

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CLEARCORRECT OPERATING LLC,
Petitioner,

v.

ALIGN TECHNOLOGY, INC.,
Patent Owner.

Case No. IPR2025-00817
Patent No. 10,791,936

PATENT OWNER'S RESPONSE

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I. INTRODUCTION

ClearCorrect Operating LLC (“ClearCorrect” or “Petitioner”) challenges claims 1-20 of U.S. Patent No. 10,791,936 (“the ’936 patent,” EX1001) based on four grounds: (1) claims 1, 4-6, 8-12, and 14-16 as obvious over Boerjes (EX1004); (2) claims 1, 4-6, 8-12, and 14-16 as obvious over Boerjes and Geng (EX1005); (3) claims 2-3, 7, 13, and 17-20 as obvious over Boerjes and Babayoff (EX1006); and (4) claims 2-3, 7, 13, and 17-20 as obvious over Boerjes, Geng, and Babayoff. Pet., 3. Align Technology, Inc. (“Align” or “Patent Owner”) respectfully requests that the Board issue a final written decision rejecting Petitioner’s grounds of challenge and affirming the patentability of the challenged claims.

Petitioner’s obviousness case is based on a fundamental misunderstanding of the prior art, as the Office has now recognized multiple times. The challenged patent provides improved systems and methods for generating a digital model of a patient’s teeth in the context of dental treatment involving physical modification of the patient’s teeth, such as prosthodontics (*e.g.*, crown preparation). Crown preparation is an invasive process that involves reducing and reshaping a damaged tooth under anesthesia. Obtaining accurate image scans of the modified tooth and the surrounding dentition is critical for generating the artificial crown, typically

fabricated by a remote dental lab, so it can be properly seated on the prepared location and allow proper occlusion.

As recognized by the Examiner during prosecution, the prior art conventionally required entirely new scans of a patient's dentition following any physical modification of the teeth. Obtaining quality scans, however, presented challenges and increased patient trauma because soft tissues must be mobilized to expose the finish line. Thus, the crown preparation process typically involved multiple patient visits, and a temporary crown must be cemented in place and later removed.

The claimed invention improved on prior approaches. Rather than requiring entirely new scans upon physical modification of the patient's teeth, accurately-captured data from past scans are preserved and utilized to build a composite model with newly-acquired data from the portion of the patient's teeth that was physically modified, thereby reducing invasiveness and patient trauma, while still ensuring that a complete high-quality scan is obtained for the fabrication process. As the Examiner recognized during prosecution, when looking at prior-art references from the same inventive group as the now-asserted prior art, the claimed approach differs from the conventional approach of obtaining an entirely new scan upon physical modification.

Petitioner challenges the claims on two sets of grounds: one set that relies on Boerjes alone, and a second set that relies on Boerjes combined with Geng.

However, critically missing from both references is any disclosure of a system that replaces a portion of an existing model with new scan data including a part of the patient's intraoral cavity that has been physically modified to generate a new composite model. As the Board correctly found at institution, Boerjes provides no such disclosure. Moreover, while the Board instituted trial based on Petitioner's alternative ground applying Boerjes in view of Geng, Geng also lacks any disclosure of replacing a portion of an existing model after the patient's intraoral cavity has been physically modified. Instead, both Boerjes and Geng disclose systems that follow the conventional approach at the time: after physically modifying a part of the patient's intraoral cavity, a new scan and model should be obtained, not a composite containing both pre- and post-modification scan data. This lack of disclosure results in an obviousness case that relies on improper hindsight-based inferences to reconstruct the claimed invention using the claim limitations as a guide. *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.").

For these reasons, and as discussed in more detail below, the Board should find that Petitioner has not met its burden to prove that the challenged claims of the '936 patent are unpatentable.

II. THE '936 PATENT IS DIRECTED TO SYSTEMS AND METHODS THAT ARE DISTINCT FROM CONVENTIONAL APPROACHES TO SCANNING MODIFIED DENTAL PREPARATIONS

A. The '936 Patent Describes Improved Systems for Selectively Updating a Portion of a 3D Model After a Physical Change

The '936 patent describes improved systems and methods for the preparation of orthodontics and prosthodontics. EX1001, Abstract, 3:11-25; EX2011, ¶¶25-26. As the '936 patent explains, 3D virtual representations are particularly useful in designing physical treatment items like aligners and prosthodontics. *Id.*, 1:35-40. For example, 3D models are used to design and manufacture a coping and/or a prosthesis, such as a crown or bridge, for mounting onto a prepared tooth. *Id.*, 1:41-49. Accuracy of the 3D model is imperative in order to manufacture the prosthesis. *See id.*, 1:50-59. However, while the 3D scan itself may accurately capture the patient's dentition, the 3D scan may reveal that the preparation of the dentition is inadequate, such as where "the form of the preparation would result in an inadequate structure for the prosthesis" (*e.g.*, the dental preparation is too long, which would result in the thickness of the crown at the cusp being too thin and thus mechanically weak). *See id.*, 16:22-29; EX2011, ¶26. Thus, the preparation sometimes would need to be subsequently modified after obtaining the virtual

model, resulting in a change inside the patient's mouth. EX1001, 2:12-17. Prior to the '936 patent, "[s]uch situations would conventionally require a rescanning of the entire physical item." *Id.*, 2:17-22. By requiring an entirely new scan, the process thus would involve significant additional time, inconvenience, and patient discomfort. *Id.*; EX2011, ¶26.

Contrary to the conventional approach, the '936 patent describes systems and methods that utilize a multi-step selective scanning and merging workflow to generate high-quality 3D models for prosthodontics applications. EX2011, ¶27. For example, during the course of preparing the patient for a dental prosthesis, the intraoral cavity of a patient is first scanned to generate an accurate three-dimensional virtual model of the prepared teeth (*e.g.*, a "first virtual model"). EX1001, 17:48-67, FIG. 1. Analysis of the virtual model may reveal that, while the prepared dentition is well defined in the virtual model, it may not be suitable for the dental procedure. *Id.*, 16:17-21. In such a case, the user can identify the part of the virtual model that corresponds to the unsuitable part of the dental preparation by demarcating the area on a display. *Id.*, 16:36-38, 21:18-29. This informs the system of the portion of the virtual model that should be retained and the portion that should be removed. *Id.*, 21:30-59; EX2011, ¶27.

Next, the dental preparation itself is modified in the area found to be unsuitable (*e.g.*, by physically altering the dental preparation, such as by a

“material removal operation” that modifies the topology of the tooth”) and “the preparation is scanned in the newly worked area.” EX1001, 6:3-12, 16:40-44; *see also id.*, 22:36-60; EX2011, ¶28. This new scan data (*e.g.*, a second virtual model) is incorporated into the virtual model to form a “composite third 3D virtual model,” in which part of the model is generated from scan data obtained prior to physically modifying the patient’s teeth and another part of the model (the removed section identified by the user) is generated from scan data obtained after the physical modification (*e.g.*, after changing a tooth preparation). *See* EX1001, 22:61-23:26, FIGS. 1, 9; EX2011, ¶28. The ’936 patent explains that this provides an efficient workflow process in which an accurate 3D virtual model suitable for manufacturing accurate dental prostheses is produced, while reducing the time and patient discomfort needed to obtain such a model. *See* EX1001, 16:66-17:3, 27:51-65; EX2011, ¶28. This inventive approach has subsequently been copied by multiple competitors, including 3Shape (a previous unsuccessful IPR challenger to the ’936 patent) and now ClearCorrect.

Independent claim 1, which embodies the above-described approach, is reproduced below. *See* EX2011, ¶¶29-33. For ease of reference, Petitioner’s labeling of the claim limitations has been added.

1[pre] A system for scanning a patient’s teeth for a dental procedure, the system comprising:

1[a] a hand-held intraoral scanner; and

1[b] a computer readable medium including instructions that when executed by a computer system, cause the computer system to:

1[c] receive first scan data of the patient's teeth from the hand-held intraoral scanner;

1[d] display, to a display, a model of the patient's teeth, wherein the model of the patient's teeth is based on the received first scan data of the patient's teeth;

1[e] receive user input defining a portion of the model to be removed;

1[f] remove, from the displayed model, a removed surface portion of the model to be removed according to the user input;

1[g] receive second scan data of the patient's teeth from the hand-held intraoral scanner, the second scan data including surface data of a physically changed portion of the patient's intraoral cavity;

1[h] replace at least a portion of the removed surface portion of the model using the received second scan data of the patient's teeth including surface data of a physically changed portion of the patient's intraoral cavity; and

1[i] output, to the display, the model of the patient's teeth with the portion of the removed surface portion replaced using the received second scan data.

B. The Office Has Repeatedly Recognized the Distinguishing Features of the Claimed Invention over the Prior Art

The distinction between the '936 patent's claimed invention and the conventional approach of the prior art has been recognized by both the Examiner and the Board in a previous IPR challenge. EX2011, ¶¶34-39. This includes art from the same inventive group as the art that Petitioner now asserts in its grounds of challenge.

During prosecution of the '936 patent, the Examiner concluded that the prior art undermined any motivation for updating a specified part of an initial scan with new scan data of a modified portion of the patient's intraoral cavity to form a composite model as recited in the '936 patent claims. For example, in allowing the claims, the Examiner concluded that the closest reference, "the Kriveshko WIPO reference (WO2007084647)" (EX2007)¹ taught that when new scan data was obtained, one should "generat[e] an entirely new scan rather than generating a composite scan by using a second scan to update the changed region from the

¹ As noted in Patent Owner's preliminary response, the Kriveshko WIPO reference is a companion application to Boerjes, is assigned to the same entity (3M Innovative Properties Company), shares a common priority claim (US Prov. App. 60/761,078), and has the same filing date (January 19, 2007).

first.” EX1002, 374-75. The Examiner noted that Kriveshko considered a process of iterative modification of a surface preparation, yet he concluded that Kriveshko nonetheless taught away from compositing new scan data into an earlier scan, instead teaching that a full new scan should be performed when an update was needed—that is, the conventional approach recognized by the ’936 patent. *See id.* The Examiner concluded, based on the teachings of the references, the prior art “explicitly teaches away from the claimed process.” *Id.*

The Examiner’s conclusions were not only informed by the Kriveshko WIPO reference, but also by references that Petitioner presents in this case as background art. Specifically, during prosecution of a related patent (US 16/176,474), the Examiner rejected claims that did not recite compositing new scan data of a physically modified portion of the patient’s intraoral cavity into an earlier scan over Paley (US 2007/0172112 A1), Rubbert (US 2002/0006217 A1), and Kriveshko (US 2007/0236494 A1”).² EX2014, 35, 75. After amending the claims to require this feature, the Examiner allowed the claims, noting that “the feature of composite scan updates following modification to the dentition, e.g. after a

² Petitioner submits Paley as EX1008, Rubbert as EX1009, and Kriveshko as EX1007. Like the Kriveshko WIPO reference, Paley and Kriveshko list inventors that overlap with Boerjes.

removal operation was done on a tooth, [is] distinct from the noise/error correction rescans” disclosed by these references. *Id.*, 9, 12. These same reasons for allowance formed the Examiner’s basis for allowing the claims of the ’936 patent. *See id.*, 6-7; EX1002, 374-75 (noting terminal disclaimer with respect to US 16/176,474).

The Board has also found the prior art to be consistent with the Examiner’s assessment. For example, in a previous IPR challenging the claims of the ’936 patent, the Board recognized the Examiner’s findings:

The Examiner stated that the claims distinguish over the cited art by reciting “updating scans to be directed to scenarios where the intra-oral cavity (e.g. dentition) is modified in between the scans (e.g. subjected to surface preparation).” According to the Examiner, the cited art “does not provide for (or suggest) generating a composite scan after intra-oral modifications are made.” When distinguishing the cited art, the Examiner stated that “the instant applications’ claims ... provide a composite scan based on both a first (initial) and second (post-change) scan.” The Examiner characterized the claimed process as follows: “generating a composite scan by using a second scan to update the changed region from the first” and “data is newly captured and composited to update for the intra-oral modification.”

3Shape A/S v. Align Tech., Inc., IPR2021-01241, Paper 16, 11 (PTAB Jan. 26, 2022).

Moreover, in denying institution of this prior challenge, the Board found that the prior art failed to teach or suggest the '936 patent's claimed invention, particularly focusing on the limitations relating to generating a composite model to include scan data of a physically changed portion of the patient's intraoral cavity. *See id.*, 15. The Board found that not only did the prior art fail to teach these limitations, but also that there was no "sufficient non-hindsight biased rationale" to modify the prior art to reach the '936 patent claims. *Id.*, 19.

As detailed below, Petitioner presents no evidence that rebuts both the Examiner's and the Board's understanding of the prior art. In fact, consistent with these prior findings, Petitioner's applied art—Boerjes and Geng—follows the conventional approach that has been repeatedly found disclosed in numerous other prior art references examined by the Office. *See* EX2011, ¶39. Only with hindsight knowledge of the challenged claims is Petitioner able to arrive at the claimed invention.

III. PERSON OF ORDINARY SKILL IN THE ART

Petitioner contends that "[a] person of ordinary skill in the art ('POSITA') as of July 19, 2010 ..., would have been a person having at least a bachelor's degree in electrical engineering, computer engineering, or a closely related field such as computer science, and two years of work experience in 3D imaging, including the generation of 3D models of physical structures and image processing." Pet., 16.

For the purposes of this response, Patent Owner applies Petitioner's proposed level of ordinary skill. Patent Owner's expert, Dr. Hassan Foroosh, met and exceeded this level of ordinary skill by July 19, 2010. EX2011, ¶¶1-11, 40-41.

IV. CLAIM CONSTRUCTION

A claim subject to *inter partes* review receives its plain and ordinary meaning, interpreted in light of the specification of the patent in which it appears. See 37 C.F.R. §42.100(b); EX2011, ¶¶42-45. While Petitioner identifies constructions for certain claim terms (Pet., 16-17), Patent Owner submits that no terms need to be expressly construed in order to reach a final written decision finding that Petitioner has failed to satisfy its burden in establishing the obviousness of the challenged claims.

V. GROUNDS 1-2: CLAIMS 1, 4-6, 8-12, AND 14-16 ARE NOT OBVIOUS IN VIEW OF BOERJES OR BOERJES AND GENG

Petitioner's Grounds 1 and 2 assert that claims 1, 4-6, 8-12, and 14-16 are rendered obvious over Boerjes alone or Boerjes in view of Geng. The petition fails to satisfy Petitioner's burden in establishing that the proposed combination renders obvious the challenged claims. EX2011, ¶46.

A. Independent Claim 1 Is Not Obvious over Boerjes or Boerjes in view of Geng

Petitioner fails to establish that independent claim 1 would have been obvious over Boerjes alone (Ground 1) or Boerjes in view of Geng (Ground 2). EX2011, ¶¶47-49.

Both of Petitioner's grounds rely on the assumption that Boerjes teaches something that it does not: selectively updating a user-identified portion of a 3D model after additional surface preparation of patient's intraoral cavity has been performed. This incorrect assumption is not only fatal to Petitioner's ground challenging claim 1 as obvious over Boerjes alone (as the Board has already found), but it is also fatal to its ground challenging the claim as obvious over Boerjes and Geng. While Petitioner proposes modifying Boerjes to include Geng's separate editing and merger tools, Petitioner's combination is nevertheless still premised on incorporating those tools to perform a function that Petitioner incorrectly asserts is taught by Boerjes. This reliance on a misreading of Boerjes results in Petitioner's failure to adequately and accurately assess the scope and content of the prior art and the differences between that prior art and the claims at issue, including limitations 1[e] and 1[h]. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966) ("Under § 103, the scope and content of the prior art are to be determined, [and] differences between the prior art and claims at issue are to be ascertained."); EX2011, ¶47.

Moreover, this reliance also infects Petitioner's alleged motivation to combine the references to arrive at the claimed invention. *Id.*, ¶48. Even if a POSITA would have sought to use Geng's editing and merger tools as part of Boerjes's system, this does not change the fact that Boerjes does not teach

replacing a portion of an original model with new scan data after additional surface preparation has been performed. Instead, both Boerjes and Geng teach performing an entirely new scan after physical modification of a patient's teeth—that is, the conventional approach that the claimed invention improves upon. Absent Petitioner's hindsight-biased rationale, there is no reason from the references themselves that would suggest deviating from the conventional approach taught by these references. *Id.*

Accordingly, for these reasons, and as detailed more below, Petitioner fails to meet its burden in establishing claim 1 as obvious over Boerjes or Boerjes and Geng.

1. Petitioner fails to establish that Boerjes teaches receiving user input defining a portion of the model to be replaced (limitation 1[e])

Limitation 1[e] recites *receive user input defining a portion of the model to be removed*.³ In both of Petitioner's grounds, Petitioner relies on Boerjes as allegedly teaching a system that receives user input defining a portion of the model to be replaced with new scan data. See Pet., 31 ("Boerjes's system receives user input defining a portion of the model to be replaced with new scan data following

³ Language recited in the challenged claims is italicized throughout this response.

physical changes to the intraoral cavity.”), 33 (“Boerjes thus discloses identifying a surface portion of the model to be replaced.”). Based on this alleged teaching, Petitioner argues that “a POSITA would have been motivated to remove the user-identified surface portion before replacing it with new scan data” (Pet., 34-35) or would have been motivated to incorporate Geng’s editor tool to remove the user-identified portion on the model (Pet., 37). As explained below, Boerjes does not describe identifying a particular portion of a model to be replaced with new scan data. Instead, Petitioner blurs distinct teachings in Boerjes to cobble together such disclosure. Petitioner’s attempt to bring in Geng’s editor tool does not remedy this deficiency. EX2011, ¶50.

Petitioner argues that Boerjes teaches receiving user input defining a portion of the model that needs to be replaced with new scan data during its quality control process, in particular during its manual quality control process. Pet., 31-32 (annotating step 408 as “Receive user input identifying a portion of the model to be removed/replaced”). While Petitioner cites to several paragraphs of Boerjes as allegedly supporting this assertion, Boerjes is actually silent on this. EX2011, ¶51.

For example, Petitioner points to paragraphs 189 and 193 of Boerjes as allegedly disclosing instances where “a user may identify areas that need replacing, such as a ‘margin line’ to be removed, ‘areas of poor margin preparation,’ and ‘holes or areas of incomplete scan[s].’” Pet., 32 (alteration original). However,

neither of these references supports this assertion. EX2011, ¶52. Paragraph 189 relates to the separate step (step 406) of Boerjes’s automated quality control process. EX1004, [00189]; EX2011, ¶53. There, Boerjes simply describes that the system may automatically perform analysis of the digital model, such as “simple quantitative analysis such as measures of accuracy, variability, or density of three-dimensional surface data for a digital model” or analysis of “adequacy and/or suitability of margins and prepared surfaces for an anticipated restoration” (*e.g.*, whether there are potential problems with the restoration, such as “occlusal irregularities, areas of poor margin preparation, areas of inadequate tooth removal”). EX1004, [00189]. Nothing in this paragraph indicates that the system accepts user input indicating portions of **the 3D model** that need replacing with new scan data. EX2011, ¶53. Paragraph 193 similarly lacks such disclosure, stating simply that the dentist may “visually” inspect a scan to “identify, *e.g.*, holes or areas of incomplete scan needed for an intended dental procedure” and may employ “features, such as rotation, zooming, and panning” to perform the visual inspection. EX1004, [00193]; EX2011, ¶54.

Petitioner also relies on Boerjes’s paragraph 196 as allegedly describing “a user ‘identif[y]ing’ ... regions of a prepared tooth surface requiring additional preparation[s]’ and ‘supplemental scanning.’” Pet., 32 (alterations original). Petitioner then reasons that because Boerjes provides “‘a number [of] interactive,

three-dimensional tools such as markup tools’ that ‘a dentist or other dental professional’ could use to identify areas to be replaced with additional scan data,” a POSITA “would have understood that the user would mark on the model ... to indicate areas of the model to be ‘replaced.’” Pet., 33 (alteration original). Again, none of the cited paragraphs actually supports Petitioner’s assertions. Paragraph 196 only describes the notion that “[f]eedback may be presented to a dentist in a number of forms,” such as “highlighting questionable or erroneous areas of a preparation within a rendered display of scan data.” EX1004, [00196]. This fails to state that the user delineates a portion of the 3D model that the system should update. EX2011, ¶¶55-56. Similarly, paragraph 192 only describes that the system may include “markup tools” that a dentist may use “to evaluate suitability for subsequent processing and the creation of a physical dental object such as a restoration”—not to identify a portion of the model to be replaced. EX1004, [00192]; *see also id.*, [00142] (generally describing that the computer may include a “display capable of receiving user input”), [00148] (stating the user “may define or specify a cementation void or die spacer” or “define, edit, or annotate a margin line, such as a computer-generated margin line”); Pet., 33 (citing same); EX2011, ¶57.

Paragraphs 197 and 199 also fail to support Petitioner’s strained reading of Boerjes. Paragraph 197 only states that the quality control steps of FIG. 4 “are not

mutually exclusive,” but, as noted above, nowhere does Boerjes state that, during any of its quality control steps, the system receives user input identifying a portion of the 3D model to be modified. EX1004, [00197]; EX2011, ¶58. Paragraph 199 (discussed more below with respect to limitation 1[h]) only discusses two alternatives that may be performed after the quality control steps, supplementing the digital model “to replace apparently erroneous or inadequate scan data” or replacing the digital model with “a new scan of the dental subject matter following, e.g., additional surface preparation.” EX1004, [00199]. Again, Boerjes is silent with respect to the user identifying a portion of the model to be replaced with new scan data.⁴ EX2011, ¶58.

Petitioner’s additional theories do not remedy the lack of disclosure in Boerjes. For instance, Petitioner attempts to shoehorn in a non-grounds reference to argue that “[i]dentifying areas to be replaced also would have been obvious to a POSITA in view of the well-known capabilities ... to identify defects and replace them.” Pet., 33 (citing EX1008). Petitioner’s conclusory assertion on what “would have been obvious to a POSITA” is insufficient to satisfy Petitioner’s

⁴ As described more below, this lack of disclosure also creates further deficiencies with respect to additional limitations recited in independent claim 9. *Infra*, §V.B.

burden. Petitioner presents no analysis as to how and why a POSITA would have been motivated to modify Boerjes to arrive at the claim limitation. *See id.*, 33-34. This is especially problematic because Petitioner’s obviousness challenge rests on the notion that Boerjes teaches replacing a portion of a model with new scan data of a physically modified portion of the patient’s intraoral cavity (*i.e.*, after additional surface preparation), but the reference that Petitioner cites was distinguished by the Examiner during prosecution as only describing “noise/error correction rescans.” EX2014, 9; EX2011, ¶59.

Similar deficiencies exist with respect to Petitioner’s reliance on Geng in its Ground 2. Petitioner argues that a POSITA “would have been motivated to look to Geng, when implementing Boerjes’s quality control process, and use Geng’s editing function to remove the undesirable portions on the model to improve the efficiency and accuracy of Boerjes’s replacement process and improve patient comfort.” Pet., 37. Thus, Petitioner’s proposed combination of Boerjes and Geng presupposes that Boerjes teaches a “replacement process,” with Geng’s editing tool being used to “remove” the portions on the model that have been identified by the user in Boerjes’s system. *See id.*, 37-40. However, as detailed above, Boerjes does not describe a “replacement process” in which a user identifies a portion of the 3D model to be replaced with new scan data. EX2011, ¶60.

Moreover, as Dr. Foroosh notes, a POSITA would not have understood that Geng's editing tool was a tool for the user-identification of a portion of a 3D model to be replaced with updated scan data. EX2011, ¶61. As Geng describes, its editor tool serves a cleanup function, such as, *e.g.*, noise removal and smoothing, of scan data. EX1005, 7:38-51. While Petitioner generally cites to Geng's description that the editor "allows operators to modify and/or eliminate any undesirable areas" (to imply that such "undesirable areas" include areas needing additional surface preparation), when read in context, a POSITA would have understood that the "undesirable areas" referenced by Geng referred to scan data that the user did not need as part of the 3D model (*e.g.*, extraneous parts or unnecessary noise). *Id.*, 7:40-44 ("The editor (312) allows operators to modify and/or eliminate any undesirable area(s) on the original 3D image obtained from the camera (104; FIG. 1), remove abnormal data point(s), and clean up the acquired image data **to reduce the sizes of image data files.**" (emphasis added)). Thus, Geng also does not describe that its editing tool allows a user to identify a portion of a 3D model to be replaced with new scan data. EX2011, ¶61. Not only does this further highlight the deficiencies in Petitioner's assertions regarding whether the prior art teaches limitation 1[e], it also raises additional issues regarding Petitioner proposed combination of Boerjes and Geng to replace the identified portion with post-

modification scan data, as discussed more below. *See infra*, §V.A.2-3; EX2011, ¶¶61-62.

Accordingly, for the reasons above, Petitioner fails to meet its burden in establishing that Boerjes (Ground 1) or Boerjes in view of Geng (Ground 2) teaches limitation 1[e].

2. Petitioner fails to establish that either Boerjes or Geng teaches replacing a portion of the model with second scan data of a physically changed portion of the patient's intraoral cavity (limitation 1[h])

Limitation 1[h] recites *replace at least a portion of the removed surface portion of the model using the received second scan data of the patient's teeth including surface data of a physically changed portion of the patient's intraoral cavity*. This limitation requires that a previously generated model (*the model*) be updated by replacing a removed portion of the model with new scan data of the patient's mouth after a physical change has occurred (*surface data of a physically changed portion of the patient's intraoral cavity*). EX2011, ¶63.

For Ground 1, Petitioner asserts that Boerjes teaches limitation 1[h]. Pet., 43-47. However, as the Board correctly found, “the disclosure of Boerjes does not teach or suggest” the features claimed in limitation 1[h]. Inst. Dec., 19. As detailed below, the petition's deficiencies as recognized by the Board at institution remain, and the Board should likewise reject Petitioner's Ground 1 in the final written decision. EX2011, ¶64.

For Ground 2, Petitioner brings in Geng’s “merger tool” that Petitioner asserts a POSITA would have been motivated to use to replace the removed portion of the model with the scan data of a physically changed portion of the patient’s mouth. *See Pet.*, 47-51. While the Board found Petitioner’s assertions with respect to this ground sufficient to institute trial, Ground 2 suffers from substantially similar flaws as Petitioner’s Ground 1. Like Ground 1, Petitioner’s Ground 2 is premised on the same misapprehension of Boerjes that the Board already rejected at institution—that is, Petitioner’s erroneous contention that Boerjes teaches updating a portion of a 3D model with new scan data following additional surface preparation to generate a composite model. Petitioner simply brings in Geng’s merger tool as a means to perform a functionality that Petitioner (wrongly) asserts is present in Boerjes. Petitioner does not, and indeed cannot, assert that Geng teaches selectively updating a portion of a model using new scan data of a physically changed portion of the patient’s mouth, making an express limitation of the challenged claim wholly missing from Petitioner’s applied art. EX2011, ¶65. This alone should render the petition deficient. 37 C.F.R. §42.104(b)(4) (“The petition must specify where **each element** of the claim is found in the prior art patents or printed publications relied upon.” (emphasis added)).

For the reasons below, Petitioner fails to establish that Boerjes alone or Boerjes in view of Geng teaches limitation 1[h].

a) Boerjes teaches rescanning, not replacing, after additional surface preparation

Petitioner argues that Boerjes teaches obtaining scan data of a *physically changed portion of the patient's intraoral cavity* when Boerjes discusses modifying a tooth preparation, such as additional shaping of a prepared tooth surface. See Pet., 41 (addressing limitation 1[g], arguing Boerjes teaches that “a dentist can identify areas that require additional preparations, complete the preparations, and then rescan these areas”) (citing EX1004, [00193], [00196], [00199]). Petitioner further argues Boerjes teaches *replac[ing] at least a portion of the removed surface portion of the model* using this scan data to create a composite 3D model. See Pet., 43-47. However, as explained below, the parts of Boerjes relied upon by Petitioner fail to disclose building a composite model from a first scan modified to include portions of a second scan following physical changes to the patient's intraoral cavity. EX2011, ¶66.

Petitioner identifies paragraph 199 of Boerjes as purportedly teaching replacement of a portion of a model after a physical change (which Petitioner argues corresponds to Boerjes's “additional surface preparation”). Pet., 43. However, Petitioner mischaracterizes this paragraph. Paragraph 199 does not

describe building a composite model from two different (due to a physical modification) scans. EX2011, ¶¶67-69. Boerjes states:

After one or more quality control steps 406-410, a determination may be made as to whether a scan and/or surface preparations are satisfactory. If the data is not satisfactory, the process 400 may proceed to step 414 where the digital model may be supplemented or replaced with new scan data. This may include, for example, new scanning to replace apparently erroneous or inadequate scan data, or a new scan of the dental subject matter following, e.g., additional surface preparation consistent with errors identified during quality control. The process 400 may then return to step 404 where a new digital model is obtained.

EX1004, [00199].

This paragraph lays out two alternatives for step 414: (1) the digital model may be supplemented; or (2) the digital model may be replaced. Paralleling these two options, Boerjes describes how each may be performed, in order, disclosing that this can include (1) new scanning to replace apparently erroneous or inadequate scan data; or (2) a new scan of the dental subject matter following, e.g., additional surface preparation. EX2011, ¶69. As stated, the only option Boerjes provides following “additional surface preparation” is an entirely new scan of the dental subject matter. *Id.*

This is evident from a plain reading of Boerjes. Boerjes states that step 414, “where the digital model may be supplemented or replaced with new scan data,” may include “new scanning to replace apparently erroneous or inadequate scan data, or **a new scan of the dental subject matter** following, e.g., additional **surface preparation** consistent with errors identified during quality control.” EX1004, [00199] (emphasis added). A POSITA would have understood this description—that **a new scan of the dental subject matter** is obtained following physical modification—comports with the conventional approach known at the time, as recognized in the ’936 patent. *See* EX1001, 2:17-22 (“Such situations would conventionally require a rescanning of the entire physical item....”); EX1002, 374-75 (Examiner noting the prior art teaches “generating an entirely new scan rather than generating a composite scan”); EX2011, ¶70.

To the extent Petitioner attempts to conflate Boerjes’s separate discussion of new scanning to “replace” scan data with Boerjes’s discussion of additional surface preparation, this mischaracterizes Boerjes. EX2011, ¶71. Boerjes does not mention this operation in connection with additional surface preparation. Instead, the replacement operation is of **erroneous or inadequate scan data**. Replacing erroneous or inadequate scan data is distinct from performing new scanning subsequent to a physical change to the patient’s intraoral cavity. EX2011, ¶71; *see*

also EX2014, 9 (Examiner recognizing that “noise/error correction rescans” are distinct from the claimed feature).

By contrast, after “additional surface preparation” has been performed, Boerjes calls for an entirely “new scan of the dental subject matter”—it never says it is replacing a region or amalgamating with a prior scan. EX2011, ¶71. By selectively quoting these two alternatives as though they were interchangeable, Petitioner creates the misleading appearance that Boerjes teaches rescanning just a portion of the dental subject matter (e.g., a modified tooth) to create a new model, whereas Boerjes in fact teaches no such thing.

Other paragraphs of Boerjes cited by Petitioner further fail to support Petitioner’s reading of Boerjes. For example, the petition cites paragraph 196 (among other paragraphs) as purportedly teaching limitation 1[h] (Pet., 45), but this disclosure confirms Boerjes distinguishes between supplemental scanning of the same unmodified dental structure due to incomplete data and, distinctly, obtaining an entirely new scan following additional preparation work. EX2011, ¶72; *see also* Pet., 40-41 (citing EX1004, [00193], [00196], and [00199] as purportedly teaching that “a dentist can identify areas that require additional preparations, complete the preparations, and then rescan these areas”). Paragraph 196 states that “an evaluation may conclude with an identification of regions of a prepared tooth surface requiring additional preparation or reduction, or regions of

a digital model requiring additional or supplemental scanning due to incomplete, erroneous, or potentially erroneous data.” EX1004, [00196] (emphasis added). Here again, Boerjes’s identification of “regions of a digital model requiring additional or supplemental scanning” is associated with “incomplete, erroneous, or potentially erroneous data,” as opposed to “regions of a prepared tooth surface requiring additional preparation or reduction.” *Id.* As described in paragraph 199, where there is “additional surface preparation,” Boerjes calls for a new scan. *Id.*, [00199]. There is no discussion of constructing a composite digital model from different scans with different surface preparations. EX2011, ¶73.

The remaining paragraphs cited in the petition also fail to support Petitioner’s assertions regarding Boerjes. EX2011, ¶74. In paragraph 193 (cited at Pet., 40-41), Boerjes merely describes that the manual quality control step (step 408 of FIG. 4) involves the dentist inspecting a scan “to visually identify, e.g., holes or areas of incomplete scan needed for an intended dental procedure,” which says nothing about partial rescanning subsequent to additional surface preparation and then building a composite model from an earlier scan and a new scan post-modification. EX1004, [00193]. Paragraphs 197 and 198 (cited at Pet., 45) state that different quality control steps are not mutually exclusive and can be performed during a single visit, again adding nothing more. *Id.*, [00197]-[00198]; EX2011, ¶75. Paragraph 139 (cited at Pet., 45) indicates that the 3D model can be of “some

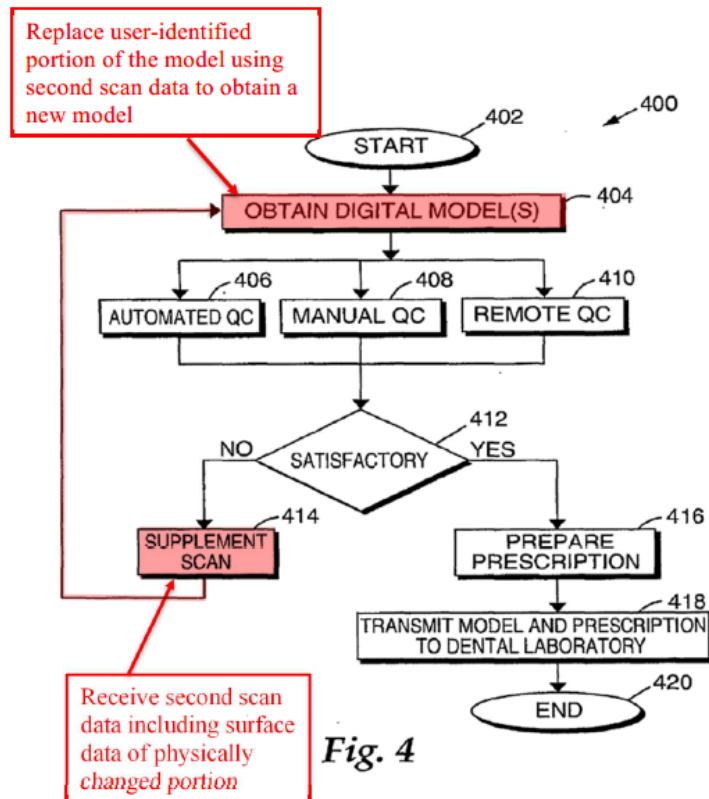
or all of the dentition according to [the] particular purpose of the scan.” EX1004, [00139]. This merely indicates that the model can be some or all of the teeth. EX2011, ¶76. There is no discussion of amalgamating different pre- and post-physical modification scans to build a composite model. *Id.* And while Petitioner also cites to an eleven-paragraph block (paragraphs 189-99, cited at Pet., 43) generally discussing Boerjes’s quality control steps, these paragraphs still fail to describe the required limitation of rescanning **part** of a dentition **after physical modification** to replace **part** of a prior model. *Id.*

Petitioner also misleadingly cites paragraph 163 of Boerjes as teaching “combining historical three-dimensional data with a three-dimensional representation of the prepared surface.” Pet., 45 (quoting EX1004, [00163]). However, like Petitioner’s other citations to Boerjes for this claim limitation, Petitioner’s stitched-together partial quotes mischaracterize the actual content of Boerjes. As is readily apparent from the text, Boerjes is discussing fabrication of a “restoration” based on multiple representations. Boerjes does not propose combining these data **into a new composite model**. EX1004, [00163]. In other words, Boerjes is using both a historical model and a new (post-preparation) model **of the entire dental subject matter** to fabricate a temporary or final **restoration** (e.g., making a crown to match the new preparation surfaces and to fill in the gap to restore the original tooth surfaces), not combining them to make some new

composite dental model.⁵ EX2011, ¶77. This disclosure thus fails to teach the type of operation required by limitation 1[h]. *Id.*

Petitioner further mischaracterizes Boerjes through its annotations to FIG. 4 of Boerjes. *See, e.g.,* Pet., 44. For example, as reproduced below, Petitioner asserts (in its red box) that step 414 in Boerjes’s FIG. 4 is to “Receive second scan data including surface data of physically changed portion,” which is followed by step 404, annotated “Replace user-identified portion of the model using second scan data to obtain a new model.”

⁵ Boerjes confirms this in paragraph 32, where it states that “an electronic dental prescription” for fabricating an artificial dental object includes “a first three-dimensional representation of one or more intraoral structures including at least one tooth surface prepared for an artificial dental object” and “a second three-dimensional representation of the at least one tooth surface prior to preparation for the artificial dental object”—*i.e.*, separate models. EX1004, [0032]; EX2011, ¶78.



Pet., 44.

However, Boerjes says no such thing. EX2011, ¶¶79-80. In fact, Petitioner’s annotations are not supported by how Boerjes actually describes its quality control steps. For example, Boerjes states that in “step 414 ... the digital model may be supplemented or replaced with new scan data,” which can either be “new scanning to replace apparently erroneous or inadequate scan data, or a new scan of the dental subject matter following, e.g., additional surface preparation.” EX1004, [00199]. This is followed by “step 404 where a new digital model is obtained.” *Id.* Thus, paragraph 199 of Boerjes describes generating a new digital model based on an entirely new scan when the patient’s

intraoral cavity is altered, such as by performing additional surface preparation, not receiving “second scan data” of a modified region and replacing a part of the model with the second scan data as Petitioner tries to insert via annotations.

EX2011, ¶80.

Petitioner’s argument that a POSITA would have been motivated to use “well-known image registration and stitching techniques as in Boerjes” to “replace at least a portion of the model with the new scan data” does not cure the deficiencies in its challenge. Pet. 45-46. Similar to the discussion above, Petitioner improperly conflates (1) supplementing inadequate scan data and (2) generating an entirely new scan following additional preparation, which are described as different operations in Boerjes, neither of which discloses the features recited in limitation 1[h]. EX2011, ¶81. Petitioner’s additional arguments present more misleading clip-quotes and mischaracterizations, but the cited content does not remedy Boerjes’s deficiencies.

Specifically, Petitioner argues “Boerjes discloses registering and combining or stitching 3D data into an aggregate 3D model.” Pet., 45 (citing EX1004, [00126], [00144], [00218]). Each of the cited portions describe image acquisition and construction **during** a scanning operation. See EX1004, [00126] (“forming a three-dimensional view of a subject reconstructed from a number of two-dimensional views.”), [00144] (“two dimensional image sets may be forwarded to

the computer 108 for derivation of three-dimensional point clouds”), [00218] (“in a system that operates to continuously acquire three-dimensional data in real time, and fits or registers incremental three-dimensional data to an aggregate three-dimensional model...”); EX2011, ¶82. There is no disclosure of building a composite model by amalgamating portions of a new scan following physical modification together with an old, pre-modification scan. EX2011, ¶82.

Petitioner’s remaining argument and citations are similarly deficient because they still rely on the incorrect assumption that Boerjes discloses building a composite model of pre- and post-modification scans (it does not). For example, Petitioner asserts that “a POSITA would have known and been motivated to use known methods, such as ‘register[ing]’ and ‘stitch[ing],’ as recognized by Boerjes, as part of Boerjes’s replacement of undesirable areas.” Pet., 46 (alterations original); *see also id.*, 46-47 (further asserting motivation to register and stitch scan data). This does nothing to remedy Boerjes’s deficiencies, since the issue is not “replacement of undesirable areas”⁶ (*e.g.*, inaccurate data) or use of registration and stitching *per se*. Rather, Boerjes fails to teach or suggest making a new model

⁶ Boerjes does not use the term “undesirable areas.” As discussed above, Boerjes discusses “replac[ing] apparently erroneous or inadequate scan data.” EX1004, [00199].

by adding post-modification scan-data to replace corresponding parts of a prior model, thereby producing a new model that is a composite of the pre- and post-modification scans—which the Board previously recognized as an essential part of the patent. EX2011, ¶83. In other words, Boerjes’s discussion of replacing erroneous or inadequate scan data or that registering and stitching were known methods is ultimately beside the point because Boerjes already tells the POSITA what to do in instances where additional surface preparation is required: take “a new scan of the dental subject matter.” EX1004, [00199]; EX2011, ¶83.

In its institution decision, the Board held that Boerjes only “contemplates the re-scanning of the dentition” after additional surface preparation and “does not assert partial insertion of new data into an existing 3D model.” Inst. Dec., 18-19. The Board’s holding is well supported by the record. For example, in paragraphs 36-37, Boerjes explains that, after acquiring a three-dimensional representation of an intraoral structure in which “one tooth surface [is] prepared for an artificial dental object,” feedback may be provided to the dentist, which “may identify corrective action.” EX1004, [0036]-[0037]. “The corrective action may include acquiring an additional three-dimensional representation” of the intraoral structure and “may include additional surface preparation of the at least one tooth.” *Id.*, [0037]. This is consistent with paragraph 199 teaching that “a new scan of the

dental subject matter” (or “an additional three-dimensional representation”) is taken after additional surface preparation. EX2011, ¶¶84-85.

Dr. Karam’s cross-examination testimony also confirms that the Board’s findings regarding Boerjes is correct. In order to support Petitioner’s hindsight-driven application of Boerjes, Dr. Karam repeatedly mischaracterized Boerjes, stretching its disclosure beyond its clear reading. For instance, Dr. Karam argued that because Boerjes’s FIG. 4 labels step 414 as “supplemental scan,” then this must mean that “you are supplementing, doing a second supplement model for that region ... that is being sent back and this is being incorporated in the first model to form a new updated model.” EX2013, 61:24-62:6; *see also id.*, 74:10-75:7. However, reading Boerjes’s FIG. 4 in this manner must necessarily **exclude** Boerjes’s express description of the step, especially as it relates to the claimed subject matter: **the digital model** may be **replaced** with “a new scan of the dental subject matter.” EX2011, ¶86.

Moreover, Dr. Karam further showcased her hindsight-driven reading of Boerjes through her attempt to improperly broaden Boerjes’s description beyond what it fairly teaches. For instance, Dr. Karam opined that when Boerjes discusses that quality control may include “visually confirm[ing] accuracy of a scan by inspection for gross errors or omissions such as holes, gaps, distortions, twists, and the like,” this contemplates identifying whether a tooth preparation is adequate.

EX2013, 88:5-90:25 (stating an inadequate surface preparation of **the tooth** means that the **scan** is inaccurate and contains gross errors). Dr. Karam made similar claims with regard to Boerjes’s description of “erroneous data” as encompassing inadequate tooth preparations. *Id.*, 117:23-119:14. Again, this is inconsistent with Boerjes’s plain description, which repeatedly distinguishes the “accuracy of a scan” and “erroneous data” from an assessment as to whether a tooth preparation is adequate. *See, e.g.*, EX1004, [00195] (stating “a prepared tooth ... may be evaluated to determine whether there is adequate space for cement to bond the restoration to the prepared tooth surface” and, “[a]s another example, a dentist may visually confirm accuracy of a scan by inspection for gross errors or omissions such as holes, gaps, distortions, twists, and the like”), [00196] (evaluation may include “an identification of regions of a prepared tooth surface requiring additional preparation or reduction, or regions of a digital model requiring additional or supplemental scanning due to incomplete, erroneous, or potentially erroneous data”), [00199] (distinguishing between “erroneous or inadequate scan data” and “additional surface preparation”); EX2011, ¶¶87-89. Dr. Karam’s cross-examination testimony is further proof that Petitioner’s grounds of challenge rest entirely on the hindsight reconstruction of the challenged claims and should be rejected for that reason. *KSR*, 550 U.S. at 421 (cautioning against “distortion

caused by hindsight bias” and warning against “temptation to read into the prior art the teachings of the invention in issue”).

As such, the record further confirms that the Board’s institution findings that Boerjes does not teach or suggest limitation 1[h] are correct. Accordingly, Petitioner fails to meet its burden in establishing that Boerjes alone teaches limitation 1[h].

- b) Geng does not teach or suggest replacing a portion of a model using scan data of a physically changed portion of the patient’s intraoral cavity

For Ground 2, Petitioner adds Geng, but for a limited purpose: combining “Geng’s merger function to replace the first scan’s undesired portion with the second scan data in Boerjes.” Pet., 48; *see also id.*, 37, 49. In its institution decision, the Board found that “Geng’s disclosure matches the language of limitations 1(e), 1(f) and 1(h)” and agreed with Petitioner that a POSITA would have had motivation to combine Boerjes and Geng to arrive at the claimed invention. Inst. Dec., 23-24. However, as explained below, Petitioner’s Ground 2 still rests on the incorrect notion that Boerjes teaches selectively updating a portion of a model with new scan data of a modified portion of the patient’s mouth, with Geng’s merger tool merely being used to achieve this (undisclosed) functionality. And, while Geng provides general description of a merger tool as part of its system, Geng provides no disclosure of using the tool to *replace at least a portion*

of the removed surface portion of the model using the received second scan data of the patient's teeth including surface data of a physically changed portion of the patient's intraoral cavity, as required by limitation 1[h]. See EX2011, ¶¶90-91.

As a result, an express limitation of the claim is wholly missing from the prior art. This alone is sufficient to render Petitioner's obviousness case deficient.

Specifically, the petition does not, and cannot, claim that Geng teaches replacing a removed portion of the model with scan data of a physically changed portion of the patient's intraoral cavity. As is evident from the petition, Petitioner relies solely on Boerjes for teaching the claimed features of receiving second scan data that includes *a physical changed portion of the patient's intraoral cavity* and using that data to *replace at least a portion of the removed surface portion of the model*. For example, Petitioner relies solely on Boerjes as teaching limitation 1[g], which recites *receiv[ing] second scan data ... including surface data of a physically changed portion of the patient's intraoral cavity*. Pet., 40-42. For limitation 1[h], Petitioner only relies on **incorporating** Geng's merger tool to accomplish Boerjes's alleged functionality of replacing a removed portion of the model with a physically changed portion obtained from a subsequent scan. See Pet., 49 (asserting "[t]he combined system would have registered the second scan data to the existing model to replace the undesired, removed portion, thereby obtaining an updated digital model of the teeth (e.g., **after additional surface**

preparation, as described by Boerjes)” (emphasis added)). Thus, Petitioner makes no claims that Geng itself teaches or suggests *replac[ing]* a portion of a model using scan data that *includ[es] surface data of a physically changed portion of the patient’s intraoral cavity.* See also EX2011, ¶92.

Indeed, Dr. Karam effectively confirmed that no such teachings can be found in Geng. During cross-examination, Dr. Karam admitted that the proposed combination of Boerjes and Geng relied on her understanding that Boerjes discloses the post-modification partial update of a model to generate a composite model. EX2013, 194:13-196:1 (stating for Ground 2 that she is “relying on Boerjes for the Boerjes replacement part which occurs ... after an update is done to the physical structure in the intraoral cavity and after that is done, basically there is a replacement”). As the Board already noted at institution, that is a misunderstanding of the reference, making her testimony regarding the combination of Boerjes and Geng fatally flawed because it relies on the assumption that the POSITA would have been motivated to use Geng’s merger tool in a way that Boerjes allegedly teaches (but, in fact, does not).

Making it clear that Dr. Karam does not rely on Geng at all for teaching partially updating a model with post-modification data, when asked to identify any part of Geng that teaches “updating an existing digital impression after a physical change in the patient’s intraoral cavity,” Dr. Karam could only identify generic

passages. EX2013, 178:19-185:17 (citing EX1005, 3:48-4:2, 4:54-65, 6:26-41, 15:41-56). These passages fail to describe replacing a portion of an existing model with scan data that includes a physically changed portion of the patient's intraoral cavity. See EX1005, 3:48-4:2 (describing FIG. 1, which "is a block diagram illustrating a dental computer-aided design"), 4:54-65 (stating the computer "includes at least one access device and/or interface that allow operator to utilize the functionality of the computer"), 6:26-41 (describing the "GUI and file management module (220) and user access interface (224)," which "provide operators with interactive tools and views for manipulating 3D images"), 15:41-56 (stating, generally, that system allows "[f]abrication of prostheses may be performed on-side, thereby allowing dental restoration procedures to be performed in a single visit"); EX2011, ¶¶93-94. In fact, as detailed more below with respect to motivation to combine, Geng teaches following the conventional approach of initiating a new scan after additional surface preparation, consistent with Boerjes's teachings. EX2011, ¶¶95-96; *infra*, §V.A.3.

Thus, by establishing that Boerjes does not teach *replac[ing] at least a portion of the removed surface portion of the model using the received second scan data of the patient's teeth including surface data of a physically changed portion of the patient's intraoral cavity*, it follows that Petitioner has failed to provide **any evidence** showing where this limitation is taught in the ground references.

However, it is a requirement that the petition “specify where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. §42.104(b)(4). Having failed to do so, Petitioner necessarily fails to make out a *prima facie* case of obviousness.

Accordingly, Petitioner fails to meet its burden in establishing that Boerjes in view of Geng teaches limitation 1[h].

3. No motivation to combine exists because both Boerjes and Geng follow the conventional approach

Petitioner also fails to establish a motivation to combine Boerjes and Geng to arrive at the claimed invention. EX2011, ¶97. In the combination, Petitioner proposes incorporating Geng’s editor tool into Boerjes’s system as a means to remove a user-identified portion of an existing 3D model. *See* Pet., 37-38. Petitioner further proposes incorporating Geng’s separate merger tool into Boerjes’s system as a means to replace the removed portion with new scan data that includes a physically changed portion of the patient’s intraoral cavity. *See id.*, 48-49.

However, even accepting the notion that a POSITA would have been motivated to incorporate Geng’s editor tool and merger tool into Boerjes’s system, Petitioner’s proposed combination still would not result in the claimed invention because it rests on the flawed assumption that Boerjes teaches replacing a removed portion of an existing model with scan data that includes a physically changed

portion of the patient's intraoral cavity. *See* EX2013, 194:13-196:1 (Dr. Karam confirming reliance on Boerjes as teaching this approach); *supra*, §V.A.2.b. Thus, even if a POSITA would have been motivated to combine the references as Petitioner proposes, the POSITA would have used those tools consistent with how Boerjes suggests: after additional surface preparation, “**a new scan of the dental subject matter**” is obtained. EX2011, ¶98. In other words, the POSITA would have continued to follow the approach conventional in the art at the time. *Id.*

Indeed, this understanding is further supported by Geng's own teachings. That is, like Boerjes, Geng's disclosure **comports** with the conventional approach at the time: when a physical structure in the patient's intraoral cavity has been modified, perform a new scan of that structure. EX2011, ¶99. For instance, FIG. 5 of Geng illustrates “steps of dental restoration treatment preparations that utilize interactive 3D imaging.” EX1005, 2:53-55. Geng explains that the process illustrated in FIG. 5 “can be implemented at the preparation appointment by utilizing the interactive 3D imaging functions provided by the system.” *Id.*, 10:64-11:2. Geng describes that, after an occlusal adjustment has been performed, “preliminary imaging of prepared teeth is utilized for treatment preparation.” *Id.*, 11:16-17, FIG. 5 (step 520); EX2011, ¶100. This preliminary imaging of prepared teeth “can be utilized for comparison with a predetermined baseline” to allow the dentist to “check certain factors that can help identify any potential issues that may

affect the restoration process.” *Id.*, 11:25-31 (stating imaging “can be used to check alignment, margin design, tooth reduction, and retention and resistance form”).

Geng goes on to explain that “[o]nce the preliminary imaging analysis has been completed,” and any necessary additional tooth preparation has been completed, “a final 3D image ... of the prepared teeth may be obtained at step (530) of FIG. 5.” *Id.*, 11:65-12:1. “This image provides the final image data upon which the restorations will be designed.” *Id.*, 12:1-2; *see also id.*, 12:2-7 (stating further that the final 3D image can be compared to the preliminary imaging to “confirm[] correction of any problems found in preliminary imaging”). Thus, like Boerjes, Geng also teaches obtaining a new scan after additional surface preparation. EX2011, ¶101. In other words, Geng itself does not even suggest using **its own tools** in the manner suggested by Petitioner; rather, Geng still follows the conventional approach. *Id.* This confirms that Petitioner’s obviousness case rests entirely on hindsight reasoning. *In re Hedges*, 783 F.2d 1038, 1041 (Fed. Cir. 1986) (proceeding “contrary to the accepted wisdom” is “strong evidence of unobviousness”); *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983) (stating the POSITA is one “who is normally guided by the then-accepted wisdom in the art” and “[t]o imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference

or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome”); EX2011, ¶102.

Despite Petitioner’s insistence that the claimed invention would have been obvious to a POSITA, it is telling that Petitioner’s asserted references teach following the conventional approach. As noted above, the Examiner recognized that the claimed invention of generating a composite scan by replacing a portion of an original scan with post-modification scan data was contrary to the conventional approach exemplified by the prior art. EX1002, 374-75; EX2014, 9.

Moreover, the Board made similar findings when addressing petitioner 3Shape’s attempt to apply conventional prior-art approaches to the same claims, characterizing 3Shape’s modification of the prior art as lacking “a sufficient non-hindsight biased rationale.” *3Shape*, IPR2021-01241, Paper 16, 19-21. Instead, the only place where one will find the claimed invention, besides the ’936 patent itself, is in products copying Align’s patented technology. Align previously asserted the ’936 patent against infringing 3Shape products, the operation of which is demonstrated, for example, in a publicly available video.⁷ Indeed, ClearCorrect

⁷ <https://www.youtube.com/watch?v=I3gNtitSoQ0>. For comparison, operation of Align’s iTero platform can be found here:

<https://www.youtube.com/watch?v=NA1JE94Bwbg>.

also copied Align's invention into its infringing products which are the subject of litigation that prompted this IPR. Thus, the record overwhelmingly supports the conclusion that Petitioner is merely engaging in hindsight reconstruction of the claims.

Accordingly, in view of the above, Petitioner fails to meet its burden in establishing the obviousness of independent claim 1.

B. Independent Claim 9

Petitioner argues that Boerjes (Ground 1) and Boerjes in view of Geng (Ground 2) render obvious independent claim 9. Petitioner's arguments refer to and incorporate by reference its arguments with respect to independent claim 1. *See* Pet., 60 (incorporating limitation 1[h] analysis for limitation 9[e]).

Accordingly, for the same reasons discussed above with respect to claim 1, Petitioner fails to establish that independent claim 1 is obvious over Boerjes or Boerjes and Geng. EX2011, ¶103.

Furthermore, Petitioner fails to establish that claim 9 is rendered obvious over Boerjes or Boerjes and Geng for additional, independent reasons. EX2011, ¶104. Specifically, limitation 9[c] recites *receiving user input via the displayed model demarcating a portion of the model to be retained and a surface portion of the model to be replaced*. Petitioner argues that "Boerjes discloses or at least renders obvious this limitation." Pet., 58.

First, Petitioner argues that Boerjes discloses limitation 9[c] because it “discloses receiving user input identifying a portion of the displayed model to be replaced with new scan data.” *Id.* However, as explained above with respect to limitation 1[e], Boerjes provides no such disclosure and instead only generally discusses supplementing an existing 3D model or replacing it. EX2011, ¶105. Thus, just as Boerjes fails to teach receiving user input identifying a portion of the model to be replaced, it also fails to teach receiving user input *demarcating a portion of the model to be retained and a surface portion of the model to be replaced.* *Id.*; *supra*, §V.A.1.

Despite this lack of disclosure, Petitioner argues that “[a] POSITA also would have understood that it was well known to receive user input demarcating a portion of the model to be retained and a portion of the model to be replaced,” citing to two background references. Pet., 59 (citing EX1014, [0078], [0083], Figs. 1, 5, 7; EX1007, [0096], [0101]). However, background references cannot be used to rewrite an applied reference to supply disclosure that is neither taught nor suggested by the reference. Moreover, even if Petitioner’s background references were considered, neither support the proposition that it was “well known” to demarcate a portion of the model to be retained and a portion of the model to be replaced with new scan data (thus preventing the new scan data from overwriting or otherwise impacting the surface of the retained portion). For example, EX1014

discuss identification of a “demarcation profile” to separate a 3D virtual model into a first model part representing the dental site comprising a tooth preparation and a second model representing the soft tissues abutting the tooth preparation, with the user being able to “extrapolate where he or she considers” any finish line, gum line, or other preparation is present, but is missing in the model. *See* EX1014, [0025], [0078], [0083], FIGS. 4-5; EX2011, ¶106. The cited portions of EX1007 also fail to support that the claimed feature of demarcating portions to be retained and to be replaced was “well known.” Specifically, paragraph 96 discusses that, while “acquiring” three-dimensional data, the acquisition is shown to the user to “let[] the user know where scanning has been performed and where additional scanning may be appropriate.” EX1007, [0096]. Paragraph 101 states only that the user may “select[]” a point or region on the model “where reacquisition is to be attempted.” *Id.*, [0101]. Neither of these paragraphs demonstrate receiving user input demarcating a portion of the model to be retained and a portion of the model to be replaced.

Lastly, Petitioner’s assertion that it nevertheless “would have been obvious to a POSITA to modify a system to identify on the display a portion of the model to be retained as well as the portion to be replaced” (Pet., 59) rests on conclusory, hindsight-based reasoning. That is, like Petitioner’s approach to updating a portion of a model with post-modification scan data, Petitioner handwaves away an

express limitation of the claim by asserting it would “provide useful graphics” despite Petitioner’s asserted art (or even cited background art) failing to teach the claimed feature, much less any purported benefit to it. *See* EX2011, ¶¶106-07.

Accordingly, Petitioner fails to meet its burden in establishing the obviousness of claim 9 for these additional reasons.

C. Dependent Claims 4-6, 8, 10-12, and 14-16

Claims 4-6, 8, 10-12, and 14-16 depend directly or indirectly from either claims 1 or 9. These claims are not obvious over Boerjes (Ground 1) or Boerjes and Geng (Ground 2) for the same reasons identified above with respect to independent claims 1 and 9. EX2011, ¶108.

VI. GROUNDS 3-4: CLAIMS 2-3, 7, 13, AND 17-20 ARE NOT OBVIOUS IN VIEW OF BOERJES AND BABAYOFF OR BOERJES, GENG, AND BABAYOFF

Petitioner additionally fails to meet its burden to establish obviousness under Grounds 3 and 4. As an initial matter, claims 2-3, 7, and 13 depend from either independent claims 1 and 9. Petitioner also relies on and incorporates its analysis of claim 1 for independent claim 17, including relying on its analysis of limitations 1[e] and 1[h] as teaching limitations 17[f]-17[g] and 17[i]. Pet., 81-82. Claims 18-20 depend from claim 17. Thus, for the reasons identified above with respect to Grounds 1 and 2, Petitioner fails to establish the obviousness of claims 2-3, 7, 13,

and 17-20 over Boerjes and Babayoff or Boerjes, Geng, and Babayoff. EX2011, ¶¶109-10.

Moreover, as detailed below, additional, independent bases exist for finding that Petitioner has failed to meet its burden to establish obviousness of the challenged claims under Grounds 3 and 4. *Id.*, ¶111.

A. Petitioner Fails to Establish that a POSITA Would Have Been Motivated to Combine Boerjes and Babayoff to Add Color Scanning

For its Grounds 3 and 4, Petitioner alleges that “[a] POSITA would have found it obvious to use Babayoff’s hand-held intraoral scanner in Boerjes’s system or the Boerjes-Geng system.” Pet., 69. In particular, Petitioner asserts that “[a] POSITA would have understood that Babayoff’s intraoral scanner would improve the dental restoration procedure of Boerjes or Boerjes as modified by Geng by providing color data for presenting an accurate 3D color model” and that Babayoff’s “intraoral scanner with color scan data would improve Boerjes’s automatic identification of the margin line.” *Id.*, 75; *see also id.*, 76 (asserting reasonable expectation of success and arguing Babayoff “provid[es] the benefit of precise color matching and margin-line identification”). During cross-examination, Dr. Karam confirmed that the purported combination of Boerjes and Babayoff (or Boerjes, Geng, and Babayoff) relies on the assertion that Babayoff

would improve Boerjes or Boerjes and Geng “by adding color scanning.”

EX2013, 37:3-39:24; *see also* EX1003, ¶¶188-94.

Petitioner fails to show that a POSITA would have understood that Babayoff’s scanner “would improve” Boerjes’s system (alone or as modified by Geng). Rather, a POSITA would have recognized that Boerjes’s scanner system already captures color data for its 3D digital model. EX2011, ¶¶112-14. For example, Boerjes explains that “after completing a scan, a dental office may transmit a digital model to a dental laboratory or a fabrication facility for evaluation of adequacy of the scan,” where the dental laboratory may “evaluate color and suggest shade matching for a dentist.” EX1004, [00194]. A POSITA would have understood this to mean that the digital model includes color data, and thus, Boerjes’s system already performs color scanning. EX2011, ¶114. Indeed, Dr. Karam confirmed that the feedback provided by the dental laboratory, including its evaluation of color, would be “based on the remote analysis of the digital model.” EX2013, 57:20-58:17. As Dr. Foroosh explains, additional discussion in Boerjes confirms that a POSITA would have appreciated that Boerjes’s system already performs color scanning. *See* EX2011, ¶115 (noting Boerjes describes using a tri-stimulus model (*e.g.*, Hue-Saturation-Intensity model) known to provide color information for 3D color models) (citing EX1004, [00181], [00194], [00200], FIG. 3).

Because a POSITA would have understood that Boerjes’s system (including as modified by Geng, as Petitioner proposes) already performs color scanning, the POSITA would have appreciated that the purported benefits (*i.e.*, to “allow the dentist to more accurately match the color and shade of a prosthesis” or “facilitate the identification of a finish line”) identified by Petitioner can be achieved by Boerjes alone. EX2011, ¶114. Thus, Boerjes “does not require modification with [Babayoff]’s teaching to achieve” color scanning, making Petitioner’s motivation to combine Boerjes (or Boerjes and Geng) illogical and deficient. *Western Digital Techs., Inc. v. Longitude Licensing Ltd.*, IPR2023-01230, Paper 31, 41-42 (PTAB Jan. 21, 2025) (finding petitioner failed to “present an evidence-supported rationale for the proposed modification” because “the very functions identified as reasons for combining the references are fully realized by” the reference proposed being modified).

B. Petitioner Fails to Establish that Boerjes and Babayoff or Boerjes, Geng and Babayoff Render Obvious Claims 7, 13, and 17

As explained below, Petitioner also fails to show that Boerjes (with or without Geng) and Babayoff render obvious claims 7, 13, and 17. EX2011, ¶116.

1. Claim 7

Claim 7 indirectly depends from claim 1 through claims 4-6. Claim 7 further recites *wherein the instructions to replace the at least the portion of the removed surface portion of the model using the received second scan data*

comprise instructions to further discard a remainder of the received second scan data, the remainder including the identifying surface data, after stitching the portion of the received second scan data with the model. The claimed *identifying surface data* is recited in claim 5, where the identifying data is used to register the received second scan data with corresponding parts of the model. Thus, claim 7 claims the feature that, after the second scan data has been stitched to the portion of the model to be replaced, the portion of the second scan data to register the scan data to the original model (*the identifying surface data*) is discarded. In other words, claim 7 specifies that the remainder of the second scan data that is not used for replacement is discarded (*e.g.*, so as not to overwrite or otherwise impact the portions of the model to be retained). EX2011, ¶117.

Petitioner argues that Boerjes in view of Babayoff or Boerjes in view of Geng and Babayoff renders this claim obvious. Pet., 78. In particular, Petitioner relies on Babayoff as allegedly teaching that “it was well known to discard a remainder of received second data.” *Id.* (citing EX1006, [0177]). Petitioner further argues that a POSITA “would have been motivated to modify Boerjes or Boerjes-Geng to discard the corresponding points (‘identifying surface data’/‘identifying data’) of the second scan data after registration and stitching, as taught in Babayoff, because they would be repetitive.” *Id.*, 78-79.

Petitioner fails to show that the applied references render claim 7 obvious because Petitioner's assertion still relies on the incorrect assumption that Boerjes teaches defining a portion of the model to be retained and a portion of the model to be replaced. EX2011, ¶¶118-19; *see also supra*, §§V.A.1, V.B. Moreover, Petitioner only cites to Boerjes as suggesting "aligning identifying data of the second scan data with corresponding parts of the model" based on its disclosure of stitching scan data to generate a 3D model. Pet., 53-54 (citing EX1004, [00144]). Petitioner points to a similar stitching process for creating the 3D model in Geng. *Id.*, 54 (citing EX1005, 7:57-8:3). However, neither reference describes that, during this process, there is excess data or that excess data should be discarded. EX2011, ¶119. Thus, given the lack of disclosure that (1) the references teach an identification of a portion of the model that should be retained and a portion that should be replaced, (2) there is any desire to discard scan data during the stitching process, Petitioner fails to show why a POSITA would have been motivated to even turn to Babayoff's alleged method of discarding scan data in the first instance. *Id.*

Moreover, even if a POSITA would have motivated to modify Boerjes or Boerjes and Geng in view of Babayoff's teachings, the petition fails to demonstrate such a combination would result in *the remainder including the identifying surface data* being discarded. EX2011, ¶120. As an initial matter, Petitioner points to

nothing in either Boerjes nor Babayoff asserted to disclose the claimed identifying surface data. Rather, Petitioner merely cites disclosure in each of “stitching” data together. Pet., 53-54 (citing EX1004, [00144]), 78 (citing EX1006, [0176]-[0177]). As noted above, Petitioner argues that the stitching process would be understood to use portions of the scan data used to align the data with corresponding parts of the model, which Petitioner maps to the claimed identifying data. See Pet., 53-54.

However, As Dr. Foroosh explains, the stitching processes described, including Babayoff’s as relied on for claim 7, would not discard the overlapping data set used to align images and/or a model because that data set would not be expected to be repetitive. EX2011, ¶121. As he notes, these references describe stitching data to existing three-dimensional data through optimization techniques—that is, the system optimizes the alignment of data sets by fitting features of the data to be as close as possible. See EX1004, [00144] (stating “[t]he three-dimensional data for each newly acquired two-dimensional image set may be derived and fitted or ‘stitched’ to existing three-dimensional data”); EX1005, 7:57-8:3 (“The merger (320) is able to bring the 3D images together and optimize the geometric registration of these images.”). This does not mean that the data used to register scan data with another data set will result in a one-to-one correspondence with each other. EX2011, ¶122. This is evident from Babayoff itself, in which “the overlap zones” of two data sets are numerically transformed (*e.g.*, by a series

of translations and rotations) “until at least a portion of the data from the first entity coincides with at least a portion of the data from another entity.” EX1006, [0177]. These coinciding portions are then “combined by adding both sets of coordinates, and discarding every data point that is repeated.” *Id.* In other words, Babayoff illustrates that the data used to align scan data with a corresponding part of a model can include data that is not a repeated point. EX2011, ¶122.

In view of this, a POSITA would have understood that, even if the teachings of Babayoff were followed (*i.e.*, discarding those points that are “repeated”), this would still not result in *the remainder including the identifying surface data* being discarded. This is because other data points that form the identifying surface data used to align the data sets (through, *e.g.*, best fit or common geometric features) would not be repetitive. EX2011, ¶123. This would be especially true in the combination proposed by Petitioner, where second data representing a temporally distinct scan of the patient’s mouth post-modification is being stitched together with a model representing the patient’s mouth pre-modification and data is then discarded according to Babayoff’s teachings regarding “repetitive” data points. *Id.* As Dr. Foroosh observes, in such scenarios, it would be highly unlikely that the identifying data used to align the second scan data with the model would be repetitive of points in the original model, resulting in the identifying data being **retained** rather than discarded. *Id.*

Accordingly, for the reasons above, Petitioner fails to meet its burden in establishing the obviousness of claim 7. EX2011, ¶124.

2. Claims 13 and 17

Petitioner incorporates its claim 7 analysis for dependent claim 13 and limitation 17[j] of independent claim 17. Pet., 80, 82. Accordingly, for the same reasons discussed above with respect to claim 7, Petitioner fails to meet its burden in establishing the obviousness of claims 13 and 17.

Accordingly, for these additional reasons, Petitioner fails to establish the obviousness of the claims challenged in Grounds 3 and 4. EX2011, ¶125.

VII. CONCLUSION

Accordingly, for at least the reasons set forth above, the petition fails to meet its burden of establishing the unpatentability of claims 1-20 of the '936 patent. Patent Owner respectfully submits that the challenged claims should be found to be not unpatentable over the grounds raised in the petition.

Respectfully submitted,

Date: February 12, 2026

/ Michael T. Rosato /
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VIII. APPENDIX

EXHIBIT NO.	DESCRIPTION
2001	Claim Construction Order, <i>Align Technology Inc. v. ClearCorrect Operating LLC</i> , et al., No. 24-cv-00187-ADA-DTG (W.D. Tex. Jun. 5, 2025)
2002	Scheduling Order, <i>Align Technology Inc. v. ClearCorrect Operating LLC</i> , et al., No. 24-cv-00187-ADA-DTG (W.D. Tex. Aug. 5, 2024)
2003	Fourth Scheduling Order, <i>Align Technology Inc. v. ClearCorrect Operating LLC</i> , et al., No. 24-cv-00187-ADA-DTG (W.D. Tex. Jun. 12, 2025)
2004	DocketNavigator Median Time-to-Trial Statistics for Judge Alan D. Albright and for W.D. Tex. Overall, July 1, 2020 – July 1, 2025
2005	Judge Albright Patent FAQ, https://www.txwd.uscourts.gov/for-attorneys/judge-albright-courtroom-faq/ (accessed July 3, 2025)
2006	Joint Request to Amend the Claim Schedule, <i>Align Technology Inc. v. ClearCorrect Operating LLC</i> , et al., No. 24-cv-00187-ADA-DTG (W.D. Tex. Jun. 6, 2025) (ECF No. 187)
2007	International Application Publication No. WO 2007/084647 to Kriveshko et al.
2008	Complaint for Damages and Injunctive Relief, <i>Align Technology, Inc. v. ClearCorrect Operating, LLC</i> , Case No. 6:24-cv-00187 (W.D. Tex. Apr. 11, 2024) (ECF No. 1)
2009	ClearCorrect’s Preliminary Invalidity Contentions, <i>Align Technology, Inc. v. ClearCorrect Operating LLC</i> , Case No. 6:24-CV-00187 (W.D. Tex. Sept. 26, 2024)

2010	ClearCorrect Prior Art Narrowing Disclosure, <i>Align Technology, Inc. v. ClearCorrect Operating, LLC</i> , Civil Action No. 6:24-cv-00187-ADA-DTG
2011	Declaration of Hassan Foroosh, Ph.D.
2012	<i>Curriculum vitae</i> of Hassan Foroosh, Ph.D.
2013	Transcript of the Deposition of Dr. Lina Karam, held on February 2, 2026
2014	Excerpts from Prosecution History of U.S. Application No. 16/176,474

CERTIFICATE OF COMPLIANCE

Pursuant to §42.24(d), the undersigned certifies that this paper contains no more than 14,000 words, not including the portions of the paper exempted by §42.24(b). According to the word-processing system used to prepare this paper, the paper contains 12160 words.

Respectfully submitted,

Date: February 12, 2026

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CERTIFICATE OF SERVICE

I certify that the foregoing Patent Owner's Response Pursuant to 37 C.F.R. §42.120 and accompanying Exhibits 2011-2014 were served on February 12, 2026, on the Petitioner at the following electronic service addresses:

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