition are the same or substantially the same as those previously presented to the Office. *Advanced Bionics*, Paper 6 at 10. Factors (c), (e), and (f) “relate to whether the petitioner has demonstrated a material error by the Office” in its prior consideration of that art or arguments. *Id.* Only if the same or substantially the same art or arguments were previously presented to the Office do we consider whether the petitioner has demonstrated a material error by the Office. *Id.* “At bottom, this framework reflects a commitment to defer to previous Office evaluations of the evidence of record unless material error is shown.” *Id.* at 9

2. *Whether the Same or Substantially the Same Art or Arguments Were Previously Presented to the Office*

Petitioner contends that “neither Kim nor Invisalign was disclosed or considered during examination,” and “Salah was cited in the specification of the ’945 patent . . . , but Salah was never disclosed in an IDS [Information

Disclosure Statement] nor was an English translation ever provided.” Pet. 47. Petitioner further contends that the references relied on in the Petition are not “cumulative to the references applied during examination, as the discussion of claim 1 shows that the prior art relied on herein discloses the elements indicated as missing by the Examiner (i.e., steps 2–4 of claim 1, see EX 1004, 254–58⁶) from the cited Greenberg, Wen, and Kitching references.”⁷ *Id.* at 47–48. Petitioner further contends that, given Petitioner’s analysis for the sole challenge, allowance by the Office constituted material error. *Id.* at 48.

Patent Owner argues that “the art asserted in the Petition is duplicative of the art considered by the Examiner.” Prelim. Resp. 42. Patent Owner argues that Salah was “cited in the ‘945 Patent, was cited in the original specification, and appears in the prosecution search history.” *Id.* (citing Ex. 1001, 7:9, 7:26, 7:28, 7:42, 9:7–8; Ex. 1004, 20, 139, 222, 224, 225, 274, 281, 283; Ex. 2002 ¶ 110). Patent Owner argues that Kim is duplicative of Salah because “Petitioner cites Kim in part for the same reasons as Salah.” *Id.* at 43 (citing Pet. 21; Ex. 2002 ¶ 110). Patent Owner also argues that Greenberg, Wen, and Kitching “also relate to the creation of aligners or the comparison of one representation of a patient’s teeth to another to track the progress of tooth movement,” which is “the same disclosure” as Kim. *Id.* (citing Ex. 1004, 256). Patent Owner further argues

⁶ The page numbers cited for the prosecution history of the ‘945 patent (Ex. 1004) refer to the page numbers inserted by Petitioner in the bottom, right hand corner of each page.

⁷ In the Reasons for Allowance, the Examiner identified Greenberg (US 2014/0120488 A1), Wen (US 2017/0100214 A1), and Kitching (US 8,562,338 B1) as the “closest combined references.” Ex. 1004, 255–258.

that the '945 patent discusses the “state of the art,” so for the same reasons the claims “were not obvious over orthodontist’s practice of in-person checks to see if aligners were still suitable for treatment, they remain nonobvious in light of” the disclosure relied upon in Kim and Invisalign for determining aligner separation. *Id.* at 43–44.

“Previously presented art includes art made of record by the Examiner, and art provided to the Office by an applicant, such as on an Information Disclosure Statement (IDS), in the prosecution history of the challenged patent.” *Advanced Bionics*, Paper 6 at 7–8. There is no dispute that Salah was at least cited in the specification of the '945 patent. There is no evidence, however, that the Examiner substantively considered Salah during prosecution. Nor is there any evidence that Kim or Invisalign were of record during prosecution or that the Office considered the Kim, Invisalign, and Salah combination proposed by Petitioner.

In the Reasons for Allowance, the Examiner stated that the references cited (Greenberg, Wen, and Kitching) do not teach or suggest steps 2, 3, and 4 of the method recited in claim 1 of the '945 patent. Ex. 1004, 254–258. Although Patent Owner appears to argue that the disclosure in Kim and Invisalign is cumulative to disclosure in the '945 patent, Patent Owner does not meaningfully explain how Kim and Invisalign are cumulative of the references cited during prosecution (i.e., Greenberg, Wen, and Kitching) in light of this disclosure in the '945 patent. Patent Owner argues generally that Kim has “the same disclosure” as Greenberg, Wen, and Kitching (Prelim. Resp. 42), but none of these references have been submitted as evidence in this proceeding. Petitioner relies on Kim, Invisalign, and Salah

to teach steps 3 and 4 of claim 1, *see* Pet. 29–34,⁸ and argues that the missing elements identified by the Examiner are found in these prior art references, so they are not cumulative. *Id.* at 47–48. On this record, we are not persuaded otherwise, as Patent Owner does not address all of these limitations, or explain how Kim and Invisalign are cumulative of the references considered by the Examiner, and thus, does not sufficiently support the position that the Examiner considered combinations the same as, or similar to, those presented by Petitioner.

Under these circumstances, we find the first part of the *Advanced Bionics* framework is not satisfied because the Petition sets forth a combination of prior art and arguments that are not the same or substantially the same as that considered by the Examiner during prosecution. Accordingly, we decline to exercise our discretion to deny institution pursuant to 35 U.S.C. § 325(d).

IV. ANALYSIS

A. *Legal Standards*

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which said claimed invention pertains.” The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the

⁸ As further discussed below, Petitioner argues that step 2 is a conditional limitation that may be ignored if the dentition image is the same as the aligner image.

scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). An obviousness determination based on a combination of references requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see KSR*, 550 U.S. at 418. Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418; *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (a finding of a motivation to combine “must be supported by a ‘reasoned explanation’” (citation omitted)).

“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)); *see also Intelligent Bio-Sys.*, 821 F.3d at 1369. Therefore, to prevail in an *inter partes* review, Petitioner must explain how the proposed combination of prior art would have rendered the challenged claims unpatentable. At this preliminary stage, we determine

whether the information presented in the Petition shows there is a reasonable likelihood that Petitioner would prevail in establishing that at least one of the challenged claims would have been obvious over the proposed combination of prior art.

B. Level of Ordinary Skill in the Art

Petitioner contends a person of ordinary skill in the art “would typically have an advanced degree, such as a Masters’ Degree or Ph.D. in computer science, computer engineering, electrical engineering, or a related field, with at least two years of work in computer vision, image analysis, medical imaging, or related areas.” Pet. 12–13 (citing Ex. 1002 ¶¶ 50–51). Petitioner also contends a person of ordinary skill in the art “could have less education but significant professional experience in one or more of these fields” and “could be a member of an interdisciplinary team.” *Id.* at 13.

Patent Owner does not contest Petitioner’s definition at this stage. Prelim. Resp. 16.

We find Petitioner’s proposal is consistent with the level of ordinary skill in the art reflected by the prior art of record, and, therefore, adopt Petitioner’s proposed level of ordinary skill in the art for purposes of this Decision. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

Petitioner provides constructions for the terms “interior tooth outline” and “exterior tooth outline” as recited in claim 1. Pet. 14–15. Specifically, Petitioner contends that the Specification of the ’945 patent supports that an “interior tooth outline” refers to a line delimiting a free end of a tooth, and an “exterior tooth outline” refers to a line delimiting a part of an aligner. *Id.*

(citing Ex. 1001, 5:10–20). According to Petitioner, Patent Owner urged the same interpretation during prosecution. *Id.* at 15 (citing Ex. 1004, 242).

Petitioner argues that step 1 of claim 1 (limitation 1(1)) indicates that “the dentition and aligner images may be the same image, which would be an image depicting both an aligner and a patient’s teeth.” Pet. 14 (citing Ex. 1002 ¶¶ 52–54). In these embodiments, where the aligner image and dentition image are not different, Petitioner contends that step 2 of claim 1 (limitation 1(2)) may be ignored, as that limitation recites “if the dentition image is different from the aligner image.” *Id.* (citing *Fresenius USA, Inc. v. Baxter Int’l, Inc.*, 582 F.3d 1288, 1297–1298 (Fed. Cir. 2009)).

In addition, Petitioner contends that step 3 of claim 1 (“determination, by means of image processing software . . . of interior and exterior tooth outlines . . .”) whether construed as a means-plus-function limitation or not, does not distinguish over the prior art. Pet. 15. However, Petitioner further identifies the function as “determining interior and exterior tooth outlines” and the structure “to encompass image processing software, such as any examples identified at EX1001, 10:28–11:34, including any of the methods disclosed by Salah.” *Id.* at 17.

Patent Owner does not respond to Petitioner’s proposals, and argues that, “even under Petitioner’s proposals, the Board should deny institution.” Prelim. Resp. 16.

Only terms that are in controversy need to be construed, and then only to the extent necessary to determine whether to institute *inter partes* review. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”

(quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). As noted above, at this stage, Patent Owner does not dispute Petitioner's proposals.

After reviewing the parties' arguments and evidence, we determine that we do not need to expressly address Petitioner's contentions for step 3 of claim 1 for purposes of this Decision. For purposes of providing guidance to the parties, we preliminarily agree with Petitioner's construction of "interior tooth outline" and "exterior tooth outline," as supported by the Specification. *See* Ex. 1001, 5:8–15; Ex. 1004, 241–242 (Patent Owner stating "[a]s specified at page 7, lines 3–10, of the subject application, the interior tooth outline qualifies a line which delimits the free end of a tooth on an image and the exterior tooth outline qualifies a line which delimits part of the aligner on an image"). We also preliminarily agree with Petitioner, on this record, that step 2 of claim 1 recites a conditional limitation, that, if met, is not needed to be performed. *See, e.g., Cybersettle, Inc. v. Nat'l Arbitration Forum*, 243 Fed.Appx. 603, 607 (Fed. Cir. 2007) ("It is of course true that methods steps may be contingent. If the condition for performing a contingent step is not satisfied, the performance recited by the step need not be carried out in order for the claimed method to be performed."). This is supported by the Specification:

In one embodiment, the dentition image is the aligner image. In other words, the same updated image makes it possible not only to see the aligner outline 28 but also to see the dentition outline 16, through the aligner (FIG. 3). This single image therefore makes it possible to compare aligner 20 and dentition outlines. Advantageously, readjustment step 2), described later, is not needed.

Ex. 1001, 6:15–20. These constructions are preliminary and based on the current record. The parties may further address these issues during trial.

D. Alleged Obviousness Over Kim, Invisalign, and Salah

Petitioner contends claims 1, 2, and 4–6 would have been obvious over Kim, Invisalign, and Salah. Pet. 17–46. Having considered the arguments and evidence before us, we find that the record establishes a reasonable likelihood that Petitioner would prevail on at least one claim in this asserted ground of unpatentability.

1. Kim (Ex. 1005)

Kim is titled “Method and System for Providing Remote Teeth Alignment Services and Computer-Readable Medium on Which the Method is Recorded,” and is generally directed to “a method and system for providing remote teeth alignment services to remotely advise an appropriate step of a clear aligner using a smartphone of an orthodontic patient, and a computer-readable medium on which the method is recorded.” Ex. 1005, code (54), ¶ 1.

In particular, Kim describes:

a method and system for providing remote teeth alignment services, by which an orthodontist may obtain accurate teeth alignment information using a device, e.g., a smartphone, of an orthodontic patient, may remotely and accurately diagnose the condition of the patient based on the teeth alignment information, and may remotely provide information about an accurate step of a clear aligner to be currently worn by the orthodontic patient, thereby greatly reducing a diagnosis time and cost of the orthodontic patient and the orthodontist, the accuracy of diagnosis may be improved by automatically obtaining photos of accurate sizes and locations using various virtual lines, the teeth alignment information may be easily used by the orthodontist by providing the teeth alignment

information in the form of report information and classifying the teeth alignment information based on time, teeth alignment may be precisely performed in a customized manner by providing manufacturing information to a clear aligner manufacturer when an additional or modified clear aligner is necessary, interest of orthodontic patients may be increased by disclosing the teeth alignment information of a selected orthodontic patient, and the orthodontic patients may be inspired with a greater desire for aligned teeth by providing benefits to the selected orthodontic patient, and a computer-readable medium having recorded the method thereon.

Ex. 1005 ¶ 10. Figure 1, which depicts “a conceptual view of a system for providing remote teeth alignment services,” (Ex. 1005 ¶ 26) is reproduced below:

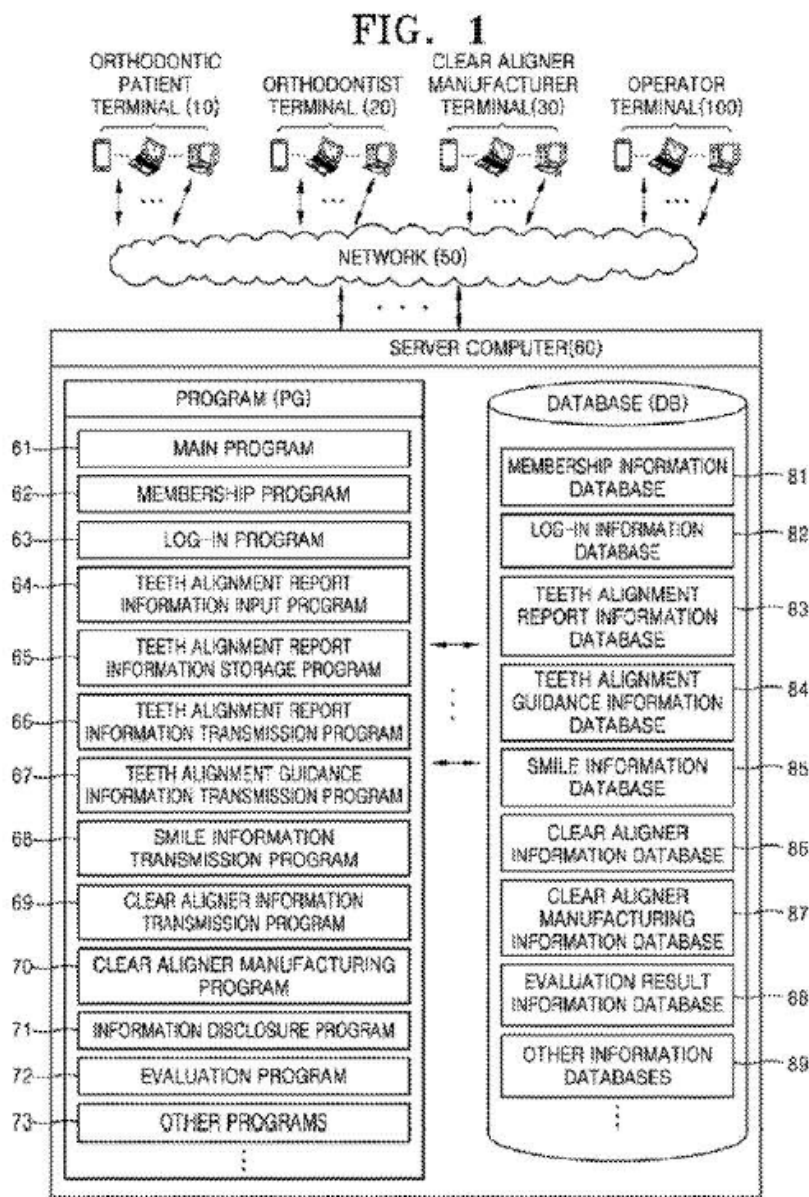


Figure 1, shows, among other things, orthodontic patient terminal 10, orthodontist terminal 20, clear aligner manufacturer terminal 30, operator terminal 100, and server computer 60, all interconnected through network 50. Ex. 1005 ¶ 39, 49, Fig. 1. Orthodontic patient terminal 10 may be, for example, a mobile device. *Id.* ¶ 42. Orthodontist terminal 20 may, likewise, be a smartphone or mobile device. *Id.* ¶ 44.

According to Kim, the patient may provide “teeth alignment information” to orthodontist terminal 20 by taking a variety of photographs of the patient’s teeth from different angles using orthodontic patient terminal 10. *Id.* ¶¶ 10, 42, 55, 56, 60 80. Orthodontic patient terminal 10 may also send “clear aligner information about a currently worn clear aligner” to orthodontist terminal 20, so that “the orthodontist checks a photo or a video of the clear aligner currently worn by the orthodontic patient, and determines whether the clear aligner is normal and corresponds to an appropriate step.” *Id.* ¶ 66; *see also id.* ¶ 10.

2. *Invisalign (Ex. 1006)*

Invisalign is “intended to help the Invisalign practitioner successfully monitor Invisalign treatments and address issues that may arise between receipt of Aligners from Align to the completion of treatment.” Ex. 1006, i. Invisalign provides guidance to monitor treatment progress of patients after aligners have been received and are being worn by the patient. *Id.* at i–iv. For example, the practitioner can “evaluate any fit concerns that may arise” by “[h]av[ing] patients arrive with the previous stage Aligner and the current Aligner.” *Id.* at ii. Invisalign includes information on “Managing Aligner fit and seating,” and advises that an “Aligner [is] seating poorly” if there is greater than 1 mm gap between the teeth and aligner. *Id.* at 1. Invisalign further states that “Aligners should be fitting well at the end of the 2-week period.” *Id.*

3. *Salah (Ex. 1008)*

Salah is titled “Method for Monitoring Dentition,” and is generally directed to “monitoring . . . the appearance of the teeth of a patient.” Ex. 1008, codes (54), (57). Salah generally describes methods for

monitoring the positioning, shape, and/or appearance of a patient's teeth by obtaining two-dimensional ("2D") images of a patient's teeth and comparing them to a three-dimensional ("3D") digital reference model. *Id.* at 1:1–2:19.

Salah's method starts with the creation of a 3D "initial reference model" of the patient's dental arch, then a 2D "updated image" is acquired and analyzed to assess tooth deformation and/or displacement since the "initial reference model," and then the "initial reference model" is modified until a "final reference model" is obtained that corresponds to the updated image. Ex. 1008, 1:28–2:19.

Salah describes that the "updated image" may be a "photograph taken by the patient." *Id.* at 2:24, 31:5–7 ("image acquisition can be carried out by the patient himself or by one of their relatives, using a simple cell phone, anywhere, and especially outside a medical, dental or orthodontic practice"); *see also* 27:11–13 ("image acquisition apparatus" . . . "preferably comprises a camera . . . which the user, e.g., the patient or one of their relatives, positions by means of a viewfinder or screen, before operating it."). In order to compare the updated and reference images, Salah describes comparing discriminant information on both images. *Id.* at 40:19–20. "Discriminant information is preferably chosen from the group consisting of *contour information*, color information, density information, a distance information, brightness information, saturation information, reflection information and combinations of these." *Id.* at 34:8–10 (emphasis added). Salah obtains various methods for processing an image to obtain discriminant information, including deep learning. *Id.* at 34:15–36:14.

4. *Analysis of Independent Claim 1*

Petitioner contends that the combination of Kim, Invisalign, and Salah teaches the limitations of independent claim 1. Pet. 24–34. In support, Petitioner identifies certain passages and figures in the references and explains their significance with respect to the corresponding claim limitation. *Id.* Petitioner also provides reasons why it would have been obvious to a person of ordinary skill in the art to combine the references with a reasonable expectation of success. *Id.* at 17–23.

a) *Preamble*

The preamble recites “[a] method for evaluating the shape of an orthodontic aligner worn by a patient, said method comprising the following steps:” Ex. 1001, 13:59–61.

Petitioner contends that both Kim and Invisalign teach such a method.⁹ Pet. 24. According to Petitioner, “Kim teaches evaluating an aligner by reviewing an image of the aligner currently worn by the patient, to determine whether the aligner is normal and appropriate.” *Id.* (citing Ex. 1005 ¶ 66). Petitioner also contends that “Invisalign teaches that evaluating a currently-worn clear aligner includes assessing the fit of the aligner, and that this assessment involves determining a distance between the teeth and the aligner when worn by the patient.” *Id.* (citing Ex. 1006, 1).

At this stage, Patent Owner does not respond to Petitioner’s contentions. *See generally* Prelim. Resp.

⁹ Petitioner does not argue, one way or the other, whether the preamble is limiting. We make no determination at this stage of the proceeding whether the preamble of claim 1 is limiting.

Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that Kim and Invisalign teach the recited elements of the preamble for purposes of institution.

b) Limitation 1(1)

Petitioner contends that limitation 1(1) would have been obvious over Kim, Invisalign, and Salah. Pet. 25. Limitation 1(1) recites “acquisition of at least one two-dimensional image of teeth of said patient, referred to as ‘updated image’, under actual acquisition conditions; at least one updated image referred to as ‘aligner image’, at least partially representing the aligner in a service position in which it is worn by said teeth; and at least one updated image referred to as ‘dentition image’, identical to or different from the aligner image, representing said teeth.” Ex. 1001, 13:62–14:3.

Petitioner states that limitation 1(1) may be satisfied by “acquiring only a single image that represents both an aligner worn by a patient’s teeth and the patient’s teeth themselves.” Pet. 25.

Petitioner contends that Kim teaches that the camera of a patient’s smartphone or similar device may be used to acquire photographs “showing a teeth alignment state of the orthodontic patient,” which can further include “receiving the clear aligner information about a currently worn clear aligner,” enabling the orthodontist to “check[] a photo or a video of the clear aligner currently worn by the orthodontic patient” to “determine[] whether the clear aligner is normal and corresponds to an appropriate step.” Pet. 25–26 (citing and quoting Ex. 1005 ¶¶ 55, 56, 66).

Petitioner contends that “Invisalign confirms that analyzing a two-dimensional image representing a patient’s aligner in a service position as well as the patient’s teeth (e.g., a photo or video taken by a cellphone,

consistent with the teachings of Kim) can produce measurements useful for orthodontic assessment.” Pet. 26 (citing Ex. 1006, 1). Petitioner contends that “Invisalign teaches that a large gap between a tooth and an aligner (e.g., more than 1 mm) indicates poor fit” and “further illustrates that such a gap is visually distinguishable in a digital photograph of a patient’s teeth.” *Id.* Petitioner, therefore, contends that “Invisalign provides a reason to acquire a two-dimensional image of the patient’s teeth with an aligner being worn in a service position: by assessing the gap visible between aligner and teeth, Invisalign teaches that it can be determined whether an aligner fits correctly (e.g., is normal and corresponds to an appropriate step), or whether it is seated or fit poorly.” *Id.* (citing Ex. 1002 ¶ 72); *see also* Ex. 1006, 1; *see also* Pet. 18–19.

Petitioner contends that, in view of Kim and Invisalign’s teachings, a person of ordinary skill in the art “would have had reason to analyze images of the teeth of a patient wearing an aligner in a service position to evaluate whether the aligner fit appropriately.” Pet. 19–20. According to Petitioner, the proposed “combination would be applying known methods for orthodontic evaluation of aligner fit based upon the appearance of the aligner worn on the patient’s teeth, as taught by Invisalign, in order to analyze a photo or video of the aligner worn by the patient, as taught by Kim, predictably providing feedback regarding tooth-aligner separation to aid an orthodontist regarding whether the clear aligner is normal and corresponds to an appropriate step of treatment.” *Id.* at 20. Petitioner contends that Kim indicates that “employing such techniques would serve goals including enhancing accuracy, reducing the time and cost of treatment, and facilitating remote assessment.” *Id.* (citing Ex. 1005 ¶¶ 8–10, 72).

Petitioner further contends that “Salah similarly teaches acquiring dental images [with a cellphone], including of teeth fitted with orthodontic appliances.” Pet. 26; *see id.* (citing Ex. 1008, 27:11–13, 31:4–7, 64:7–12, Fig. 11; Ex. 1002 ¶ 73); *see also id.* at 21–22. According to Petitioner, “[a]cquiring a two-dimensional image depicting teeth wearing an aligner is also consistent with published methods of orthodontic practice.” Pet. 27; *see id.* (citing Ex. 1009, 19; Ex. 1002 ¶¶ 74–75); *see also id.* at 20–21.

Patent Owner argues that none of the references teach “acquisition of an image of an aligner, as worn by a patient, during a method of evaluating the shape of an aligner. Prelim. Resp. 31. According to Patent Owner, “Kim discloses only the acquisition of images of a patient’s teeth.” *Id.* at 32; *see also id.* at 29–30. With respect to Invisalign, Patent Owner argues “Invisalign describes aligner issues for which dental practitioners should visually check during in-person, in-office appointments,” and “[t]o the extent that Invisalign teaches any image capture, that image capture is done for the purposes of creating aligners, not assessing the fit of those aligners in a patient’s mouth.” *Id.* at 32 (Ex. 1006, i–iii, 4, 6, 9; Ex. 2002 ¶¶ 77–82, 95; Ex. 2004 ¶¶ 29, 32). Patent Owner also argues that the example cited by Petitioner in Salah shows an intraoral appliance, not an aligner. *Id.* at 33.

Petitioner has sufficiently shown that the combination of Kim, Invisalign, and Salah teaches this limitation for purposes of institution. Patent Owner’s arguments largely address the references separately, rather than in combination as proposed by Petitioner. *See, e.g., In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.”). That is, Petitioner has

shown, at minimum, that the combination of Kim, Invisalign, and Salah teaches limitation 1(1). As asserted by Petitioner, Kim teaches, at minimum, using a cellphone to acquire an image of the patient's teeth,¹⁰ Salah teaches using a cellphone to acquire an image of the patient's teeth while the user is wearing an orthodontic appliance, and Invisalign provides a reason to acquire an image of the patient's teeth with an aligner being worn, i.e., in order to assess the gap between the tooth and aligner. Ex. 1005 ¶¶ 55–56; Ex. 1008, 27:11–13, 31:4–7, 64:7–12; Fig. 11; Ex. 1006, 1. We are also persuaded by Petitioner's contentions that using cellphones to acquire images depicting teeth wearing an aligner "was known to be a useful practice for assessment of a patient's orthodontic treatment status." Pet. 28 (citing Ex. 1009, 19; Ex. 1002 ¶ 74–75).

Patent Owner also argues that a person of ordinary skill in the art would not have been motivated to combine Kim or Salah with Invisalign because "Kim and Salah relate to *remote* monitoring of *teeth positions* using images of the patient's teeth captured *without aligners* in place," whereas Invisalign "describes a visual approximation performed *in-person* when the patient visits the orthodontist's office." Prelim. Resp. 27 (citing Ex. 1005 ¶ 10; Ex. 1008, 2:21–27; Ex. 2002 ¶ 90; Ex. 1006, ii; Ex. 2004 ¶ 29). According to Patent Owner none of the cited prior art "suggests that 'the shape of an orthodontic aligner' can be *remotely* evaluated *from an aligner*

¹⁰ We recognize that there may be a dispute over Kim's disclosure, i.e., whether Kim teaches acquisition of an image of only the patient's teeth, or whether Kim teaches acquisition of an image of the patient's teeth while wearing the "currently worn" aligner. We encourage the parties to further develop these issues during trial.

image or describes how that could be done.” *Id.* at 27–28 (citing Ex. 2002 ¶ 90).

At this stage of the proceeding, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had reasons to combine the reference’s teachings, with some rational underpinning, and would have had a reasonable expectation of success in doing so. We apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Moreover, “the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418.

Patent Owner’s arguments do not directly address Petitioner’s reasoning, which is supported by testimony from Dr. Foroosh, that the combination “appl[ies] known methods for orthodontic evaluation of aligner fit based upon the appearance of the aligner worn on the patient’s teeth, as taught by Invisalign, in order to analyze a photo or video of the aligner worn by the patient, as taught by Kim, thereby providing feedback regarding tooth-aligner separation to aid an orthodontist regarding whether the clear aligner is normal and corresponds to an appropriate step of treatment.” *See* Pet. 20. Petitioner provides reasons for the combination, such as those as stated in Kim, of “enhancing accuracy, reducing the time and cost of treatment, and facilitating remote assessment,” and Invisalign’s teachings of “how to evaluate aligner fit.” *Id.* at 19–20 (citing Ex. 1005 ¶¶ 8–10, 72). We find these reasons sufficient for purposes of institution. Moreover, Patent Owner’s argument that none of the cited prior art “suggests that aligner fit can be remotely assessed from an aligner image or describes how

that could be done,” (*id.* at 32 (citing Ex. 2002 ¶ 96) (emphasis omitted)) is not persuasive, as it implies that the reason to combine the references must come from a single reference. *See DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (stating that motivation to combine prior art references may exist “even absent any hint of suggestion in the references themselves”).

Therefore, based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that the combination of Kim, Invisalign, and Salah teaches limitation 1(1) for purposes of institution, and has provided sufficient reasoning supported by a rational basis for the combination.

c) Limitation 1(2)

Limitation 1(2) recites “if the dentition image is different from the aligner image, conversion of the dentition image so that it represents said teeth as seen under the acquisition conditions used during the acquisition of the aligner image in step 1).” Ex. 1001, 14:4–8.

As discussed above, Petitioner contends that “Step 1(2) only applies ‘if the dentition image is different from the aligner image.’” Pet. 28. Petitioner contends that, “[f]or the embodiment discussed above for step 1(1), step 1(2) is satisfied because the dentition and aligner images are not different, rendering the remainder of step 1(2) inapplicable.” *Id.* at 29 (citing Ex. 1002 ¶¶ 76–77).

Based on our review and consideration of the current record, we agree with Petitioner. As stated above, the parties may further address whether limitation 1(2) is a conditional limitation during trial.

d) Limitation 1(3)

Petitioner contends that limitation 1(3) would have been obvious over the combination of Kim, Invisalign, and Salah. Pet. 30. Limitation 1(3) recites “determination, by means of image processing software, for each of a plurality of teeth represented on the dentition and aligner images, of interior and exterior tooth outlines representing the outline of the free end of said tooth on the dentition and aligner images, respectively.” Ex. 1001, 14:9–14.

Petitioner contends that this limitation “is satisfied by determining ‘interior and exterior tooth outlines’ for a plurality of teeth in [a] single image [representing a dentition and an aligner].” Pet. 30. According to Petitioner, this “is satisfied by detecting edge lines representing the free end of a tooth and of a corresponding edge of an aligner in an image depicting both.” *Id.* at 29–30.

Petitioner argues that “Salah teaches that dental images may be analyzed to detect ‘discriminant information,’ which can include contours of objects depicted in the images, including teeth and other intraoral objects such as gums.” Pet. 30 (citing Ex. 1008, 34:5–14, 55:21–56:7). Petitioner points to Figure 6b of Salah, which shows “[a] contour map of detected tooth edges showing the resulting outlines of teeth,” which “includes outlines of the free ends of each of a plurality of teeth.” *Id.* (citing Ex. 1008, Figs. 6a, 6b, 23:4–8, 34:6–7, 34:5–14). According to Petitioner, “Salah expressly discloses that the contours it describes may be detected using ‘image processing software,’ which ‘can be used, for example, to detect high contrast regions and determines contours.’” *Id.* at 31 (citing and quoting Ex. 1008, 34:11–14).

Petitioner contends that a person of ordinary skill in the art “would have known how to determine the width of such gaps [between the aligner and the edge of the teeth] using image processing software.” Pet. 21. Petitioner argues that “[t]he ‘945 patent and Patent Owner’s statements during prosecution confirm that it was known to [persons of ordinary skill in the art] to use image processing techniques, such as those disclosed by Salah, to detect interior and exterior tooth outlines in images of the teeth of patients wearing an aligner.” *Id.* at 22 (citing Ex. 1001, 10:22–27; Ex. 1004, 241–242). Petitioner further asserts that

it would have been obvious to measure the distance between the ends of the patient’s teeth and the corresponding edges of the aligner, as taught by Invisalign, using the edge detection image processing techniques taught by Salah to detect the contours of each object in an image depicting the patient wearing the aligner on the patient’s teeth, and to thereby identify the size of the gap between the aligner and the teeth. A [person of ordinary skill in the art] would have had reason to use Salah’s techniques for contour detection to detect the edges of teeth and aligners, as Invisalign teaches that the gap between the surfaces of teeth and an aligner should be below a threshold value (1 mm), and as Dr. Foroosh explains, a [person of ordinary skill in the art] would have understood that the width of a gap between two objects in a photograph is equivalent to the distance between the two contours defining the objects’ edges. In the case of an image of an aligner on teeth, the distances to measure would be the distances from the contour defining the end of the teeth to the contour defining the surface of the clear plastic aligner. EX1002, ¶¶61-63.

Pet. 22–23. Petitioner states that “[t]he resulting combination would use each reference’s teachings to perform substantially the same function as they provide alone, applying Salah’s contour detection to detect edges of teeth and aligners to produce a measurement of distance between these surfaces,

as taught by Invisalign, to assess whether the imaged aligner fits appropriately for the current step in patient treatment, as taught by Kim.” *Id.* at 23. Petitioner contends that a person of ordinary skill in the art “would thus have had a reasonable expectation of success, as the combination would be one of complementary techniques, applied in understood ways, to produce a predictable outcome.” *Id.*

Patent Owner argues that Petitioner “improperly pick[s] and choos[es] disclosure from different inventions in Salah with the benefit of hindsight knowledge.” Prelim. Resp. 34 (citing Pet. 30). Further, Patent Owner argues that Salah does not “suggest[] the use of image processing to detect aligners, let alone a determine exterior tooth outlines representing the outline of the free end of said tooth on the aligner images.” *Id.* at 35 (citing Ex. 2002 ¶ 100). Rather, Patent Owner argues, Salah discloses monitoring tooth positions, not the shape of an aligner. *Id.* Patent Owner argues that, during prosecution, “the Examiner agreed, that methods of monitoring tooth movement are distinct from the claimed methods that require [limitation 1(3)].” *Id.* at 35–36 (citing Ex. 1004, 254–256; Ex. 2002 ¶ 100).

Patent Owner further argues that a person of ordinary skill in the art “would not have understood Salah to teach or suggest analysis of an *aligner* image by means of image processing software” because “aligners are generally transparent and do not represent any strong contrast with a patient’s teeth or the inside of the patient’s mouth,” and “Salah teaches that image processing can be used to ‘detect high contrast regions and determine contours.’” Prelim. Resp. 36–37 (citing and quoting Ex. 1008, 34:13–14; Ex. 2002 ¶¶ 101, 102; Ex. 1001, 27:35–43). Patent Owner argues that Kim does not cure this defect in Petitioner’s case because “Kim discloses only

that the orthodontist conducts some unspecified analysis of images of patient's teeth without aligners.” *Id.* at 37 (citing Ex. 1005 ¶¶ 66, 85; Ex. 2002 ¶ 103); *see also id.* at 30 (arguing that “Kim does not suggest any non-human analysis of the images of a patient's teeth.”). Patent Owner also argues that “Invisalign does not suggest that [a visual approximation performed in person by a dental practitioner] could be applied to the analysis of aligner images using image processing software.” *Id.* at 38 (citing Ex. 2002 ¶ 104). Patent Owner also argues that “Petitioner misstates the file history” of the '945 patent, and that “Patent Owner never admitted that the prior art taught or suggested making a determination of interior or exterior tooth outlines using an aligner image.” *Id.*; *see also id.* at 30.

Further, with respect to the motivation to combine, Patent Owner argues that Petitioner's assertions of predictability are unsupported because the references do not describe a method for determining the scaling of the image, and without that, determining the separation between the aligner and teeth would not have been possible. Prelim. Resp. 30. Patent Owner also argues that a person of ordinary skill in the art would not have had a reasonable expectation of success in combining Kim, Invisalign, and Salah for several reasons. *Id.* at 39–41. First, Patent Owner argues that the combination “does not simply arrange old elements with each performing the same function” because Salah does not disclose contour detection to detect edges of teeth and aligners, and Invisalign does not disclose a method for measuring between edges of teeth and aligners. *Id.* at 39–40. Second, Patent Owner argues that Salah's analysis method is fundamentally different from that in the '945 patent, so there would have been no reasonable expectation of success because “Salah discloses that ‘a zone of weak

contrast,’ such as between the aligner and the teeth, can only be ‘likened to a zone corresponding to an outline with a low probability,’ and preferably should not be used for any analysis.” *Id.* at 40 (citing Ex. 2008, 531, 533; Ex. 1008, 60:17–24, 61:2–3; Ex. 2002 ¶ 108). Third, Patent Owner argues that “Petitioner’s hindsight-based efforts to show that a [person of ordinary skill in the art] **could** have performed the methods recited in the ’945 Patent Challenged Claims do nothing to demonstrate that a [person of ordinary skill in the art] **would** have been motivated [to do so] with a reasonable expectation of success without the ’945 Patent in hand.” *Id.*

At this stage of the proceeding, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had reasons to combine the reference’s teachings, with some rational underpinning, and would have had a reasonable expectation of success in doing so. *See* Pet. 17–23. Similar to limitation 1(1) above, Patent Owner’s arguments largely address the references separately, rather than combined as proposed by Petitioner. Moreover, as stated previously, reason to combine the references need not come from the references themselves. *See DyStar*, 464 F.3d at 1368.

We find persuasive Petitioner’s contentions, which are supported by testimony from Dr. Foroosh, that a person of ordinary skill in the art “would have known how to determine the width of such gaps [i.e., the separation between the edges of the aligner and the patient’s teeth when the aligner is worn] using image processing software.” Pet. 19, 21; Ex. 1002 ¶¶ 61–64. Salah teaches that a person of skill in the art would know how to detect contours of teeth (i.e., discriminant information) using imaging processing software, and provides a list of “well-known and preferred methods.” Ex. 1008, 34:8–36:14; *see* Ex. 1002 ¶ 82. Similarly, the ’945 patent states

“[a] person skilled in the art knows how to process an image in order to isolate *an outline*,” and provides a list of “known and preferred” image processing methods that almost completely matches the list of image processing methods provided in Salah. Ex. 1001, 10:22–23 (emphasis added); Ex. 1008, 34:15–36:14; Ex. 1002 ¶ 82. During prosecution, Patent Owner quoted this portion of the Specification, and stated “[i]n particular, a person of ordinary skill in the art knows how to determine an outline of interior tooth representing the outline of the free end of said tooth on the dentition images from said dentition images and how to determine an outline of exterior tooth representing the outline of the free end of said tooth on the aligner images, by means of image processing software.” Ex. 1004, 241–242. As acknowledged by Patent Owner during prosecution, the ’945 patent describes the “interior tooth *outline*” as delimiting the free end of the tooth, while the “exterior tooth *outline*” delimits *part of the aligner*. Ex. 1001, 5:10–15 (emphasis added); Ex. 1004, 242.

We also find persuasive the illustration provided by Dr. Foroosh, as to how the combined system would work, and in particular, that “the photographs of Kim, Salah, and Invisalign are ordinary camera images such as those acquired by a cellphone, [so] they show essentially the same thing a person would see when viewing teeth and an aligner in real life. The ability to see a gap and virtually assess it in real life naturally maps over the ability to detect and measure the same gap using computer vision techniques like Salah’s various image processing software options for detecting objects and the contours defining the objects’ edges.” Ex. 1002 ¶ 83.

We do, however, note that Patent Owner’s arguments may have merit, particularly Patent Owner’s arguments as to the reasonable expectation of

success of the combination, and we encourage the parties to further develop these issues during trial.

Therefore, based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that the combination of Kim, Invisalign, and Salah, teaches limitation 1[3] for purposes of institution, and has provided sufficient reasoning supported by a rational basis for the combination.

e) Limitation 1(4)

Petitioner contends that limitation 1(4) would have been obvious over the combination of Kim, Invisalign, and Salah. Pet. 33. Limitation 1(4) recites “comparison of the interior and exterior tooth outlines, so as to determine at least one score according to said comparison.” Ex. 1001, 14:15–17.

Petitioner describes this combination as follows:

As discussed above for step 1(1), Kim teaches checking “a photo or a video of the clear aligner currently worn by the orthodontic patient” to determine “whether the clear aligner is normal and corresponds to an appropriate step.” EX1005, ¶66. As part of this assessment, a [person of ordinary skill in the art] would have applied the teachings of Invisalign to assess the distance between the patient’s teeth and the aligner. See EX1006, 1; *supra* §IV.B.2. And as discussed for step 1(3), this assessment would involve measuring a distance between an outline of each tooth and the corresponding outline for the aligner, using the image processing software of Salah to detect each outline via contour detection. See EX1008, 34:11-36:14; *supra* §IV.B.4. The result of this comparison would produce at least one score.

Pet. 33–34. Petitioner asserts that the “score would be one or more values indicating the distance from each tooth to the aligner,” which “could be a

direct measurement of the image (e.g., in terms of pixels) . . . a value comparing the distance of one or more teeth from the aligner to a threshold as taught by Invisalign.” *Id.* at 34 (citing Ex. 1006, 1; Ex. 1002 ¶¶ 86–87; Ex. 1008, Fig. 1, 40:22–41:18).

At this stage, Patent Owner does not separately respond to Petitioner’s contentions. *See* Prelim. Resp. 39.

Based on our review and consideration of the current record, we determine that Petitioner has sufficiently shown that the combination of Kim, Invisalign, and Salah teaches limitation 1(4) for purposes of institution, and has provided sufficient reasoning supported by a rational basis for the combination.

f) Conclusion Independent Claim 1

For the reasons set forth above, we determine, that the information presented in the Petition demonstrates a reasonable likelihood that claim 1 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Kim, Invisalign, and Salah.

5. Remaining Claims

Petitioner contends that the combination of Kim, Invisalign, and Salah teach the limitations of claims 2 and 4–6 and, in support, identifies certain passages and figures in the references and explains their significance with respect to the corresponding claim limitations. Pet. 34–46. At this stage, Patent Owner does not separately challenge these contentions. *See generally* Prelim. Resp.

Because we determine above that Petitioner demonstrated a reasonable likelihood of prevailing in its challenge to claim 1 of the ’945 patent, we institute *inter partes* review on all claims challenged in the

ground. *See* 37 C.F.R. § 42.108(a) (2023) (“When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

V. CONCLUSION

After considering the evidence and arguments presented in the Petition, we determine Petitioner has established a reasonable likelihood of prevailing on its assertion that at least one claim of the ’945 patent is unpatentable, and we institute an *inter partes* review on all the challenged claims and on the ground presented in the Petition. *See* 37 C.F.R. § 42.108(a).

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that pursuant to 35 U.S.C. § 314, *inter partes* review is instituted as to all the challenged claims of the ’945 patent and on the ground of unpatentability presented in the Petition; and

FURTHER ORDERED that *inter partes* review is commenced on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

IPR2024-00110
Patent 11,109,945 B2

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