

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIGN TECHNOLOGY, INC.,

Petitioner,

v.

DENTAL MONITORING SAS,

Patent Owner.

Case No. IPR2024-00110

U.S. Patent No. 11,109,945

PATENT OWNER'S RESPONSE

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Patent Trial and Appeal Board
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PATENT OWNER'S UPDATED EXHIBIT LIST

Exhibit Number	Description
2002	Declaration of John T. Mongan, M.D., Ph.D., dated February 20, 2024
2003	Curriculum Vitae of John T. Mongan, M.D., Ph.D.
2004	Declaration of Budi Kusnoto, D.D.S., M.S., dated February 20, 2024
2005	Curriculum Vitae of Budi Kusnoto, D.D.S., M.S.
2006	Rui Zhao et al., Changing Clear Aligners Every 10 Days or 14 Days? A Randomised Controlled Trial, 39(1) Australasian Orthodontic J. 1 (2023)
2007	May 7, 2020 Press Release of Petitioner, Align Technology, Inc.
2008	U.S. Pat. Pub. 2017/0325689 (Dental Monitoring's English Language Translation of the International Patent Application published as Salah (PCT Publication No. WO2016066651))
2009	Timothy T. Wheeler, Orthodontic Clear Aligner Treatment, 23(1) Seminars in Orthodontics 83 (2017)
2010	Emilia Taneva, Budi Kusnoto, Carla A. Evans, Chapter 9: 3D Scanning, Imaging, and Printing in Orthodontics, Issues in Contemporary Orthodontics (Farid Bourzgui 2015)
2011	Orhan Tuncay et al., Effectiveness of a Compliance Indicator for Clear Aligners, 43(4) J. Clin. Orthod. 263 (2009)
2012	Silvia Caruso, Sara Caruso, et al., A Knowledge-Based Algorithm for Automatic Monitoring of Orthodontic Treatment: The Dental Monitoring System. Two Cases, 21(5) Sensors (Basel) 1856 (2021)
2013	Barry J. Glaser, "The Insider's Guide to Invisalign Treatment," (3L Publishing, 2017)
2014	[RESERVED]
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2021	[RESERVED]
2022	[RESERVED]
2023	[RESERVED]
2024	[RESERVED]
2025	[RESERVED]
2026	[RESERVED]
2027	[RESERVED]
2028	Expert Declaration of Dr. John Mongan, M.D., Ph.D., in support of Dental Monitoring's Patent Owner's Response
2029	Updated Curriculum Vitae of John T. Mongan, M.D., Ph.D.
2030	Expert Declaration of Dr. Budi Kusnoto, D.D.S., M.S., in support of Dental Monitoring's Patent Owner's Response
2031	Updated Curriculum Vitae of Budi Kusnoto, D.D.S., M.S.
2032	[RESERVED]
2033	American Board of Orthodontists, <i>Ideal Photographs and Radiographs</i>
2034	Institute of Medical Illustrators, <i>IMI National Guidelines: Orthodontic Photography</i> (Feb. 2008).
2035	Canon, <i>Canon Dental Photography Guide</i> (2015)
2036	[RESERVED]

2037	Excerpts from Declaration of Dr. Maureen A. Valley in <i>Dental Monitoring SAS v. Align Technology, Inc.</i> , 3:22-cv-07335-WHA (Dkt. 104-5)
2038	R. Kaplan, <i>Standardization for Serial Intraoral Photography</i> , The C.V. Mosby Co. 431 (1979)
2039	[RESERVED]
2040	S. Samawi, <i>Clinical Digital Photography in Orthodontics: Professional Photographic Records in Daily Practice</i> , 18 Jordan Dental J. 20 (2012)
2041	[RESERVED]
2042	[RESERVED]
2043	[RESERVED]
2044	[RESERVED]
2045	[RESERVED]
2046	I. Ahmad, <i>Digital Dental Photography, Part 2: Purposes and Uses</i> , 206(9) British Dental J. 459 (May 2009)
2047	S. Finlay, <i>Photographic Analysis and Diagnosis: Step One</i> , 2(3) Inside Dentistry (Oct. 2009)
2048 ¹	Deposition Transcript of Dr. Hassan Foroosh, Ph.D., in IPR2023-01369 (May 17, 2024)
2049	[RESERVED]
2050	[RESERVED]
2051	[RESERVED]
2052	[RESERVED]

¹ Patent Owner is not yet in receipt of the witness's signature or the officer's certification and will coordinate with Petitioner to file an updated exhibit once complete. 42.53(f)(5)-(6).

2053	Declaration of N. E. Frank-White (attaching S. Frey, <i>A Quick Look at Dental Monitoring, The Ortho Cosmos</i> , http://theorthocosmos.com/quick-look-dental-monitoring/ (Apr. 17, 2017))
2054 ²	Deposition Transcript of Dr. Hassan Foroosh, Ph.D., in IPR2024-00110 and IPR2024-00052 (June 28, 2024)
2055	<i>Making Sure Your Invisalign Aligners Fit Correctly</i> , Morita Orthodontics (2016)
2056	Apple, <i>Apple Reinvents the Phone with iPhone</i> , Apple Newsroom (Jan. 9, 2007)
2057	[RESERVED]
2058	[RESERVED]
2059	[RESERVED]
2060	[RESERVED]
2061	U.S. Pat. No. 11,049,248
2062	Declaration of H. Foroosh in support of Align's petition for <i>inter partes</i> review of U.S. Pat. No. 11,049,248
2063	N. Smith, <i>Clear aligner therapy: An esthetic approach to total patient care</i> , Dentistry IQ (Sept. 25, 2017)
2064	Provisional Patent Application No. 62/417,985 to Carrier et al.

² Patent Owner is not yet in receipt of the witness's signature or the officer's certification and will coordinate with Petitioner to file an updated exhibit once complete. 42.53(f)(5)-(6).

I. Introduction

Patent Owner, Dental Monitoring SAS, respectfully submits that all challenged claims of U.S. 11,109,945 (the “’945 patent”) are patentable over the ground raised in the Petition.

The ’945 patent provides novel methods for evaluating the shape of an orthodontic aligner that can be used with a simple cellphone image.³ To do so, the challenged claims detect, identify, and compare the contours in an image of a patient’s teeth wearing the aligner. Petitioner relies on three ground references, each relating to fundamentally different techniques and none disclosing a method for assessing aligner fit compatible with an image. Nonetheless, with knowledge of the invention, Petitioner improperly culls and combines portions of each reference in an effort to get to the claimed methods.

Petitioner’s hindsight was guided by its uninformed and inexperienced expert’s misinterpretations of the three ground references. First, Dr. Foroosh incorrectly says that Kim discloses patient-created photographs of teeth with

³ Although the challenged claims of the ’945 patent do not require the use of cellphone images, Petitioner’s analysis of its ground references relies on their use of “a smartphone” or a “cellphone”. *E.g.*, Paper 2, 25-26. Thus, Patent Owner’s Response likewise focuses on embodiments using a cellphone.

aligners, when it does not and is instead focused on photographs of teeth *alone* for diagnosis and treatment. Second, he rejected or ignored teachings of Invisalign requiring the clinical knowledge of an orthodontist, teachings that would reveal to a skilled reader that Invisalign is concerned with in-person treatment. Dr. Foroosh also cherry-picks one image from Invisalign—despite admittedly having “*no idea*” whether it is representative of an aligner fit situation an orthodontist would have encountered in clinical practice in 2017. It is not. It is an extreme and artificial illustration showing an aligner that has been partially inserted so that a gap is visible between the teeth and aligner. In reality, however, aligner fit issues were difficult to detect with the naked eye, especially when they had only just begun to emerge. Third, Dr. Foroosh ignored the fact that the image analysis in Salah—which monitors tooth movement over time and does not disclose imaging aligners—is reliant on areas of high contrast in the image, whereas orthodontists would have known that aligners blend, not contrast, with teeth.

It is unsurprising that Dr. Foroosh drew many wrong conclusions from these references related to the dental field when he has *no experience* in that field. Even setting aside the many errors in Petitioner’s analysis, its combination does not disclose the claimed evaluation of contours in an image pertaining to teeth and the aligner, *i.e.*, the claimed interior and exterior tooth outlines. The only reference that discloses image processing at all—Salah—never compares two contours from

a single photograph. And it does not teach or suggest recognizing whether a contour corresponds to an aligner or a tooth because that is simply not needed for its methods.

For these and the other reasons discussed below, Patent Owner respectfully submits that the Board should find all the challenged claims are patentable over the ground raised in the Petition.

II. Level of Ordinary Skill in the Art

In its Institution Decision, the Board adopted Petitioner’s then-uncontested assertion that a person having ordinary skill in the art (“POSA”) 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” and that they “*could* be a member of an interdisciplinary team including persons with backgrounds such as electrical engineering, computer science, optical imaging, and dentistry or orthodontics, and *could* call upon the knowledge of other team members *as appropriate*.” Paper 7, 13; Paper 2, 12-13.⁴

Patent Owner’s experts provided a slightly different definition. EX2028, ¶¶46-49 (“[A] person of ordinary skill in the relevant field as of June 9, 2017 would

⁴ All emphases herein are added unless otherwise indicated.

have had a bachelor's degree or higher in computer science, bioinformatics, or a related engineering discipline, and several years of work experience relating to the development of image analysis techniques or algorithms. A POSA *would* have also worked as part of a multi-disciplinary team, which *would have included individuals familiar with medical imaging, dental imaging, dentistry, and/or orthodontics.*"); EX2030, ¶¶54-57. Although these definitions are not materially different, the definition of a POSA is material to the merits of Petitioner's ground.

Here, the relevant field is aligner treatment. EX2030, ¶57. Kim, Invisalign, and Salah concern dental and/or orthodontic treatment, Kim and Salah discuss dental imaging, and all of Petitioner's references are directed to and/or assume the knowledge of dental professionals. EX1002, ¶¶42-45, 46, 48, 51, 56-58, 62; EX2030, ¶¶58, 70, 80-82; EX2028, ¶49. Indeed, Invisalign expressly states that it is a clinical guide "to help the Invisalign practitioner," and as Petitioner's declarant Dr. Derakhshan alleges in her declaration, she "provided orthodontists and dentists" with Invisalign as "part of [her] duties at Align" to "provide[] instruction to orthodontists and dentists to certify them in the use of . . . Invisalign clear plastic aligners." EX1011, ¶¶2, 5-6; EX1006, i; EX2030, ¶58; EX2028, ¶84. Patent Owner's Response is thus supported by the Declaration of Dr. Budi Kusnoto—a practicing clinician, researcher, and academic in orthodontics for twenty-five

years—with whom Dr. Mongan consulted in forming his opinions on the '945 patent. EX2028, ¶¶49; EX2030, ¶¶3-12.

Petitioner's definition recognizes that a POSA "*could* call upon the knowledge of other team members *as appropriate*." Paper 2, 13. For *all* of Petitioner's ground references, it would have been appropriate, and in fact necessary, for a POSA to consult with an individual having experience in dentistry and/or orthodontics to understand their teachings. EX2030, ¶¶56-57; EX2028, ¶49.

However, Petitioner's expert, Dr. Foroosh, has no professional training or experience with dentistry or orthodontics, and admitted he did not consult with such a person in forming his opinions. EX2048, 11:9-11, 12:19-22, 13:12-23; EX2054, 124:16-19. Dr. Foroosh's lack of relevant experience led him to misinterpret or ignore portions of Invisalign, Kim, and Salah. For example, Dr. Foroosh alleged that Invisalign Figure A is illustrative of what "a person would see when viewing teeth and an aligner in real life," when in reality, he had "*no idea*" whether the one photograph he selected from Invisalign is a representative or common position for an aligner on a patient's teeth. EX2054, 60:18-61:4, 45:17-19, 74:9-15. Dr. Foroosh also could not say how an orthodontist would allegedly measure the separation between tooth and aligner despite advancing a motivation to transition patients from in-person to remote treatment based on Invisalign. *E.g.*, EX2054, 42:4-7, 58:24-59:5, 65:12-23; *infra* §VII.A.

“[T]he level of [ordinary] skill in the art is a prism or lens through which ... the Board views the prior art and the claimed invention ... [to] prevent[] hindsight” bias. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *see also* Paper 7, 13 (citing *Okajima*). Because Petitioner failed to consider the ground references from the perspective of a properly informed POSA under either definition, its hindsight-driven ground should be rejected.

III. State of the Art

A. Dental Photography

For decades before the '945 patent, dental photographs captured by dental professionals during in-office patient consultations were an integral part of dental care. EX2030, ¶¶24-36. By 2017, there was a recognized standard set of orthodontic photographs comprising specific views of a patient's teeth. EX2030, ¶¶25-27; EX2033; EX2038; EX2040.

Acquiring standard orthodontic images required specialized training and equipment, *e.g.*, cheek retractors and dental mirrors, as well as a DSLR camera to ensure high-resolution photographs. EX2040, 23-25, 28-31; EX1008, Figs. 5A-5B; EX2064, [0051], Figs. 1A, 9; EX2034, 21; EX2030, ¶¶28-34. Although some dentists had attempted to use cellphones, this was rare due to associated challenges with obtaining the necessary high-quality images using a cellphone. EX2030, ¶¶32, 51. For example, holding the phone “close to the teeth” to get a “high level of detail,”

could result in “blurry” images and “optical distortion.” EX2064, [0004]; EX2028, ¶81. But holding the phone “too far” from the teeth, resulted in a different problem—photos that “cannot meet the orthodontic standards.” EX2064, [0004]; EX2030, ¶81.

B. Aligner Treatment

Aligners are one type of orthodontic device designed to exert gentle pressure and thereby reposition a patient’s teeth. EX1001, 1:23-31; EX2030, ¶37. As of June 2017, aligner treatment generally began with a patient attending an in-person consultation with an orthodontist to establish a proper diagnosis as to the patient’s suitability for aligner treatment. EX2030, ¶38. This examination typically was conducted either by visual inspection and/or using in-office scanning technology. EX1001, 1:16-59; EX2030, ¶38.

If the orthodontist determined that the patient was suitable for aligner treatment, the orthodontist would then conduct scans of the patient’s starting dentition. EX1001, 1:16-22; EX2030, ¶¶38-39. These in-office scans were typically conducted by a trained dental professional on specialized machines employing various scanning technologies that generated digital three-dimensional models of a patient’s dentition. EX2030, ¶39; EX2010, 147-80.

Based on these initial scans, a sequence of aligners would be designed and fabricated by one of several third-party companies, such as Petitioner. EX1001,

1:21-36; EX2030, ¶40. Once the patient received their aligners, the patient would wear one aligner for a predetermined interval of time and then change to the next aligner to continue shifting their teeth according to the treatment plan. EX1001, 1:35-36; EX2030, ¶¶42-43. In 2017, effective aligner treatment required frequent in-person orthodontic examinations to determine whether treatment was on track. EX1001, 1:42-45; EX2030, ¶¶44-45. These in-person examinations did not involve quantitative assessments of aligner fit, nor did they involve making any measurements of separations between the aligner and the dental arch on a tooth-by-tooth basis. EX2030, ¶¶45-46.

As explained by Dr. Kusnoto, conventional aligner treatment examinations as of June 2017 involved two primary qualitative and subjective assessments. EX2030, ¶¶46-49. First, orthodontists would visually inspect the current state of dentition and compare that state to the anticipated dentition for that point in the aligner treatment. *Id.* Second, orthodontists assessed the aligner treatment for problems with, e.g., aligner fit, tooth attachments, or dentition complications. EX2030, ¶¶48-49; EX2013, 39-40, 275-76; EX1006. Generally, a patient would be asked to try on their current aligner, and each aligner was visually and manually examined for large gaps between the aligner and the teeth. EX2030, ¶49. Using their hands, the orthodontist would manually examine the aligner for potential rocking (that is, movement of one part of the aligner off of a patient's teeth when pressure is applied

to another part of the aligner). *Id.* A similar examination was then conducted using the next aligner in a patient's sequence. *Id.*

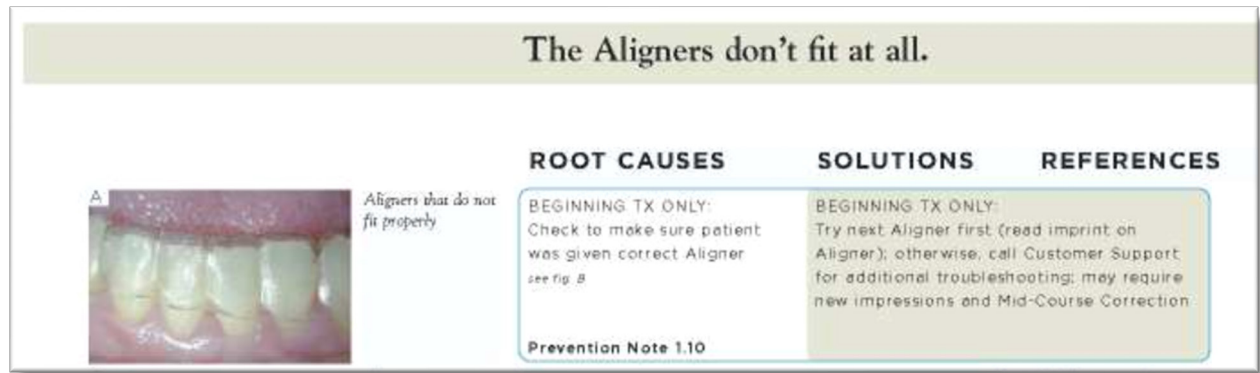
These subjective visual and manual inspections performed by orthodontists were susceptible to inconsistency and inaccuracy, for example, due to level of experience, length of the appointment, speed of review, number of patients seen, fatigue, etc. EX2030, ¶47. Reliance on periodic in-person examinations also meant that treatment issues could go undiagnosed for multiple weeks between check-ins. EX1001, 1:53-59; EX2030, ¶47. When an orthodontist did identify significant issues with the patient's progress at an in-person examination, the patient's teeth would have to be rescanned, a new series of aligners manufactured, and the remaining aligners from the previous series discarded. EX1001, 1:46-52; EX2030, ¶52. As a result, aligner treatment was often delayed and prolonged. *Id.*, 1:49-59; EX2030, ¶52.

In June 2017, it was not the standard of care to use images of aligners in the service position, let alone such images captured using a cellphone camera, to evaluate aligner fit.⁵ EX2030, ¶51. Indeed, as Dr. Kusnoto explains, aligner fit

⁵ Petitioner identified only one reference discussing remote evaluation of aligner fit using a video recorded on a patient's cellphone—Frey, which is not prior art because

(Cont'd on next page)

issues were often difficult to detect with the naked eye, especially when they had only just begun to emerge. As Petitioner’s Invisalign reference shows, the separation is subtle, even when “Aligners don’t fit at all.”



EX1006, 6; EX2030, ¶63.

IV. Overview of the '945 Patent

The '945 patent claims priority to June 9, 2017. Petitioner does not challenge this priority date.

The challenged claims provide novel methods of “evaluating the shape of an orthodontic aligner” for purposes of aligner treatment. *See, e.g.*, EX1001, 1:65-66, 2:24-27 (“[A] method according to the invention makes it considerably easier to evaluate the suitability of the aligner for the treatment, while at the same time making this evaluation particularly reliable.”), Abstract, 13:59-60; EX2028, ¶¶52-60.

it was derived from disclosures made by the inventors of the '945 patent. *Infra* § VII.C.

“According to the invention, the shape of the aligner is evaluated by comparing an outline of this aligner, in its service position, with an outline of the teeth wearing it.” EX1001, 6:7-9.

In particular, the '945 patent discloses “acquisition of at least one two-dimensional image of the teeth of [a] patient, referred to as ‘updated image’, under actual acquisition conditions.” *Id.*, 2:1-3. “[A]t 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.” *Id.*, 2:4-6. And “at least one updated image referred to as ‘dentition image’, identical to or different from the aligner image, representing said teeth.” *Id.*, 2:7-9. If the dentition image is the same as the aligner image, the '945 patent teaches that it is possible not only to see the aligner outline but also to see the dentition outline through the aligner, and a “single image therefore makes it possible to compare aligner and dentition outlines.” *Id.*, 6:15-20; EX2028, ¶53. The images can be captured remotely, for example, on a patient’s cellphone. EX1001, 5:61-64.

The '945 patent further discloses “determination, 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.” EX1001, 2:15-19; EX2028, ¶55. The '945 patent states that a “tooth outline” is understood to mean a line displaying the shape of a

free end of a tooth on an image. EX1001, 5:8-9; EX2028, ¶55. “[S]uch a line may delimit the free end of this tooth,” in which case the “tooth outline is then qualified as an ‘interior tooth outline.’” EX1001, 5:10-13; EX2028, ¶55. “Such a line may also delimit part of the aligner,” and “is then qualified as an ‘exterior tooth outline.’” EX1001, 5:14-15; EX2028, ¶55. As the bottom of the tray of an aligner substantially compliments the free ends of the teeth, “in an image depicting the bottom of the tray, the tray-bottom outline defines a set of exterior tooth outlines.” EX1001, 5:15-20; EX2028, ¶55.

The ’945 patent invention further comprises “comparison of the interior and exterior tooth outlines, followed by determination of at least one score according to said comparison.” EX1001, 2:20-22; EX2028, ¶56. The comparison step is performed “preferably in accordance with one of the two particular embodiments ... corresponding respectively to FIGS. 7 and 8” of the ’945 patent. EX1001, 11:35-38; EX2028, ¶56.

For example, “for each of a plurality of teeth for which interior and exterior tooth outlines have been determined,” “a distance d between the interior and exterior tooth outlines of each of said teeth is determined.” EX1001, 11:40-43; EX2028, ¶57. This “may for example be the mean distance or the maximum distance between the pixels of said outlines corresponding to one and the same point on the tooth.” EX1001, 11:45-47; EX2028, ¶57. “[A] distance threshold S_d is determined,

preferably using the distances [already] determined.” EX1001, 11:51-52; EX2028, ¶57. Preferably, the distance threshold “is substantially equal to the smallest of the distances [already] determined.” EX1001, 11:53-55; EX2028, ¶57. Next, the “distance score” is determined, for each of the teeth, “as a function of the distance d between the interior and exterior tooth outlines and of the distance threshold.” EX1001, 11:63-67; EX2028, ¶57. “The higher the distance score, the greater the separation of the tooth concerned from the tray.” EX1001, 12:4-5; EX2028, ¶57.

As another example, as set forth in Figure 8, “at least one score known as the ‘offset score’, is determined, for each pair of teeth of [a consecutive] triplet, as a function of the difference in offset with a tooth adjacent to said tooth and of the offset-difference threshold.” EX1001, 13:7-10; EX2028, ¶58. “In particular, the difference in offset of the first tooth with the second tooth may be compared against the offset-difference threshold.” EX1001, 13:11-13; EX2028, ¶58. “The offset-difference threshold may notably be subtracted from the offset difference of the first tooth with respect to the second tooth in order to determine a score for the offset between the first and second teeth.” EX1001, 13:13-17; EX2028, ¶58. “This offset score indicates, for example if it is positive, that one or each of the first and second teeth is liable to be separated from the bottom of the tray.” EX1001, 13:17-20; EX2028, ¶58. The ’945 patent explains that “[i]n general, when a first offset score for first and second teeth indicates the separation of one of these two teeth, a second

offset score is determined for the second tooth and a third tooth adjacent to the second tooth. If the second offset score is lower than the first offset score, it is probable that it is the first tooth that has separated from the bottom of the tray. If not, it is probably the second tooth that has separated.” EX1001, 13:28-34; EX2028, ¶58.

Preferably, “an evaluation method according to the invention also has one or more of the ... optional features,” including “comparison of the score against an acceptability threshold and the emission of information according to the result of the comparison.” EX1001, 2:32-38; EX2028, ¶59.

In one embodiment, the invention disclosed in the '945 patent “is used to establish a diagnosis and/or to modify the treatment, particularly to recommend a change in aligner and/or to determine the characteristics of a future aligner for the patient.” EX1001, 13:44-47; EX2028, ¶60. The invention in the '945 patent further provides “a method of adapting an orthodontic treatment, in which method an evaluation method according to the invention is implemented and then, according to the result of said evaluation, a new aligner is manufactured.” EX1001, 3:36-40; EX2028, ¶60.

V. Claim Construction

In view of the positions taken by Petitioner, as well as the Board's analysis in the Institution Decision, Patent Owner requests construction of the following terms.

A. “shape of an orthodontic aligner” (claim 1)

The Petition does not take a position on whether the preamble of claim 1 is limiting. Paper 2, 24. However, to the extent it is limiting, the phrase “shape of an orthodontic aligner” should be construed to mean “the shape of the aligner relative to the shape of the teeth of the patient.” EX2028, ¶¶125-28.

The specification describes a method of “assessing the shape of an orthodontic aligner” for purposes of aligner treatment. *E.g.*, EX1001, cl. 1; *see also id.*, Abstract, 1:65-67. It further explains that the shape of the aligner is assessed relative to the patient's teeth so as to determine its suitability for treatment. *Id.*, 5:1-7. A POSA would have understood that, as set forth in the '945 patent, the “shape of an orthodontic aligner” can be assessed by “comparing an outline of this aligner, in its service position, with an outline of the teeth wearing it.” EX1001, 6:7-9; *see also id.*, 11:42-47 (“In step i), a distance d between the interior and exterior tooth outlines of each of said teeth is determined (FIG. 7). The distance between the interior 14 and exterior 18 tooth outlines of a tooth may for example be the mean distance or the maximum distance between the pixels of said outlines

corresponding to one and the same point on the tooth.”); EX2028, ¶127. The ’945 patent thus teaches that the “shape” of the aligner is evaluated by comparing the outline of the teeth and the outline of the aligner. EX2028, ¶127.

Petitioner’s expert confirms that the claimed “method for evaluating the shape of an aligner” refers to the shape of the aligner relative to the teeth, *i.e.*, the fit of the aligner. Dr. Foroosh’s analysis of the preamble to claim 1 points to prior art that allegedly involved “determining a distance between the teeth and the aligner when worn by the patient” as also disclosing a method of “assessing the fit of the aligner.” EX1002, ¶68; *see also* EX2028, ¶128.

B. “for each of a plurality of teeth ... interior and exterior tooth outlines representing the outline of the free end of said tooth” (claim 1)

The Petition also does not propose a construction for the phrase “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,” which is recited in claim 1. This phrase should be construed as requiring the use of image processing software to determine “for each of multiple teeth, an interior tooth outline representing the outline of the free end of each of the multiple teeth and an exterior tooth outline representing the corresponding part of the aligner.” EX2028, ¶¶129-34.

That is, the claimed methods of the '945 patent require not only the use of image processing software to determine contours, but also that the contour belongs to a tooth or an aligner, and that the interior and exterior tooth outlines correspond to the same tooth. EX2028, ¶130. This is apparent from the wording of the claim, which requires “**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.”

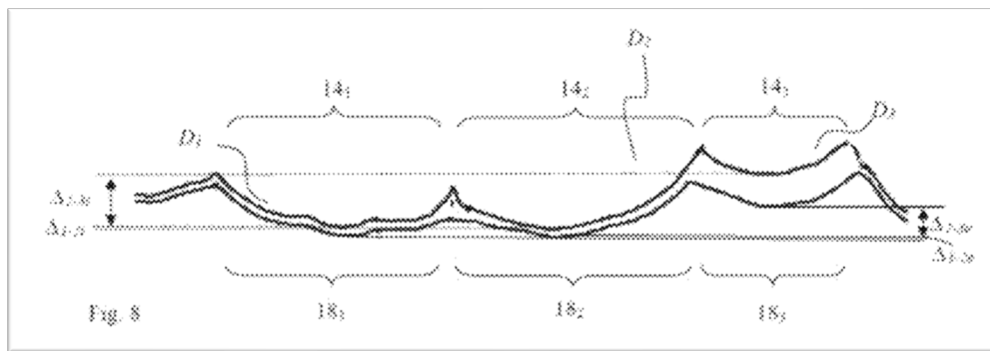
This construction is also evident from other limitations in claim 1 and the dependent claims. For instance, Step 4) of claim 1 recites “comparison of the interior and exterior tooth outlines, so as to determine at least one score according to said comparison.” EX1001, cl. 1. As the specification explains, the comparison step is performed “preferably in accordance with one of the two particular embodiments ... corresponding respectively to FIGS. 7 and 8” of the '945 patent. EX1001, 11:35-38; EX2028, ¶131. For example, “for each of a plurality of teeth for which interior and exterior tooth outlines have been determined,” “a distance *d* between the interior and exterior tooth outlines *of each of said teeth is determined*.” EX1001, 11:40-43; EX2028, ¶131. This “may for example be the mean distance or the maximum distance between the pixels of said outlines *corresponding to one and the same point on the tooth*.” EX1001, 11:45-47; EX2028, ¶131. As another example, as set

forth in Figure 8, “at least one score known as the ‘offset score’, is determined, for *each pair of teeth of [a consecutive] triplet*, as a function of the difference in offset with a tooth adjacent to said tooth and of the offset-difference threshold.” EX1001, 13:7-10; EX2028, ¶131. “In particular, the difference in offset of *the first tooth with the second tooth* may be compared against the offset-difference threshold.” EX1001, 13:11-13; EX2028, ¶131. In other words, the comparison must be between interior and exterior tooth outlines corresponding to the free end *of the same tooth*. EX2028, ¶131.

Claim 5 further recites: “determination of a distance score dependent on the distance between the interior and exterior teeth outlines.” EX1001, cl. 5. Again, it is clear from the ’945 patent that the distance score is the distance between a tooth and the portion of the aligner corresponding to that tooth (*i.e.*, the interior tooth outline and corresponding exterior tooth outline). EX1001, 12:1-5 (“For preference, the distance score for a tooth is equal to $S(d, S_d)$ namely the difference between the distance between the interior and exterior tooth outlines *for this tooth* and the distance threshold. The higher the distance score, the greater the separation *of the tooth concerned* from the tray.”); EX2028, ¶132.

This interpretation is further supported by the specification, which explains that the disclosed methods determine an interior tooth outline and its “*corresponding*” exterior tooth outline, meaning the outline of the aligner region

associated with the particular tooth. EX1001, 5:33-40 (“When a tooth is positioned in the tray ... its interior tooth outline substantially coincides with the *corresponding* exterior tooth outline ... or is offset and substantially parallel to the *corresponding* exterior tooth outline ...”); EX2028, ¶133. This concept is illustrated in Figure 8 of the ’945 patent, reproduced below:



EX1001, Figure 8. As shown in Figure 8, the method identifies individual interior tooth outlines pertaining to teeth (14₁, 14₂, and 14₃) and corresponding individual exterior tooth outlines pertaining to regions of the aligner (18₁, 18₂, and 18₃) for multiple teeth (D₁, D₂, and D₃). *See also* EX1001, 12:16-19, 13:5-27; EX2028, ¶133.

As discussed further below, Petitioner is thus incorrect that this claim element can be satisfied by using image processing software to determine generic contours, without identifying that the contour belongs to a tooth or an aligner, and that the interior and exterior tooth outlines correspond to the same tooth. *Infra*, § VII.B.

VI. Petitioner's Ground References

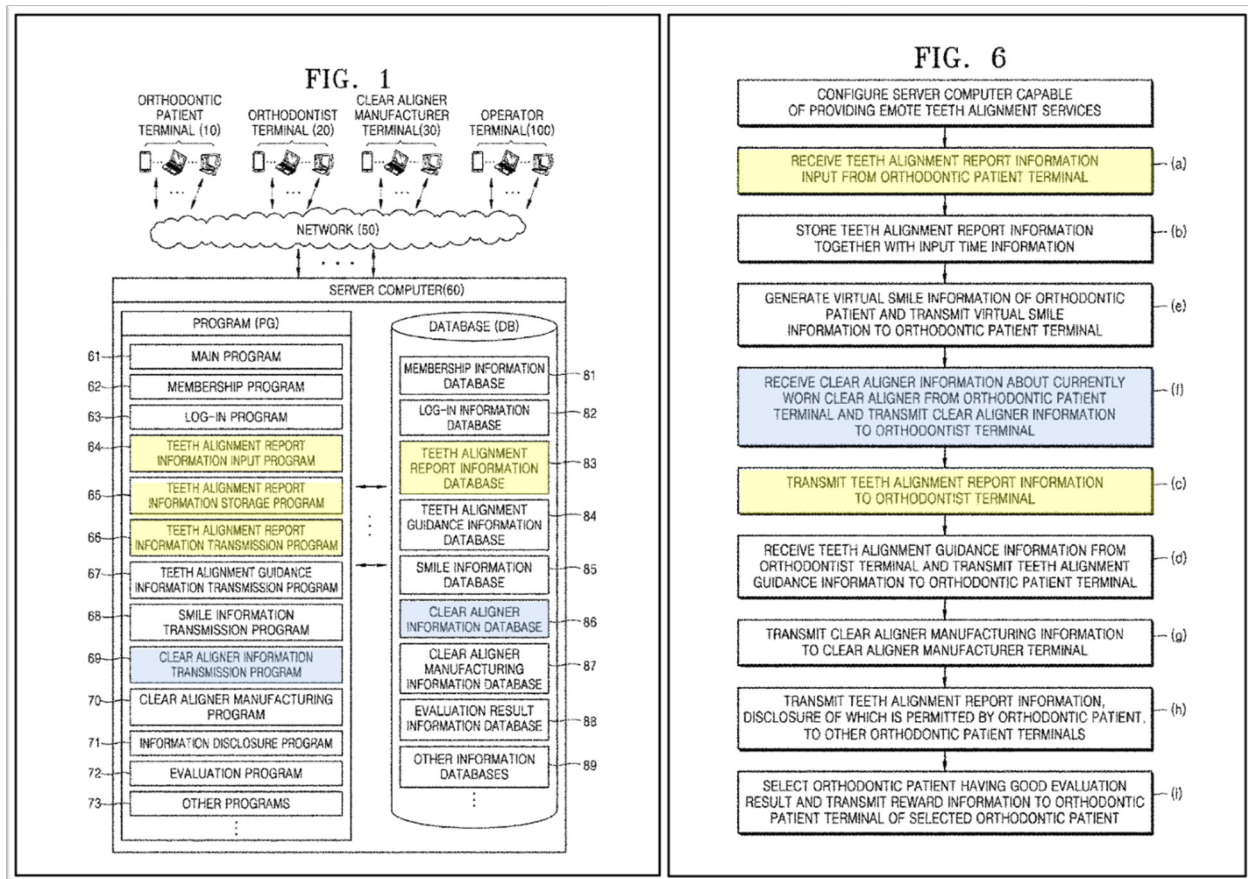
A. Kim

Kim relates to a method for “providing remote teeth alignment services” to assess whether treatment is progressing correctly. EX1005, [0010]; EX2028, ¶¶66-83; EX2030, ¶¶70-71. According to Kim, an orthodontic patient sends “teeth alignment information using a device, e.g., a smartphone.” EX1005, [0010]; *see also id.*, [0013], [0041]-[0042], [0056], [0058], FIG. 6. “[B]ased on the teeth alignment information,” an orthodontist may “remotely and accurately diagnose the condition of the patient” and “may remotely provide information about an accurate step of a clear aligner to be currently worn by the orthodontic patient.” EX1005, [0042]. The teeth alignment information of Kim can include multiple different views of the patient's teeth. EX1005, [0013], [0056], FIGS. 8-13, FIG. 16, FIG. 19, FIG. 23; EX2028, ¶69.

In 2017, assessing teeth alignment and assessing the fit of an aligner were two distinct analyses. Assessing the alignment of the patient's teeth involved an overall evaluation of the patient's dentition based on tooth positions. EX2030, ¶¶47-48, 76. Assessing the fit of an aligner involved checking that the aligner provided adequate and effective pressure on the patient's teeth to bring about the desired movement of the teeth. *Id.*, ¶76. Typically, this involved a combination of visual and manual inspections by an orthodontist during in-person appointments. *Id.*

Kim expressly relates to “remote teeth alignment services.” EX1005, [0010]. A POSA would not have understood Kim to disclose a method for assessing the fit of an aligner nor the acquisition of “at least one updated image referred to as ‘aligner image’, at least partially representing the aligner in a service position.” EX2028, ¶¶68; EX2030, ¶¶71-75. Although Kim discloses “clear aligner information,” which may—but need not—include “a photo or a video of the clear aligner currently worn” (EX1005, [0066]), a POSA would have understood this to refer only to an image of the aligner by itself, and not an image of the aligner in the service position. . EX2028, ¶¶69-78; EX2030, ¶74.

Kim draws a clear distinction between the “teeth alignment information” and “clear aligner information.” EX2028, ¶¶69-78, EX2030, ¶¶74-77. The clear aligner information is collected and transmitted in different steps of Kim’s method from the teeth alignment information, and the information is stored in different databases, as shown in Figures 1 and 6 of Kim below:



EX1005, FIGS. 1&6 (annotations added); *see also* EX2028, ¶¶72-77; EX2054, 15:12-23 (agreeing “that teeth alignment information and clear aligner information are received and transmitted in different steps”).

According to Kim, the teeth alignment information, *not* the clear aligner information, is used by the orthodontist to diagnose patients and provide aligner advice based on the position of the teeth, *not* the aligner fit itself. *Id.*, [0010], [0063], [0087]. This is consistent with the standard of care in 2017, *i.e.*, that images of aligners in a service position were *not* used to remotely assess aligner fit. EX2030, ¶¶51, 76. Instead, to assess the progress of a patient’s aligner treatment, the position

of the patient's teeth was compared with the expected position at that point in the aligner treatment. EX2030, ¶¶47, 72.

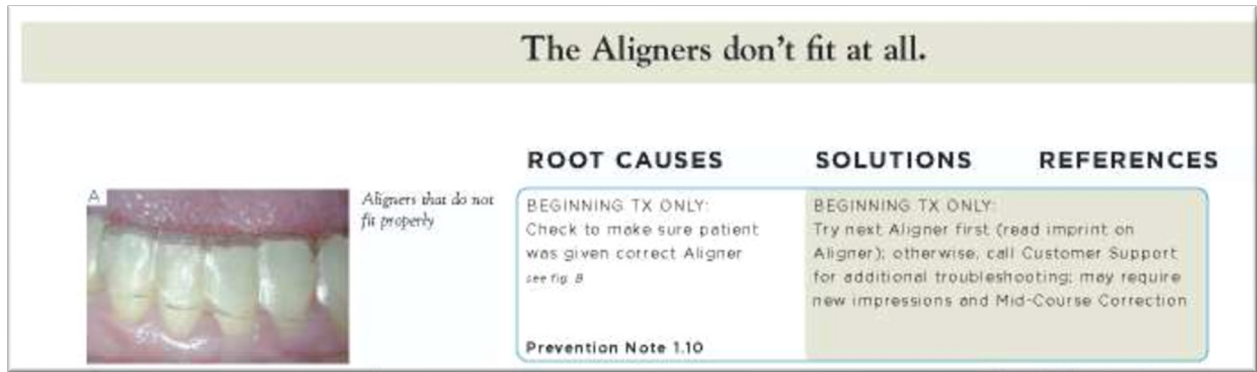
Kim discloses that, according to its “embodiments of the present invention, an orthodontist may obtain accurate teeth alignment information using a device, e.g., a smartphone, of an orthodontic patient, may remotely and accurately diagnose the condition of the patient *based on the teeth alignment information*, 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.*” *Id.*, [0093]. Kim thus teaches that its alleged benefits flow from the use of teeth alignment information, not the clear aligner information. EX2030, ¶165. At deposition, Dr. Foroosh confirmed that Kim's teeth alignment information is used to diagnose and treat patients. EX2054, 13:11-19. There is no suggestion in Kim that the clear aligner information is used for diagnosis or to monitor tooth positions, or provides the benefits that Dr. Foroosh relies upon.

Kim similarly discloses that the “clear aligner manufacturing program” may transmit clear aligner manufacturing information to the clear aligner manufacturer terminal “upon determining that an additional or modified clear aligner is needed, *based on the teeth alignment report* information.” *Id.*, [0067]; *see also id.*, [0020] (same), [0090] (same). Here again, Kim is consistent with how clear aligners were

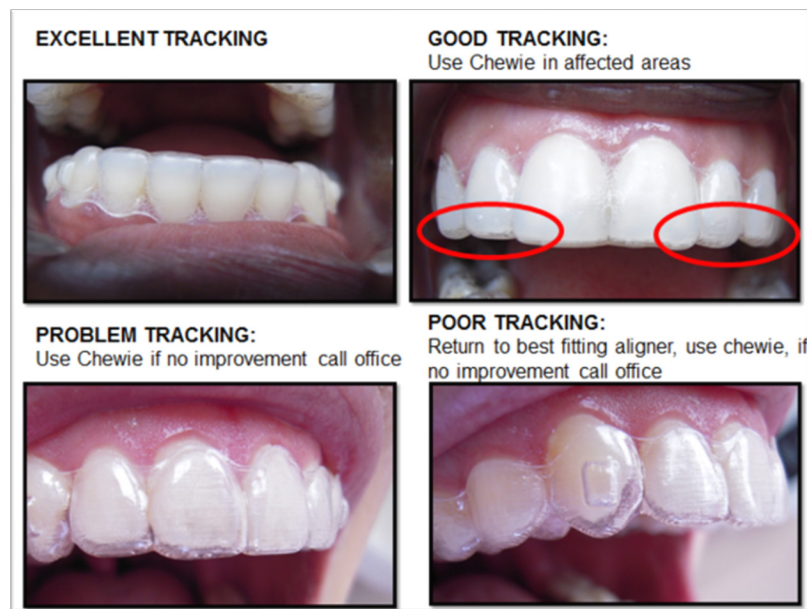
designed and manufactured in 2017, *i.e.*, using the positions of the teeth. EX2030, ¶77; EX1006, iii; EX2010 [Taneva].

The clear aligner information in Kim is used only to “determine[] whether the clear aligner is normal and corresponds to an appropriate step,” that is, whether the aligner appears to be in a working condition and the patient is using the correct aligner for their current treatment step. EX1005, [0066]; EX2028, ¶79; EX2030, ¶74; *cf.* EX2054, 22:6-19 (confirming that Dr. Foroosh had no basis in Kim to interpret “normal” as “fitting well”).

A POSA would have understood Kim to be directed to the problems that could occur when a patient was not capable of frequently visiting the orthodontist by providing a way to assess “teeth alignment” remotely. EX1006, [0009], [0010]. Kim never purports to provide a novel way to assess aligner fit from a photograph, nor explains how that could be done. EX2028, ¶81; EX2030, ¶73. A POSA would have known that aligner fit issues were often difficult to detect with the naked eye and thus, in-person manual manipulation of the aligner was also used to assess fit. EX2030, ¶75. As illustrated below, the separation is subtle, even when “Aligners don’t fit at all.”



EX1006, 6; EX2030, ¶63. By way of a further example, aligners may have “GOOD TRACKING,” but still require adjustment, although the teeth and aligners are nearly-indistinguishable from a photograph alone.



EX2055.

A POSA would have further recognized that images captured according to the disclosure in Kim—by an untrained person using a cellphone in 2017—were unlikely to be of high quality. EX2028, ¶81; EX2064, [0004] (noting that holding

the cellphone “close to the teeth” could result in “blurry” images and “optical distortion”). Although Kim discloses a program to provide guidance to the patient on positioning their head or teeth (EX1005, [0014]), there is no disclosure of any guidance on how to acquire an image showing the aligner on teeth. EX2028, ¶81. This confirms that Kim is not directed to assessing aligner fit from an image of a patient wearing their aligner. *Id.*

To the extent Petitioner suggests that the phrase “currently worn” aligner suggests that the aligner is being worn at the time the patient takes a photograph, a POSA would have had no such understanding. Kim uses the phrase “currently worn” to refer to the aligner that the patient is wearing or should be wearing during the current phase of treatment based on the teeth alignment information, and not when taking photographs. EX2028, ¶80. Indeed, Kim discloses that the patient may receive “teeth alignment guidance information” from the orthodontist, which may include “an appropriate step of a clear aligner to be *currently worn* by the orthodontic patient.” EX1005, [0063]; *see also id.* [0041], [0093].

Finally, Kim does not disclose any non-human image analysis of images from the teeth alignment information or clear aligner information. EX2028, ¶¶81-83; *see also* EX1005, [0085] (“Then, as illustrated in FIG. 19, the orthodontist may check the transmitted teeth alignment report information per patient using the orthodontist terminal 20.”). Likewise, Kim does not suggest determining interior or exterior

tooth outlines or comparing them to determine at least one score, as required by each challenged claim. EX2028, ¶83.

B. Invisalign

Invisalign is a “Clinical Monitoring Guide” published by Petitioner “to help the Invisalign practitioner successfully monitor Invisalign treatments and address issues that may arise between receipt of Aligners from [Petitioner] to the completion of treatment.” EX1006, i.

Invisalign does not relate to methods for remotely assessing aligner fit. On the contrary, Invisalign relates to in-office check-ups. EX2028, ¶¶84-95; EX2030, ¶58. To that end, Invisalign outlines the steps that clinicians should take “*at every patient appointment.*” EX1006, ii. These steps including having the “patient[] arrive with the previous stage Aligner and the current Aligner” so the dental professional can assess any treatment concerns and “[e]valuat[ing] for tight contacts with unwaxed floss and relieve with finishing strips if present.” *Id.*, ii. Invisalign also instructs clinicians to use a dental scaler to “check retention” of the aligner. EX1006, 1; EX2030, ¶58. These steps cannot be performed remotely. EX2030, ¶58. Indeed, Petitioner did not offer any product for remotely assessing aligner treatment progress until 2020. EX2007.

Petitioner and its expert select one image from Invisalign, shown below as Figure A, and reproduce it repeatedly. Paper 2, 32, 39-40; EX1002, ¶¶49, 71, 103.

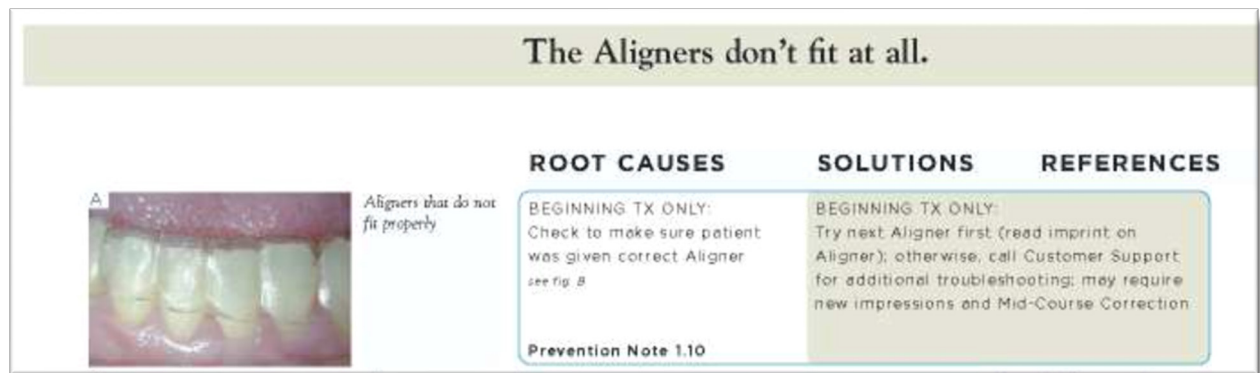


EX1006, 1. In its Institution Decision, the Board found persuasive Dr. Foroosh's assertion that Figure A was illustrative of what "a person would see when viewing teeth and an aligner in real life." Paper 7, 33. At deposition, however, Dr. Foroosh admitted to having "no idea" whether this figure is representative. EX2054, 60:18-61:4. Instead, he said he was "not relying on what an orthodontist would encounter" and did not "know the answer" to "what an orthodontist would encounter." *Id.*, 45:8-21; *see also id.*, 74:9-14 (describing such an understanding as "out of the scope of [his] expertise").

Unlike Dr. Foroosh, Dr. Kusnoto is an orthodontist and he does know what would have been seen when assessing aligners in real life. As Dr. Kusnoto explains, Figure A shows an aligner that has been partially inserted to ensure a large gap

between the teeth and aligner; it is not representative of an aligner fit situation that would be encountered by an orthodontist in 2017. EX2030, ¶¶61-64. Instead, Figure B—shown alongside Figure A above, and which is not cited or reproduced by Petitioner or Dr. Foroosh—is a better representation of what orthodontists had to evaluate during the normal course of aligner treatment. EX1006, 1; EX2028, ¶87; EX2030, ¶64.

Petitioner itself appears to recognize the extreme and artificial nature of the Invisalign image relied on by Dr. Foroosh, as it depicts an aligner that does not “fit at all” with significantly smaller gaps between the aligner and the teeth.



EX1006, 6.

Relatedly, although Invisalign indicates a separation between the teeth and the aligner of greater than 1 mm reflects a general aligner fit issue, it provides no method to quantitatively measure that separation, and describes only a visual approximation that would be made during an in-person check-up. EX2028, ¶91; EX2030, ¶59. An orthodontist in June 2017 could not reliably distinguish in person between, for

example, separations of 0.9 mm (on-track treatment) and 1.1 mm (off-track treatment) based on the visual examination taught in Invisalign. EX2030, ¶59. For this reason, Invisalign suggests that, in the case of a separation that appears to be less than 1 mm, the orthodontist should simply continue to monitor aligner fit. *Id.*

Invisalign makes no mention of capturing images to assess aligner fit, let alone doing so with a cellphone. Nonetheless, in the Institution Decision, the Board also noted Dr. Foroosh’s testimony that “the photographs of ... Invisalign are ordinary camera images such as those acquired by a cellphone.” Paper 7, 33. At deposition, however, Dr. Foroosh conceded the photographs in Invisalign were captured with a DSLR camera by a trained professional. EX2054, 71:11-14, 134:10-135:11. In 2017, training and a sophisticated camera and lighting setup were required to capture high-quality dental images, given the state of cellphone camera technology at that time. EX2030, ¶¶32-34. Petitioner’s CEO, Joe Hogan, confirmed this, stating that: “[e]arly on [in the 2020 COVID-19 pandemic], many doctors ***began*** using video calls, texts, and patient-submitted photos through a variety of platforms to help monitor patient progress, reduce in-office appointments, and ensure continuity of patient care during treatment.” EX2007. This was certainly not the standard of care in June 2017. To the extent Invisalign discloses capturing images at all, it is solely for the purposes of aligner design and manufacture—before the aligners ever exist. EX2028, ¶91; EX2030, ¶68; , 70:2-7.

Finally, Invisalign does not disclose analysis of any image by means of a deep learning device trained by means of a learning base. EX2028, ¶94.

C. Salah

Salah is directed to monitoring the position and/or shape of a patient's teeth over time. EX1008, 1:25-2:19; EX2028 ¶¶95-97; EX2030, ¶82; EX2054, 90:6-9. Salah's multi-step method includes creating a 3D digital reference model ("initial reference model"), acquiring a 2D image of the patient's arches ("updated image"), and, by comparing the initial reference model and a "final reference model" created from the "updated image," determining deformation or displacement of teeth between the creation of the reference model and the updated image. EX1008, 1:25-2:19; EX2028, ¶¶98-119; EX2030, ¶¶80-81. A POSA would have recognized that Salah is directed to assessing teeth alignment, which is distinct from assessing aligner fit. EX2028, ¶¶118; EX2030, ¶¶80-84.

As to image acquisition, Salah is clear—the goal is to enable "image acquisition [to] 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." EX1008, 31:4-7. Importantly, for these simple images to be useful, Salah first requires that a detailed 3D model of the patient's teeth is formed using physical modeling (e.g., "plaster model") or "preferably . . . using a professional device, such as a 3D scanner, preferably implemented by a healthcare

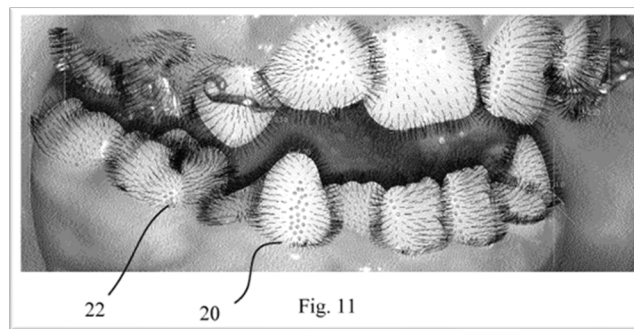
professional, such as an orthodontist or orthodontic laboratory.” EX1008, 19:25-20:21. Salah’s accuracy depends on starting with this detailed 3D model, as it becomes the reference for further analyses of the patient’s teeth over time. EX2028, ¶99. That is, the detailed reference model is a point of comparison for later-taken, lower-quality images. Salah never suggests that the lower-quality images are useful alone. *Id.*

To analyze the 2D updated image relative to the 3D digital reference model, Salah discloses preparing from the 2D image “an updated map relating to at least one piece of discriminant information,” which Salah defines as “characteristic information that can be extracted from an image (‘image feature’)” such as “contour information” or “[b]rightness information.” EX1008, 33:9-10, 18:11-17. Salah identifies eighteen “preferred methods” and eighteen methods that are “not preferred” but “can also be used,” for determining “discriminant information.” EX2028, ¶104. The preferred methods include contour detection techniques, such as the Canny algorithm. *Id.*; EX1008, 34:15-16. The non-preferred methods also include techniques that can be used in the process of determining and refining contours, including deep learning. EX2028, ¶104; EX1008, 36:14.

Nowhere does Salah indicate that the contour map for the “updated image” would reflect contours associated with individual identified teeth. EX2028, ¶105; EX1008, 18:14-15. As a result, Salah does not disclose determining “for each of a

plurality of teeth ...interior and exterior tooth outlines representing the outline of the free end of said tooth.” EX2028, ¶107. Nor does Salah disclose determining distance thresholds between tooth and aligner for a plurality of teeth. *Id.*

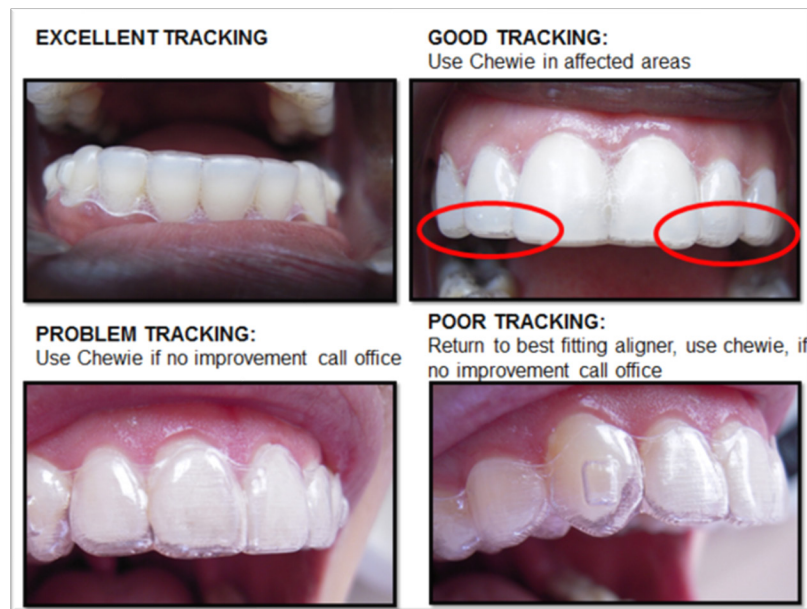
Salah is about tracking the movement of teeth, not an apparatus moving them. Salah uses discriminant information from the 2D updated image to update the 3D digital reference model to reflect that tooth movement over time. EX1008, 36:17-47:24; EX2028, ¶105. As Dr. Foroosh testified: “Salah is not talking about clear aligners; so obviously could not talk about how it fits -- how a clear aligner fits or seating on the teeth.” EX2054, 117:1-4; EX2028, ¶95. Nonetheless, citing Figure 11 (reproduced below), Dr. Foroosh alleges that Salah teaches acquiring images of teeth fitted with “orthodontic appliances.” EX1002, ¶¶72-73.



EX1008, FIG. 11; EX1001, ¶¶72-73. Salah never discusses imaging “orthodontic appliances” generally, and Dr. Foroosh has “no idea” if an orthodontist would use that term to describe the device in Figure 11. EX2054, 96:5-14. According to Patent Owner’s orthodontic expert, the device is a “bonded expander.” EX2030,

¶83. Dr. Foroosh’s efforts to extrapolate from a bonded expander to all orthodontic appliances, without even understanding what the device in Salah is, should be rejected. Unlike a clear aligner, a bounded expander is fixed to the teeth and cannot be readily removed. *Id.* A POSA would have understood that Salah’s assessment of tooth movement can be used despite wires affixed to the teeth. EX1008, 64:29-32. Salah does not suggest that the appliance itself is evaluated.

Notably, Salah never discusses images with removable aligners, nor the unique challenges that imaging and analyzing clear aligners would have posed. For example, Salah teaches that discriminant information is best extracted from areas of high contrast, but a POSA would have understood a clear aligner to present a low contrast with the teeth because it is intended to visually blend with the teeth. EX1008, 60:17-22; EX2028, ¶164; EX2030, ¶84. In the images below, the edges of the aligner are nearly the same color as the teeth. In the case of the “EXCELLENT TRACKING” and “GOOD TRACKING” photographs, the teeth and aligners are nearly-indistinguishable from a photograph alone.



EX2055. Thus, nothing in Salah would have guided a POSA to acquire an image of a patient's teeth with a clear aligner, let alone evaluate such an image to assess aligner fit.

VII. Petitioner Has Failed to Prove That the Ground References Render the Challenged Claims Obvious

The burden is on Petitioner to show that a POSA would have been motivated to combine the teachings of the prior art references to achieve the claimed invention and that would have had a reasonable expectation of success in doing so. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007). This inquiry concerns “whether a skilled artisan not only *could* have made but *would* have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention.” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015).

The mere fact that a possible arrangement existed in the prior art does not provide a reason that a POSA would have attempted such an arrangement. *Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 887 (Fed. Cir. 2024). Here, Petitioner has failed to identify why a POSA would have made the specific asserted combination, and instead relies on the type of hindsight *KSR* warned against. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

A. A POSA Would Not Have Been Motivated to Combine Kim, Invisalign, and Salah to Achieve the Claimed Invention

Petitioner's ground is based on an unqualified expert's misinterpretation of the ground references. When properly understood and correctly analyzed, however, Petitioner's references do not render the challenged claims obvious.

1. Petitioner's Expert Repeatedly Misinterprets Kim

Petitioner's motivation to combine Kim with Invisalign is premised on the incorrect assertion that Kim teaches the use of photographs of seated aligners in assessing treatment. Paper 2, 18-19; EX1002, ¶¶71-72. Petitioner's only basis for this assertion is the "clear aligner information" described in a single paragraph of Kim (EX1005, [0066]), but that teaching concerns images of the aligner itself, not a patient wearing the aligner. *Supra* § VI.A. Petitioner appears to recognize as much. Paper 2, 18 (admitting that "Patent Owner may argue Kim does not sufficiently

describe the aligner currently worn and imaged is in a service position on the patient's teeth"). *Supra*, § VI.A.

Even if the clear aligner information did include an image of a patient's teeth with an aligner on—which it does not—that image is not used for diagnostic or treatment purposes. *Id.* Only the separate teeth alignment information, comprising photographs of patients' teeth alone, is used for those purposes. EX1005, [0063], [0085], [0087], [0093]. And the purported benefits of Kim—enhancing accuracy, reducing the time and cost of treatment, and facilitating remote assessment—stem from Kim's use of teeth alignment information.

At deposition, Dr. Foroosh agreed that Kim's teeth alignment information and clear aligner information are distinct, and it is the teeth alignment information that is used to diagnose and treat patients. EX2054, 13:11-19, 15:12-23. Dr. Foroosh further admitted that there was no basis in Kim for his opinion that the reference discloses checking an aligner image to determine whether the aligner was “fitting well.” *Id.*, 22:6-19.

Because Petitioner and its expert misinterpret Kim as assessing aligner fit from an image, the purported motivation to combine Kim with Invisalign based on that misinterpretation should be rejected. *E.g.*, *Grit Energy Sols. v. Oren Techs., LLC*, 957 F.3d 1309, 1322 (Fed. Cir. 2020) (discounting expert testimony inconsistent with express disclosures of the prior art); *Biedermann Techs. v. K2M*,

Inc., 678 F. Supp. 3d 716, 723-24 (E.D. Va. 2023) (expert testimony insufficient to support anticipation when expert erred in analyzing the prior art).

Petitioner’s motivation to combine Kim with Salah is also based on the faulty premise that Kim “teaches application of *computer image analysis* to dental images.” Paper 2, 21; EX1002, ¶61. But Dr. Foroosh confirmed at deposition that Kim discloses no computer image analysis, and he withdrew this as a motivation to combine Kim with Salah. EX2054, 30:12-15; *see also* EX2028, ¶152. Petitioner identifies *no* other reason to combine Kim and Salah, and Dr. Foroosh’s misinterpretation of Kim should defeat this proposed combination as well. *See Grit Energy*, 957 F.3d at 1322; *Biedermann*, 678 F. Supp. 3d at 723-24.

2. Petitioner’s Expert Admitted to Not Understanding Key Portions of Invisalign

Invisalign is a “Clinical Monitoring Guide” intended “to help the Invisalign practitioner.” EX1006, i; *see also supra*, § VI.B. By his own admission, however, Dr. Foroosh is not an Invisalign practitioner and has no recollection of *ever* reading similar clinical guidelines before this case. EX2054, 32:20-33:3, 33:14-16. Because of his lack of orthodontic experience, Dr. Foroosh was unable to understand key portions of Invisalign or explain the meaning of terms appearing on the same pages of Invisalign that he cites in his declaration. *E.g.*, EX2054, 33:14-34:11 (cannot define “auxiliary,” appearing on page i), 36:5-17 (unaware of how “interproximal

reduction,” appearing on page ii, “affects the treatment”), 38:18-39:24 (having “no idea” what counts as “patient compliance,” appearing on page ii); *cf.* EX1002, ¶45 (citing Invisalign pages i-ii). Notably, Dr. Foroosh could not explain whether “an unengaged attachment” in Invisalign means the same thing as phrases used throughout his declaration, including an aligner that is “seated poorly” or “poorly fitted aligner. EX2054, 37:22-38:8; *cf.* EX1002, ¶¶58, 72, 103, 112 (referring to poorly seated or fitted aligners).

Dr. Foroosh also did not understand portions of Invisalign directly related to aligner fit. Although Invisalign discloses use of a scaler in-person to “check retention,” Dr. Foroosh “[did]n’t know what – what the document is referring to in this case and what operations a dentist should perform” and indeed “cannot know” how to use a scaler to check retention because he is “not trained as a dentist.” EX2054, 65:12-23. Dr. Foroosh thus ignored this portion of Invisalign, stating that it “didn’t” “factor into [his] opinions.” *Id.* 66:8-15. But this teaching from Invisalign is highly relevant because it confirms that Invisalign is directed to methods for assessing aligner fit that can only be performed in-person.

Dr. Foroosh also admitted to disregarding other aspects of Invisalign directed to in-office treatment, focusing instead on its “pictures” and “specific quantification methods” to “motivate a POSA for the combination that [he is] providing.” EX2054, 63:4-17; *see also id.*, 62:20-23 (“I rely on some of the disclosures in the form of

images or quantification methods that Invisalign is providing.”), 88:6-9 (“in my combination, I didn’t even use the fact that this is disclosing, you know – in fact, this is disclosing an in-office treatment”). Dr. Foroosh’s approach is improper. An expert cannot just “selectively cull[] from the prior art to fit the parameters of the patented invention.” *Cheese Sys., Inc. v. Tetra Pak Cheese and Powder Sys., Inc.*, 725 F.3d 1341, 1352 (Fed. Cir. 2013).

In its Institution Decision, the Board found persuasive Dr. Foroosh’s assertion that Figure A of Invisalign was illustrative of what “a person would see when viewing teeth and an aligner in real life.” Paper 7, 33. But Dr. Foroosh has since admitted that he has “*no idea*” whether the one photograph he selected from Invisalign shows a common position for an aligner on a patient’s teeth and he cannot say how an orthodontist would have allegedly measured the separation between tooth and aligner. EX2054, 60:18-61:4, 45:17-19, 58:24-59:7, 74:9-14 (describing such an understanding as “out of the scope of [his] expertise”). A POSA would have known, however, that orthodontists did not quantitatively assess aligner fit from photographs in 2017. EX2030, ¶¶45, 64.

In sum, Dr. Foroosh failed to properly analyze Invisalign as a prior art reference, which requires “full appreciation of what such reference fairly suggests to one of ordinary skill in the art.” *Application of Wesslau*, 353 F.2d 238, 241 (C.C.P.A. 1965). Because Dr. Foroosh was not qualified to evaluate Invisalign and

failed to consider it as a whole, his uninformed and incorrect opinions on how a POSA would have understood the teaching of this reference should be rejected. *See Medtronic Inc. v. Intermedics, Inc.*, 799 F.2d 734, 741 (Fed. Cir. 1986) (expert testimony should be “circumscribed ... on the basis of the witness’s range of expertise.”).

3. Petitioner’s Expert Admitted to Relying on Hindsight

Dr. Foroosh selected his combination using impermissible hindsight, driven by what is claimed in the ’945 patent and not the motivations and teachings of the art in 2017. *See KSR*, 550 U.S. at 421 (warning against “the distortion caused by hindsight bias” caused by “arguments reliant upon ex post reasoning”); *Otsuka Pharm. Co., v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012) (“The inventor’s own path itself never leads to a conclusion of obviousness; that is hindsight. What matters is the path that the person of ordinary skill in the art would have followed, as evidenced by the pertinent prior art.”).

Dr. Foroosh’s hindsight is apparent when you compare his approach for the ’945 patent to that for U.S. 11,049,248 (“the ’248 patent”), which Petitioner challenged in a co-pending proceeding. *Align Tech. Inc. v. Dental Monitoring S.A.S.*, IPR2024-00052. Like the ’945 patent, the ’248 patent claims a method for evaluating the shape of an orthodontic aligner. EX1001, cl. 1; EX2061, cl. 1. But critically, the ’248 patent requires analysis by means of a deep learning device

trained by a learning base, whereas the '945 patent requires the use of image processing software. *Id.*

In both IPRs, Dr. Foroosh relies on Kim, Invisalign, and Salah. With respect to the '248 patent—a patent that requires a deep learning device—Dr. Foroosh alleges that a POSA would have been motivated to use a neural network found in a fourth ground reference (Maninis *et al.*, “Convolutional Oriented Boundaries: From Image Segmentation to High-Level Tasks”), including based on the teachings of Salah. EX2062, ¶¶75-76. But for the '945 patent, “deep learning is not in the picture” and Dr. Foroosh is “not considering deep learning.” EX2054, 157:21-158:3. Instead, Dr. Foroosh says that a POSA would use a different, non-deep learning method identified as preferred in Salah, the Canny algorithm, to detect contours. EX1002, ¶83; EX2054, 178:20-179:2 (“[I]n this patent the '945, I'm saying that the POSA would say – he or she would go with the alternative of known [*sic*] deep learning method, and Salah is disclosing a whole group of those nondeep learning methods.”).

Dr. Foroosh does not explain why a POSA would have been motivated to select two different techniques from Salah for the two different patents. To the contrary, his alleged motivations of a POSA are the same for both patents. EX2054, 157:21-158:3, 159:10-13. Dr. Foroosh's selection of two different methods—one

preferred, one not—depending on the challenged patent exposes his improper hindsight-driven approach.

Because they rely on hindsight, Dr. Foroosh’s opinions should be afforded little weight. *Fox Factory, Inc., v. SRAM, LLC*, IPR2016-01876, Paper 59, 18 (P.T.A.B. April 2, 2018) (giving “little weight to [expert’s] testimony on rationale to combine” where motivated by hindsight).

4. A POSA Would Not Have Been Motivated to Assess Aligner Fit Using an Aligner Image

Kim does not disclose the use—or usefulness—of photographs showing seated aligners in an orthodontist’s remote evaluation of a patient’s treatment. EX2028, ¶149. Rather, Kim expressly relates to “remote teeth alignment services” using images of a patient’s teeth (without an aligner) to assess whether treatment is progressing correctly. EX1005, [0010]; EX2028, ¶68; EX2030, ¶¶71-75. In 2017, assessing teeth alignment and assessing the fit of an aligner were two distinct analyses. Typically, assessing the fit of an aligner involved a combination of visual and manual inspections that could only be performed by an orthodontist during in-person appointments. *Id.*, ¶¶49, 76. Kim never purports to provide a novel way to assess aligner fit from a photograph, nor contains any teaching to suggest that could be successfully achieved.

Consistent with the state of the art, Invisalign is concerned with in-person analyses, and it instructs orthodontists to perform certain steps at each appointment that could not be performed remotely. EX2030, ¶58. As Dr. Foroosh admitted, Invisalign discusses acquiring images only for the purposes of aligner design and manufacture, *i.e.*, before the aligners exist, and also does not teach analysis of any images. EX1002, ¶72; EX2054, 70:2-7 (Invisalign’s photographs are for manufacturing purposes only), 142:6-16 (“Invisalign is not disclosing” “doing that assessment [aligner fit] via a photo or a video”); EX2028, ¶150, EX2030, ¶68.

In the Institution Decision, the Board credited Dr. Foroosh’s opinion that “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.” Paper 7, 25. But Dr. Foroosh is not qualified to offer that opinion, and the image Dr. Foroosh relied upon was neither acquired on a cellphone nor representative of an aligner fit situation that orthodontists would have encountered in 2017. EX2028, ¶88; EX2030, ¶¶61-62.

Petitioner further alleges that: “[a] POSA also would have understood that *the type of image analysis suggested by Kim and Invisalign* could be readily applied on images or videos showing a clear orthodontic aligner being worn on the teeth of a patient.” Paper 2, 20. But as Dr. Foroosh rightly admitted, Invisalign discloses no

“type of image analysis” at all. EX2054, 143:2-5, 144:25-145:4. Neither does Kim. EX2028, ¶¶149, 166; *see also* EX1005, [0085].

Furthermore, a POSA would have recognized that the images in Invisalign were taken by trained professionals using specialized equipment and with a more sophisticated camera than a 2017 cellphone, under controlled lighting, to ensure their quality. EX2054, 71:11-14, 134:10-135:11; EX2030, ¶67. Nothing in Invisalign indicates that images taken with a cellphone would be suitable for assessing aligner fit.⁶ EX2028, ¶¶88, 150; EX2064, [0004] (noting that holding the cellphone “close to the teeth” could result in “blurry” images and “optical distortion”).

Although Invisalign notes that a separation of greater than 1 mm is indicative of a fit issue, it does not suggest measuring an aligner separation on an image to assess aligner fit. EX2028, ¶¶90, 151. Rather, as Dr. Kusnoto explains, in 2017, fit issues were difficult to diagnose with the naked eye and orthodontists used a

⁶ The Board was 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.’” Paper 7, 25. The sole basis for Petitioner’s contention, however, is Frey—a reference that is not prior art to the ’248 patent. *Infra*, § VII.C.

combination of visual examination and manual manipulation to determine whether an issue existed. EX2028, ¶¶151-52; EX2030, ¶¶63, 75-76.

For these reasons, a POSA would not have been motivated to modify the approach in Kim to obtain images of an aligner in a service position and measure the distance between tooth and aligner from a cellphone image captured by an untrained person, and nothing in Kim or Invisalign suggests that the in-person visual and manual inspection in Invisalign could be successfully replaced with computer-implemented analyses of patient-initiated photographs captured using a cellphone. EX2028, ¶152.

In its Institution Decision, the Board also noted Petitioner’s assertion that the combination of Kim and Invisalign “would be applying known methods for orthodontic evaluation of aligner fit.” Paper 7, 23-27. Again, Petitioner’s expert Dr. Foroosh is not qualified to offer an opinion on what was known in the orthodontic field in 2017. *See supra* § II. Dr. Foroosh is also wrong—in 2017, aligner fit was not quantitatively evaluated based upon a photograph of the aligner on the patient’s

teeth or by measuring the separation between a tooth and the aligner. EX2030, ¶¶45, 69. No methods existed in the prior art to do so.⁷ *Id.*

Petitioner also adds Salah to Kim and Invisalign, but that still would not have motivated a POSA to acquire images showing an aligner in a service position using a cellphone to assess aligner fit. Although Salah does include one image that shows a device positioned on the teeth, that device is a bonded expander that could not have been removed by the patient prior to taking the photograph—and not an aligner, which could have been readily removed. EX1008, FIG. 11; EX2028, ¶153; EX2030, ¶¶83-84. There is no dispute that “Salah is not talking about clear aligners; so

⁷ Petitioner notes that, when responding to a rejection under 35 U.S.C. § 112, Patent Owner confirmed that, with the benefit of the teaching in the specification, a POSA would have been able to practice the methods claimed in the '945 patent. EX1004, 241-242. However, Patent Owner never admitted that the prior art taught or suggested determining interior or exterior tooth outlines using an aligner image. This is confirmed by the Examiner's conclusion that the prior art did not disclose “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.” EX1004, 254-56.

obviously could not talk about how it fits -- how a clear aligner fits or seating on the teeth.” EX2054, 117:1-4.

Salah does not describe any method for assessing the fit of any device relative to the teeth. Rather, Salah assesses tooth positions over time by updating 3D models of a patient’s teeth. Salah further teaches that, to the extent contours are used to update those 3D models, only high contrast areas should be used to ensure a high-quality analysis. EX1008, 60:17-22; EX2028, ¶154. Specifically, Salah teaches that “an area of high contrast” can produce high-quality contours, whereas a “low-contrast area” will produce low-quality contours. EX1008, 60:17-24; EX2028, ¶181. Salah thus recommends processing the reference image to retain only the outlines identified with a high probability. EX2008, [0533]; EX1008, 61:2-4; EX2028, ¶154. That is because, if the “quality threshold is low, the discriminant information retained will be abundant, but *unreliable*” and this “will then lead to the retention of ‘false’ contour points, i.e. points which, will be mistakenly considered as belonging to the contour of teeth and gums.” EX1008, *Id.*, 60:27-61:1. Salah thus teaches that it is preferred that “the quality threshold is high in order to retain only highly reliable discriminating test information.” *Id.*, 61:2-3.

Because aligners visually blend with the teeth, they represent areas of low contrast. EX2030, ¶84; EX2028, ¶164. A POSA would have understood Salah to teach away from using contour detection with aligner images. EX2028, ¶¶154, 164.

KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 416 (2007) (“[W]hen the prior art teaches away from combining certain known elements, discovery of [] successful means of combining them is more likely to be nonobvious.”); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (substituting a method into the prior art that “would have been expected to perform inefficiently in that role” undermines motivation); *see also Plas-Pak Industries, Inc. v. Sulzer Mixpac AG*, 600 Fed. App’x. 755, 758 (Fed. Cir. 2015) (“a change in a reference’s ‘principle of operation’ is unlikely to motivate a person of ordinary skill to pursue a combination with that reference”).

For all of the above reasons, a POSA would not have been motivated to combine these three references. This lack of motivation defeats Petitioner’s arguments as to all challenged claims. Paper 2, 24., 34, 37-38, 44, *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020) (“The obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether they would have been motivated to do so.” (internal quotations omitted)). Additionally, none of Petitioner’s references, alone or together, suggest that the analysis of tooth positions using photographs of teeth (without aligners) in Kim or Salah or the in-person visual and manual inspection in Invisalign could be successfully replaced with computer-implemented analyses of patient-initiated aligner images captured using a cellphone. Accordingly, even combining

Petitioner’s reference does not render obvious a method for evaluating the shape of an orthodontic aligner comprising “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.”

B. The Combination of Kim, Invisalign, and Salah Does Not Disclose Or Render Obvious the Claimed Evaluation of Interior and Exterior Tooth Outlines

Even if a POSA would have been motivated to combine the references as Petitioner proposes—and they would not—the combination does would not achieve a method of “evaluating the shape of an orthodontic aligner” that includes “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” and “comparison of the interior and exterior tooth outlines, so as to determine at least one score according to said comparison,” as each of the challenged claims requires. *See* steps 1(3) and 1(4) of claim 1; EX2028, ¶¶158-70. Specifically, Kim, Invisalign, and Salah, taken together, do not suggest

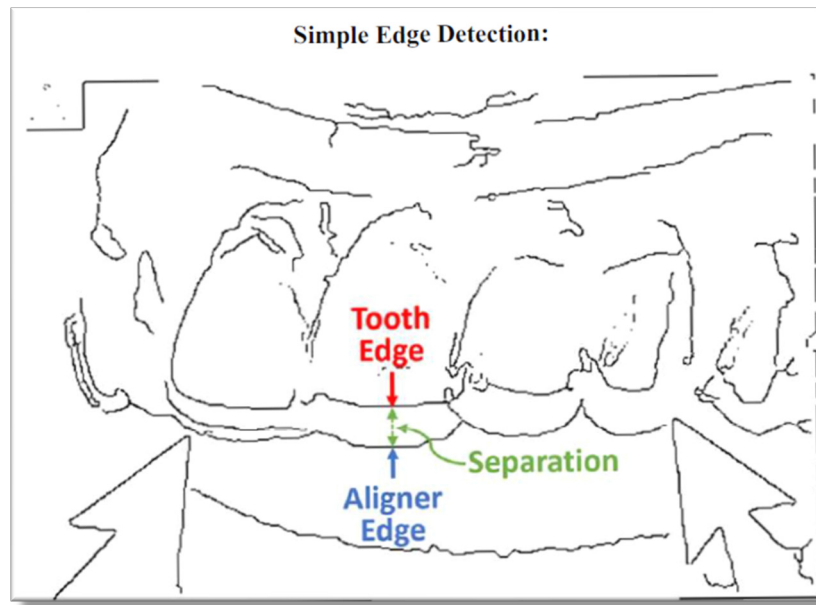
determining interior and exterior tooth outlines for a plurality of teeth in a single image, and then comparing them to determine a “score,” as claimed.⁸

Petitioner argues that Salah teaches analysis of “contours of objects depicted in the [dental] images.” Paper 2, 30; EX1002, ¶81. Although Salah discloses a contour map of tooth edges showing the outline of teeth in Fig. 6b, Salah nowhere suggests the use of image processing to detect aligners, let alone exterior tooth outlines representing the aligner. EX2028, ¶160. Salah instead discloses a method of monitoring tooth movements that updates a 3D reference model using an updated 2D image of a patient’s teeth without aligners, and the updated 3D model is then compared with the initial 3D model to determine tooth displacement. *Supra*, § VI.C; EX1008, 46:9-14, 1:1-2:22; EX2028, ¶160. Salah thus discloses an entirely different approach to that in the challenged claims—one that monitors tooth positions, and not the shape of an aligner as in the ’945 patent. EX2028, ¶160. During prosecution, the Examiner agreed that methods of monitoring tooth movement are distinct from the claimed methods that require “determination, by means of image processing software, for each of a plurality of teeth represented on the dentition and aligner

⁸ Petitioner’s arguments are limited to claimed embodiments in which the dentition and aligner images are the same two-dimensional image. Paper 2, 28; EX1002, ¶80. Therefore, a finding that these embodiments are non-obvious would be conclusive.

images, of interior and exterior tooth outlines representing the outline of the free end of said tooth on the dentition and aligner images, respectively,” concluding that this feature was not found in the prior art. EX1004, 254-56.

Salah never discloses recognizing which detected contours correspond to teeth as opposed to something else, like an aligner. EX2028, ¶¶161-62. It similarly does not disclose recognizing which portions of a detected contour correspond to individual teeth, or whether portions of two contours correspond to the same tooth. *Id.* That sort of analysis is simply not necessary to practice the methods of Salah. EX2028, ¶161. These shortfalls are illustrated by Dr. Foroosh himself, who took Figure A of Invisalign and applied the Canny edge detection taught as a “preferred” method in Salah. EX1002, ¶83; EX2028, ¶162. The result is an image that shows lines corresponding to edges, but not what the edges relate to. *Id.* Dr. Foroosh had to *manually* identify and label the “Tooth Edge,” “Aligner Edge,” and “Separation” in his resulting image below:



EX1002, ¶83; EX2054, 179:25-180:23 (“Canny edge detection ... wouldn’t be able to say which edge is a tooth edge or any other edge.”).

Petitioner does rely on any other image processing software or any other way of identifying the contours. Accordingly, Petitioner has not met its burden to show that, even if a POSA did rely on Salah as Petitioner says, it would have resulted in a method to distinguish the edge of a tooth from the edge of an aligner in order to “determine[e], *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,” as recited in claim 1. EX2028, ¶163. For the same reasons, it does not disclose “determination of a distance score dependent on the

distance between the interior and exterior teeth outlines, and the distance threshold,” as recited in claim 5. *Id.*

Salah has other deficiencies as well. Salah discloses one example of a reference map generated for an image with a bonded expander (EX1008, Figure 11), but, as detailed above, that device is not an aligner. *Supra*, § VI.C. The discriminant information used to generate this map was reflection information, not contour information. EX1008, 64:7-8; EX2028, ¶164. Regarding contour information, Salah teaches away from using low contrast contours, calling them “unreliable.” EX2028, ¶164; EX2030, ¶84. A POSA would have recognized aligners contours visually blend with the teeth and would not have provided the required strong contrast. EX2028, ¶164; EX2030, ¶84.

Because Salah discloses a different method, and does not disclose analysis of photographs showing an aligner in the seated position in a patient’s mouth, “[a]pplying the image processing approach taught by Salah to use image processing software to detect contours in an image representing a patient’s teeth with an aligner” would not “result in detection of the edges of the depicted objects (teeth, aligner portions, etc.)” as Petitioner says. EX1002, ¶83; Paper 2, 31; EX2028, ¶165.

Petitioner points to no teaching or motivation in the other references that could fix this deficiency. For example, Kim discloses only that the orthodontist conducts some unspecified visual review of images of the patient’s teeth without aligners or

images of the aligners alone. *Supra*, § VI.A; *see also* EX2028, ¶166. Invisalign also does not disclose analysis of an aligner image by *any* means, let alone with image processing software. Rather, Invisalign discloses a visual approximation performed in person by a dental practitioner and provides no method to measure separation. *Supra*, § VI.B; EX1006, ii; EX2028, ¶166; EX2054, 33:14-34:11, 38:18-39:24, 42:4-7, 65:12-23. Invisalign does not suggest that its in-person approach could be applied to the analysis of aligner images using image processing software. EX2028, ¶166. And as set forth above, Salah would have taught a POSA that, given the lack of strong contrast, it could not. *Id.*

In its Institution Decision, the Board found persuasive Dr. Foroosh's assertion, with reference to Invisalign Figure A, that a POSA "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." Paper 7, 32 (citing EX1002, ¶¶61-64; *see also id.*, 29 (citing EX1002, ¶¶61-63)). The Board also credited "the illustration provided by Dr. Foroosh" and his statement 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." *Id.*, 33 (quoting EX1002, ¶83). Only Invisalign includes a photograph of teeth and an aligner, and as noted above, at deposition, Dr. Foroosh admitted to having "no idea"

whether this figure from Invisalign is representative or how an orthodontist would measure separation based on Invisalign. EX2054, 33:14-34:11, 38:18-39:24, 42:4-7, 60:18-61:4, 65:12-23, 74:9-14 (describing such an understanding as “out of the scope of [his] expertise”). Without understanding the technique to be performed, Dr. Foroosh is not qualified to opine on an alleged motivation to do it another way. Dr. Foroosh also confirmed that the photographs of Invisalign are *not* cellphone images (as he said in the portion of his declaration quoted by the Board) but more sophisticated DSLR images (EX2054, 71:11-14, 134:10-135:11), which means that they are not in fact representative of a cellphone image of an aligner on teeth that a POSA would have encountered in 2017.

As Patent Owner’s experts explain, given the shortfalls of Petitioner’s references—taken together—a POSA would not have been motivated to pursue a brand-new method of assessing aligner fit from simple cellphone images. EX2028, ¶168. While *DyStar Textilfarben GmbH v. C.H. Patrick Co.* acknowledges that “a motivation to combine prior art references” may exist “even absent any hint of suggestion in the references themselves,” its reasoning is limited to “situations” motivated by the “universal” “desire to enhance commercial opportunities by improving a product or process.” 464 F.3d 1356, 1368 (Fed. Cir. 2006). That is, *DyStar* says that motivation can arise when the combination “results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner,

faster, lighter, smaller, more durable, or more efficient.” *Id.* Petitioner does not contend that the ’945 patent is a mere improvement of an existing technique in the art—the ’945 patent instead results in a **brand-new** technique that is able, for the first time, to assess aligner fit from a patient-created cellphone image, an entirely new type of process, for an entirely new purpose. *DyStar* thus does not address this context, in which prior art must be reconfigured for a new purpose. In situations like this one, “[t]he obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether ‘they would have been motivated to do so.’” *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020) (quoting *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014)). “Fundamental differences between the references are central to this motivation to combine inquiry.” *Id.*

As a result, Petitioner fails to show that its references disclose “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,” as required by Step 1(3) of claim 1, on which all other claims depend. EX2028, ¶169.

Because none of the references disclose Step 1(3), Petitioner’s references also fail to disclose “comparison of the interior and exterior tooth outlines, so as to

determine at least one score according to said comparison” as recited in Step 1(4). EX2028, ¶170. Further with respect to the claimed “score” of Step 1(4), Petitioner points to Kim’s teaching of determining “whether the clear aligner is normal and corresponds to an appropriate step,” and says that the measurement of separation in Invisalign would be used “[a]s part of this assessment.” Paper 2, 33-34 (citing EX1005, ¶66). As detailed above, this portion of Kim does *not* relate to assessing aligner fit or images showing an aligner seated on teeth, and describes only assessing whether the aligner is in working condition and appropriate for the current stage of treatment. *Supra* § VI.A; EX2028, ¶79; EX2030, ¶74. And Invisalign never suggests making a measure of separation. EX2028, ¶¶90, 170; EX2030, ¶59.

C. Frey Is Not Prior Art and Cannot “Confirm” Motivation

Petitioner contends that Frey (EX1009) “confirms that acquiring digital photographs of patient’s teeth, including patient-acquired cellphone images of teeth of patients wearing aligners in a service position, was known to be a useful practice for assessment of a patient’s orthodontic treatment status.” Paper 2, 23; EX1002, ¶60. However, Frey cannot confirm a motivation in the prior art because it is not itself prior art.

Frey is a blog post entitled “DIY Dental Monitoring Solution” from April 29, 2017. EX1009, 17. Frey acknowledges Patent Owner’s software and proposes a “do-it-yourself teleorthodontics system” derived from Patent Owner’s techniques.

Id., 17-18, 26. Frey links to an earlier post, which confirms that, shortly before April 29, 2017, he “had the Dental Monitoring folks come by the office” and describes Patent Owner’s various products and services. EX2053, 1.

Under § 102(b)(1), a disclosure made within a year of the priority date—like Frey—is not prior art if it was made “by another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor” (§ 102(b)(1)(A)) or “the subject matter disclosed had ... been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor” (§ 102(b)(1)(B)). Both exceptions apply. First, by his own admission, Frey derived his post from the ’945 patent inventors’ own disclosures and the reference is therefore excluded under § 102(b)(1)(A). EX1009, 17; EX2053, 1. Second, under § 102(b)(1)(B), the ’945 patent inventors publicized the same subject matter as Frey—as is evident from Frey relying on their marketing disclosures—and the exception therefore “applies to the subject matter in [Frey] being relied upon as prior art ... that was also publicly disclosed by [the inventors] before” April 29, 2017. M.P.E.P. § 2153.02. Thus, to the extent Frey discloses any part of the invention of ’945 patent, the ’945 patent confirms that Patent Owner’s products referred to and copied in Frey were invented by the same four inventors as the ’945 patent.

Even if Frey could be considered, however, it does not suggest using a computer to analyze any images. EX1009, 17-27; EX2028, ¶144; EX2054, 149:16-150:1. Frey only suggests remotely obtaining a video that the orthodontist would then visually review. Thus, it cannot confirm a motivation to apply computer-implemented image analysis to photographs of aligners in the service position on teeth and Petitioner's arguments based on Frey impermissibly following the '945 patent inventors' own inventive path. *E.g., See Otsuka Pharm. Co., v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012) ("The inventor's own path itself never leads to a conclusion of obviousness; that is hindsight.").

VIII. Conclusion

Patent Owner respectfully submits that the Board should find all the challenged claims patentable over the ground raised in the Petition.

Date: July 12, 2024

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Certificate of Word Count

The undersigned hereby certifies that the portions of the above-captioned **DENTAL MONITORING SAS'S PATENT OWNER'S RESPONSE** specified in 37 C.F.R. § 42.24 has 12,678 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft® Word for Microsoft 365 MSO.

Date: July 12, 2024

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Certificate of Service

Pursuant to 37 C.F.R. §§ 42.6(e), the undersigned certifies that on July 12, 2024, a complete copy of **DENTAL MONITORING SAS'S PATENT OWNER'S RESPONSE** was served via electronic mail on the following counsel of record for Petitioner at the email addresses: mrosato@wsgr.com, margenti@wsgr.com, and pmedley@wsgr.com, as indicated in the Petition for electronic service to the following Petitioner counsel:

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