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 SUR-REPLY

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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)

Exhibit Number	Description
2014	[RESERVED]
2015	[RESERVED]
2016	[RESERVED]
2017	[RESERVED]
2018	[RESERVED]
2019	[RESERVED]
2020	[RESERVED]
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]

Exhibit Number	Description
2033	American Board of Orthodontists, *Ideal Photographs and Radiographs*
2034	Institute of Medical Illustrators, *IMI National Guidelines: Orthodontic Photography* (Feb. 2008).
2035	Canon, *Canon Dental Photography Guide* (2015)
2036	[RESERVED]
2037	Excerpts from Declaration of Dr. Maureen A. Valley in *Dental Monitoring SAS v. Align Technology, Inc.*, 3:22-cv-07335-WHA (Dkt. 104-5)
2038	R. Kaplan, *Standardization for Serial Intraoral Photography*, The C.V. Mosby Co. 431 (1979)
2039	[RESERVED]
2040	S. Samawi, *Clinical Digital Photography in Orthodontics: Professional Photographic Records in Daily Practice*, 18 Jordan Dental J. 20 (2012)
2041	[RESERVED]
2042	[RESERVED]
2043	[RESERVED]
2044	[RESERVED]
2045	[RESERVED]
2046	I. Ahmad, *Digital Dental Photography, Part 2: Purposes and Uses*, 206(9) British Dental J. 459 (May 2009)
2047	S. Finlay, *Photographic Analysis and Diagnosis: Step One*, 2(3) Inside Dentistry (Oct. 2009)

Exhibit Number	Description
2048[1]	Deposition Transcript of Dr. Hassan Foroosh, Ph.D., in IPR2023-01369 (May 17, 2024)
2049	[RESERVED]
2050	[RESERVED]
2051	[RESERVED]
2052	[RESERVED]
2053	Declaration of N. E. Frank-White (attaching S. Frey, *A Quick Look at Dental Monitoring*, *The Ortho Cosmos*, 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	*Making Sure Your Invisalign Aligners Fit Correctly*, Morita Orthodontics (2016)
2056	Apple, *Apple Reinvents the Phone with iPhone*, Apple Newsroom (Jan. 9, 2007)

[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).

[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).

Exhibit Number	Description
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 *inter partes* review of U.S. Pat. No. 11,049,248
2063	N. Smith, *Clear aligner therapy: An esthetic approach to total patient care*, Dentistry IQ (Sept. 25, 2017)
2064	Provisional Patent Application No. 62/417,985 to Carrier et al.
2065	Deposition Transcript of Dr. Hassan Foroosh, Ph.D., in IPR2024-00110 and IPR2024-00052 (November 8, 2024)

I. Introduction

The ’945 patent describes and claims a brand-new technique that is able, for the first time, to assess aligner fit from a patient-created cellphone image, a fact that Petitioner does not contest. POR, 57. Against this groundbreaking technique, Petitioner’s proposed combination pulls together three disparate references, relying on a series of supposed motivations that range from misguided to erroneous, premised on opinions from an unqualified expert lacking any dentistry or orthodontic experience. Petitioner’s arguments fail and should be rejected.

Even if the references are combined, the combination fails on the merits because the claims indisputably require determining an outline of a tooth and an outline of an aligner, and then comparing the two. Petitioner’s combination fails to describe any technique that is capable of distinguishing a tooth outline from an aligner outline or any other outline (such as a tongue or lips), let alone matching two outlines so as to compare the outline of a particular tooth with the corresponding aligner outline. Petitioner has no response to this, other than pointing to conclusory expert arguments that were nowhere in the Petition.

II. Dr. Foroosh Lacks Requisite Skill in the Art

Petitioner’s entire case rests on the opinions of one expert. Dr. Foroosh is not qualified as a POSA under either party’s definition and, as a result, rendered

unqualified and incorrect opinions regarding the teachings of references indisputably in the dental field. POR, 4-6.

To try to excuse Dr. Foroosh's failings, Petitioner misconstrues Patent Owner's POSA definition, which provides for consultation with "individuals familiar with medical imaging, dental imaging, dentistry, and/or orthodontics." POR, 4. So too does Petitioner's definition. POR, 3-5. Petitioner now says a POSA needs only experience in medical or dental imaging, and not dentistry or orthodontics. Reply, 2. But to interpret and apply art in the dental field, as opposed to the medical imaging field, consultation with a person experienced in dentistry or orthodontics is necessary under both POSA definitions. POR, 4.

Someone with experience only in "medical and dental imaging" does not automatically have the requisite dental or orthodontic experience. Indeed, Dr. Foroosh has no training or experience with dentistry or orthodontics, and he has never assessed aligner fit.[3] POR, 5; EX2065, 46:22-47:7, 49:6-12. Thus, he is

[3] While Dr. Kusnoto rightly testified that someone experienced in medical imaging "who has work[ed] a lot in" the dental field "can certainly know the relevan[ce] of the aligner's treatment," it does not follow that all such individuals would. Reply, 3 (quoting EX1052, 27:7-28:6). Dr. Foroosh has worked on one project that involved

(Cont'd on next page)

unqualified to opine alone on the alleged obviousness of a new "method for evaluating the shape of an orthodontic aligner," as claimed. POR, 3-6, 15-16. Dr. Foroosh simply does not know how aligner fit was assessed prior to the '945 patent and was unable to fully understand the references describing it, and therefore, is not able to opine on whether a POSA would have designed the claimed aligner fit assessment method that can be performed remotely. *Id.*

Petitioner oversells Dr. Kusnoto's testimony, saying he "admit[ed] that Dr. Foroosh correctly understood the terms used." Reply, 2-3. But Dr. Kusnoto was asked only about "terms" and "terminology." Reply, 3. Patent Owner's critique is not that Dr. Foroosh used incorrect vocabulary, but that he misunderstood the references as a whole. For example, Dr. Foroosh misunderstands Kim as assessing aligner fit from an image of a seated aligner, when it discloses no such images, let alone therapeutic assessments based on them.[4] POR, 36-38. Dr. Foroosh also did

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dental—not aligner—images. EX1002, ¶6. That cannot possibly qualify as "work[ing] a lot in the field." POR, 5.

[4] Petitioner's footnote that "Dr. Mongan…formed his opinions regarding the Kim reference before even consulting Dr. Kusnoto" is misleading. Dr. Mongan testified that he formed certain specific opinions set forth in two paragraphs of his declaration

(Cont'd on next page)

not know "what [Invisalign] is referring to" or "what operations a dentist should perform" to assess aligner fit according to Invisalign, and admitted to improperly disregarding these teachings. EX2054, 65:12-23, 66:8-15; POR, 38-41. It is manifest that Dr. Foroosh's lack of dental experience and failure to consult with any individual having such experience pervades his opinions, and his opinions should therefore be given no weight. *Kyocera Senco Indus. Tools Inc. v. Int'l Trade Comm'n*, 22 F.4th 1369, 1376-77 (Fed. Cir. 2022) ("To offer expert testimony from the perspective of a skilled artisan…a witness must at least have ordinary skill in the art. Without that skill, the witness' opinions are neither relevant nor reliable.").

Petitioner points to the "Technical Field" identified in a different patent—U.S. Patent No. 11,049,248—to argue that dental or orthodontic experience is not required. Reply, 4. If the Technical Field stated in a patent is dispositive, it defeats Petitioner's point since the "Technical Field" of the '945 patent recites:

> The present invention relates to a ***method of evaluating the shape of a tray-like orthodontic appliance known as an "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.***

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before speaking with Dr. Kusnoto, and he later confirmed he was correct in his discussions with Dr. Kusnoto. EX1051, 30:3-31:15; EX2028, ¶78.

> The invention also relates to a ***method for adapting a treatment using orthodontic aligners***. The invention finally relates to a computer program for implementing these methods.

EX1001, 1:5-13. Dr. Foroosh undoubtedly has no experience "evaluating how well" an aligner "conforms to the position[] of the teeth," let alone any "method for adapting a treatment using orthodontic aligners." *Id.*

In any event, Petitioner's quibble with whether the relevant field is "aligner treatment" or "dental arch image analysis" is irrelevant. Reply, 3-4. Both "aligner treatment" and "dental arch image analysis" require a working knowledge of dentistry or orthodontics, which Dr. Foroosh lacks. POR, 5. Petitioner's reliance on Kim and Invisalign belies what it now calls the "field." Invisalign and Kim concern "aligner treatment," not "dental arch image analysis." Petition, 5-8; EX2028, ¶¶66-93.

Recognizing its expert's failings, Petitioner also seeks to rely on Dr. Maureen Valley's declaration in a different IPR, involving a different patent and ground references. Reply, 2 (citing IPR2023-01369, Paper 23 and EX1035). That is both improper and inapposite. *Unified Patents Inc. v. Sound View Innovations, LLC*, IPR2018-00599, Paper 50, at 50-51 (P.T.A.B. Sept. 9, 2019) (excluding declaration from different IPR as hearsay). Dr. Foroosh did not consult Dr. Valley here.

EX2065, 11:20-12:3; EX2054, 124:16-19. Besides, Dr. Valley's declaration cannot save Petitioner—it does not even address Kim and Invisalign.

III. Claim Construction Requires "Interior And Exterior Tooth Outlines" "For Each of a Plurality of Teeth"

Petitioner says that whether "outlines must be detected for each of plurality of teeth and the corresponding parts of the aligner" "makes no difference to the case presented in the petition." Reply, 5. Petitioner then says that "the petition expressly proposed detecting outlines of the free ends of each tooth (and the corresponding parts of the aligner)." Reply, 5-6. Thus, it appears that Petitioner agrees with Patent Owner's construction, which requires "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." POR, 17. As discussed below, this construction is significant to the merits, as Petitioner has not shown that its combination can determine whether a contour pertains to a tooth or an aligner, that is, whether the contour is an interior tooth outline or exterior tooth outline. *Infra,* §VII; *see also* POR, 50-60.

IV. Petitioner's Supposed Motivations to Combine Are Erroneous

At each turn, the Reply compounds the Petition's misinterpretations of the references to suggest inaccurate motivations to combine them.

A. There Was No Motivation to Combine Kim with Invisalign or Salah

The Petition finds motivation to combine Invisalign with Kim "[i]n view of Kim's disclosure of orthodontic checking of a photo or video of an aligner currently worn by the patient."[5] *Id.*, 19. However, Kim does not disclose an image of a seated aligner. Rather, Petitioner takes one paragraph of Kim—relating to "clear aligner information"—out of context and applies it to the distinct "teeth alignment information." POR, 36-37. To be clear, the teeth alignment information of Kim relates to assessing teeth alignment of bare teeth, not assessing aligner fit. EX2030, ¶¶71-73. Petitioner's Reply does not, because it cannot, justify Petitioner's conflation of these two distinct aspects of Kim.

Petitioner instead doubles down on this single paragraph. Based on mere attorney argument and the word of an expert who has ***never*** assessed aligner fit,

[5] Petitioner's combination begins with Kim. Petition, 17-18. As an initial matter, Kim is not a prior art patent or printed publication under 35 U.S.C. § 311(b) because it was not published before the priority date and never issued as a patent. Thus, it cannot be used as a ground reference. *See Lynk Labs, Inc. v. Samsung Electronics Co., Ltd.*, No. 2023-2346 (Fed. Cir.). Even if Kim can be considered, it does not support Petitioner's case here.

Petitioner says that "the clear aligner currently worn" refers to an aligner on teeth. Reply, 7-8; EX2065, 46:22-47:7, 49:6-12. In contrast, Patent Owner's experts explain why this paragraph discloses only images of aligners on their own, each citing numerous other statements in Kim supporting their interpretation. EX2030; ¶¶71-79; EX2028, ¶¶71-80. Dr. Kusnoto reached his opinion using his undisputed orthodontics expertise, and Dr. Mongan's view is based on Kim's disclosures of distinct computer architectures. *E.g.*, EX2030, ¶74; EX2028, ¶¶72-74; EX1051, 31:2-15. Dr. Mongan then consulted with Dr. Kusnoto to confirm his understanding. EX2028, ¶78.

Petitioner suggests that the images of Kim must show seated aligners because "PO points to no evidence…that photos of aligners on their own provided dental practitioners with meaningful information during treatment." Reply, 7. However, Invisalign discusses visual examination steps to assess the aligner off the teeth, including "read[ing] the imprint on Aligner" to ensure the patient is using the correct aligner and checking for "Staining or discoloration" or "Holes or bubbles," all of which would be equally important in the remote methods of Kim. EX1006, 6, 36-37. Invisalign thus recognizes that important clinical information can be drawn from the aligner on its own.

Even if Petitioner were correct that Kim teaches images of aligners on teeth—it does not—Petitioner's expert confirmed Kim itself provides no basis for

determining whether the aligner is "fitting well" from an image alone. EX2054, 22:6-19. Thus, even under Petitioner's view, Kim cannot provide the motivation or expectation of success to assess aligner fit from an image, and no other ground reference alone or in combination suggests analyzing images of aligners on teeth at all. POR, 30-31, 34-35.

Next, the Petition erred in its supposed motivation to combine Kim and Salah, stating that "Kim teaches application of computer image analysis to dental images." Petition, 21. In the Reply, Petitioner reframes this argument, suggesting that Kim somehow teaches "analysis of images on computers" akin to Salah's computer-aided image analysis to justify their combination. Reply, 8-9. Either way, Petitioner's expert disclaimed this motivation at deposition. POR, 38 (citing EX2054, 30:12-15). Kim—at best—teaches visual inspection of images displayed on a computer. Reply, 8-9 (quoting EX1005, ¶66 ("the orthodontist checks [the] photo or video")); EX2030, ¶78. Moreover, an orthodontist "check[ing]" an image is far afield from the computer-implemented image analysis of Salah. Importantly, as Kim discloses only cellphone images taken by untrained persons using 2017 technology, there is no teaching or suggestion that these images would be suitable for computer-implemented analysis at all. POR, 25-26.

B. Petitioner's Expert Disregarded Key Portions of Invisalign and His Opinions on Motivation Are Thus Unreliable

Petitioner tries to sidestep the fact that Dr. Foroosh was unable to understand and therefore disregarded Invisalign's teachings regarding in-office examinations. POR, 38-40. Incredibly, Petitioner contends it was permissible for Dr. Foroosh to "focus[] on measurements that can be performed remotely on images" and ignore the rest of Invisalign. Reply, 10. But Dr. Foroosh's opinion that "Invisalign's teachings of how to evaluate aligner fit" can be readily replaced with "analyz[ing] images of the teeth of a patient wearing an aligner in a service position to evaluate whether the aligner fits appropriately" (EX1002, ¶59) lacks credibility. How can Dr. Foroosh know that Invisalign's "measurements [] can be performed remotely on images" (Reply, 10) when he does not understand how aligner fit was assessed in-person or whether and how any measurements were performed? EX2054, 45:17-19, 58:24-59:7, 74:9-14 (that understanding was "out of the scope of [his] expertise"). Dr. Foroosh cannot. Rather, as Dr. Kusnoto explained, aligner fit was not assessed by making measurements; it required a combination of in-person visual and manual assessments. EX2030, ¶¶58-59, 66. The prior art did not suggest that this holistic assessment could be replaced by a remote measurement of a cellphone image. POR, 44-46, 49.

C. Petitioner Cannot Reconcile Salah's Need for "Contrast" with Its Use for Clear Aligners

Petitioner argues that Salah does not teach away from using its image analysis techniques on low-contrast areas, such as those showing clear aligners on teeth. Reply, 10-11. Not so. Salah does not "merely observe[] that higher-contrast areas can produce higher-contrast contours" (*id*., 11); Salah actually removes low-contrast contours from the analysis altogether because they are unreliable. EX1008, 61:2-3; EX2028, ¶154.

Petitioner—unable to dodge the fact that Dr. Foroosh based his opinions on an egregiously unrealistic aligner image from Invisalign—says it was "straightforward" to analyze more representative images. Reply, 10. However, more representative images would have lower contrast and the Petition and the Board's Institution Decision were based on Dr. Foroosh's assertion that Figure A of Invisalign could be readily analyzed using the techniques of Salah and Maninis. Petition, 19-21; Institution Decision 7, 33. Indeed, Dr. Foroosh tried to duplicate his analysis of Invisalign's Figure A on other images and had to adjust the scale of his Canny algorithm to account for contrast and sharpness, presumably because the parameters selected for his original analysis were unsuitable for these other images. EX2065, 12:25-13:13, 14:10-19, 16:22-17:5. Regardless, the question is not whether Dr. Foroosh can detect contours, but whether a POSA upon reading Salah

would have tried to do so with a reasonable expectation of success. They would not. EX2028, ¶154.

In apparent recognition of the weakness of Salah, in a co-pending IPR, Petitioner points to a further reference as allegedly "teach[ing] how to use differences in contour strength." *Align Tech. Inc. v. Dental Monitoring S.A.S.*, IPR2024-00052, Paper 25, 17. Petitioner, however, makes no such argument here.

V. Frey Is Not Prior Art

Frey says that the disclosures relied upon in the Petition came from Patent Owner. EX1009, 17-18, 26; Petition, 21, 28. Petitioner does not dispute that the inventors of the '945 patent were Patent Owner's employees. It therefore follows by necessity that any disclosure obtained from Patent Owner was obtained "directly or indirectly" from the inventors, as required by both §102(b)(1) exceptions. Because the disclosures of Frey relating to the subject matter of the '945 patent were derived from the inventors, Frey is not prior art.

Frey cannot be considered if it is not prior art. Petitioner relies on Frey to assert that images of aligners on teeth were "known to be a useful practice for assessment of a patient's orthodontic treatment status" in 2017. Petition, 21. Frey is the ***only*** reference to suggest the use of such images and is therefore not merely confirmatory of other references. *Cf. Yeda Rsch. v. Mylan Pharms. Inc.*, 906 F.3d 1031, 1041 (Fed. Cir. 2018) (post-priority date evidence allowed where opinion

also supported by other prior art). Moreover, Frey is not probative of motivation when its teachings come from the same source as the '945 patent, *i.e.*, Patent Owner. *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.").

Petitioner also now points to an earlier Frey post—cited in Patent Owner's Response, and not the Petition—describing Dr. Frey's personal practice. Reply, 12 (citing EX2053, 7). It does not disclose that Dr. Frey was remotely analyzing images of aligners seated on teeth. Dr. Frey's vague hearsay that "[w]e routinely do this for international and out-of-state patients already" does not specify if the "this" refers to photo monitoring for clear aligner patients or for patients using braces or other orthodontic applications. EX2053, 7. Indeed, the ***only*** image in this post shows photographs of braces, and not clear aligners. *Id.*, 6. There is simply no way of knowing what Dr. Frey meant when he claimed to already "do this."

VI. Petitioner's Hindsight Biases the Analysis

Dr. Foroosh's hindsight-driven approach is clear. POR, 41-43. For the '248 patent claims requiring "deep learning," he selected a "not preferred" technique of Salah. EX2061, cl. 1; EX2062, ¶¶75-76. Applying the same POSA definition, Dr. Foroosh selected a different technique for the '945 patent. EX1002, ¶51; EX2062, ¶61. Dr. Foroosh and Petitioner provide no explanation for why that same POSA

would have allegedly chosen different techniques for different claims to achieve the same purpose of evaluating the shape of an aligner, other than the fact that the claims in the ’248 patent require deep learning and the ’945 patent claims do not. That is “fraught with hindsight” and should be afforded little weight. *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012).

VII. Petitioner’s Combination Does Not Disclose the Claimed Analysis

Petitioner does not dispute that the ’945 patent results in a brand-new technique that is able, for the first time, to assess aligner fit from a patient-created cellphone image or that, as of 2017, this was an entirely new type of process, for an entirely new purpose. POR, 57. Petitioner’s combination does not render the claimed techniques obvious.

A. The Individual References Undermine the Combination as a Whole

Petitioner criticizes Patent Owner from “attack[ing] the references individually, rather than addressing the proposed combination.” Reply, 14. However, as Petitioner articulates its combination, it is “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.” Petition, 23. Each of the individual references fails to satisfy the role Petitioner

assigns to it in this combination, and the combination as a whole therefore fails. That is, Salah's contour detection requires contrast, which a POSA would not expect to be able to distinguish between edges of teeth and clear aligners. POR, 47-49; *supra*, §IV.C. In any event, the image analysis techniques of Salah are used to assess bare teeth, not teeth fitted with aligners. EX2030, ¶¶81-82. And Salah nowhere suggests detecting edges as those of teeth and aligners; it detects only generic contours. EX2028, ¶¶161, 167. To the extent Salah discloses an image of a wired appliance, a POSA would recognize the significant differences between a wired appliance and a clear aligner, and that the technique of Salah is not attempting to assess the shape of the appliance at all. POR, 30-34; EX2028, ¶¶120-122. Invisalign does not "produce a measurement of distance," as it instead describes the in-person assessment of aligner fit that does not produce precise quantitative measures. POR, 45-46; EX2030, ¶¶60-61, 67; *supra*, §IV.B. And Kim does not disclose capturing images of an aligner on the teeth, let alone assessing whether an imaged aligner fits appropriately from an image. POR, 43; *supra*, §IV.A. In short, none of the prior art—alone or altogether—suggests the possibility of replacing the in-person assessments of aligner fit in Invisalign using image analysis of low-quality cellphone images. POR, 54-55.

Petitioner contends that advances in cellphone technology between Invisalign's publication in 2003 and the prior date of the '945 patent in 2017 are

relevant. Reply, 15. However, Salah and Kim were published years after Invisalign and still, ***nothing*** in those references suggests that cellphone images would be suitable to replace the treatment steps in Invisalign. Salah's methods are only able to use cellphone images because of an existing, high-quality 3D reference model, which is not part of Petitioner's combination. POR, 31-32, 48; EX2028, ¶99. Kim describes no computer analysis of images at all and does not suggest implicitly or explicitly that the patient-created cellphone images are suitable for anything more complex than a visual review. POR, 54-55. Petitioner's attorney argument that advances in cellphone technology by 2017 could have provided a motivation thus lacks any basis. Reply, 15.

B. Petitioner's Combination Fails to Disclose Evaluating "Interior and Exterior Tooth Outlines"

Petitioner fails to show that its combination can determine "interior and exterior tooth outlines representing the outline of the free end of said tooth" "for each of a plurality of teeth" and compare those outlines "so as to determine at least one score." EX1001, cl. 1 (Step 1(3)); POR, 50-54. Salah is the ***only*** reference on which Petitioner relies for these image processing steps, which require determination and comparison of tooth and aligner outlines. Petition, 29-34. Salah does not disclose the specific identification of a tooth outline, as compared to the outline of any other object like an aligner. POR, 52-53; EX2028, ¶¶161-62. Petitioner says

that Salah can detect a "contour of the gums" (Reply, 14), but Salah explains this detection is based on recognizing "a succession of 'spikes' between the teeth" for purposes of aligning two images, and not for purposes of identifying a gum as such. EX1008, 56:4-6. Salah does not suggest it is possible to recognize contours as corresponding to teeth or aligners or to match a contour of a particular tooth with its corresponding aligner contour, let alone how that could be done. EX2028, ¶¶160-163.

Although Dr. Foroosh highlighted only Canny edge detection for the image analysis, Petitioner argues that its combination was not limited to Dr. Foroosh's example but extended to all "'image processing software' as taught by Salah." Reply, 15; EX1002, ¶83. However, Patent Owner does not need to "reconstrue the petition" as limited to Canny edge detection because even the broadest view of the combination does not change the result. Reply, 17. Salah discloses the detection of generic contours only, and none of its methods require recognition of whether a contour is a tooth, an aligner, or something else entirely. POR, 52-53; EX2028, ¶¶161-62. Although Salah discloses a list of more than 30 image processing techniques, it does not disclose the use of semantic segmentation or object recognition, nor is that suggested in any of the other prior art references. EX1008, 34:15-36:14; EX2028, ¶103.

The Petition—and now the Reply—never said which, if any, of these other image processing techniques were allegedly suitable in the proposed combination to specifically identify tooth and aligner outlines. In fact, the Petition never discusses object recognition, semantic segmentation, or any other suitable technique as part of its proposed combination. At best, Petitioner points to Dr. Foroosh's vague statement in his expert declaration that "advanced options for contour detection could go beyond mere detection of edges, and also provide specific identification of the objects." Reply, 16 (quoting EX1002, ¶83). Dr. Foroosh does not cite any support at all, let alone Salah, for this disclosure, and it is instead conclusory *ipse dixit* that should be given no weight. 37 C.F.R. §42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9, 15 (P.T.A.B. Aug. 24, 2022). Dr. Foroosh's generic reference to "Salah's various image processing software options for detecting objects and the contours defining the objects' edges" (Reply, 16 (quoting EX1002, ¶83)) also lacks citation to any portion of Salah. Moreover, Dr. Foroosh's statement refers only to "detecting objects and [] contours," and does not say that Salah is able to provide specific identification of these objects and contours as teeth. The final quote cited in the Reply is likewise limited to "determining outlines," not what the outlines pertain to, and cites Salah's discussion of the 3D reference model, which has nothing to do with

2D image analysis. Reply, 16 ("Salah, for example, teaches determining outlines for a plurality of objects, including teeth." (citing EX1008, 23:4-8)); EX1008, 22:12-23:26 ("Creating Tooth Models"); EX2028, ¶98.

Petitioner's argument that the '945 patent claims are open ended, and are thus satisfied by "manual inputs" like the manual labeling of a tooth outline and an aligner outline, is new and improper since Petitioner never before advanced such an understanding of the claims. Reply, 17 n.2; 37 C.F.R. §42.23(b) ("A reply may only respond to arguments raised in the corresponding…patent owner response, or decision on institution"); *GCE Gas Control Equip. Inc. v. Vbox, Inc.*, No. IPR2023-00326, Paper 27, 28-29 (P.T.A.B. June 18, 2024) (rejecting as untimely new claim construction and related invalidity argument presented on reply). Indeed, the Petition only ever said that "image processing software" would perform the claimed steps, not that they would be performed manually or require manual inputs. Petition, 21-23, 33-34.

Thus, Petitioner's combination does not disclose Step 1(3) of claim 1, on which all other claims depend.

C. Petitioner's Combination Fails to Disclose Comparing "Interior and Exterior Tooth Outlines" to Determine a Score

Lastly, Petitioner is incorrect that the combination discloses determining a score according to the comparison of the tooth and aligner outlines. Reply, 17-18;

EX1001, cl. 1 (Step 1(4)). Since the combination, which relies on Salah for this feature, cannot segregate a tooth outline from an aligner outline, it cannot compare them to assess separation. POR, 57-58; EX2028, ¶170. Additionally, Kim and Invisalign do not disclose or suggest determining such a score. Kim does not disclose images of aligners seated on teeth nor the use of images to assess aligner fit. POR, 21-24, 26-27; EX2028, ¶79. And, Invisalign discloses only an imprecise "measure of separation" that a POSA would have understood to be an approximation resulting from a combination of manual and visual examinations that could not be replaced with remote image analysis. POR, 29-30; EX2030, ¶59.

For these reasons, Petitioner's combination is also unable to perform Step 1(4) of claim 1.

VIII. Conclusion

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

Date: November 15, 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 SUR-REPLY** has 4,395 words in compliance with the 5,600-word limit set forth in 37 C.F.R. §42.24. This word count was prepared using Microsoft® Word for Microsoft 365 MSO.

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Certificate of Service

Pursuant to 37 C.F.R. §42.6(e), the undersigned certifies that on November 15, 2024, a complete copy of **DENTAL MONITORING SAS'S PATENT OWNER'S SUR-REPLY** 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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