UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CLEARCORRECT OPERATING LLC,
Petitioner,

v.

ALIGN TECHNOLOGY INC.,
Patent Owner.

Case IPR2025-00816
Patent No. 11,369,456

PETITION FOR *INTER PARTES* REVIEW

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LIST OF CHALLENGED CLAIMS

Claim 1	
1(pre)	A computer-implemented method comprising:
1(a)	determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
1(b)	calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;
1(c)	identifying a collision between a first of the dental objects and a second of the dental objects based at least on the schedule of movement of the dental objects and the respective treatment paths;
1(d)	performing a first modification of the schedule of movement in response to the identifying,
1(e)	the first modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages;
1(f)	determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and
1(g)	performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision, the second modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages.
Claim 2	
2	The method of claim 1, wherein the schedule of movement is determined by selection by a user.

Claim 3	
3	The method of claim 1, wherein the schedule of movement includes one of an all-equal pattern, an A-shaped pattern, a V-shaped pattern, a mid-line shift pattern, or a[n] M-shaped pattern.
Claim 4	
4	The method of claim 1, wherein the determining the schedule of movement comprises analyzing, by a computer processor, the dental objects in their respective initial positions and respective final positions.
Claim 5	
5	The method of claim 4, wherein the analyzing comprises determining a respective distance needed to move each of the dental objects from their respective initial positions to their respective final positions.
Claim 6	
6	The method of claim 1, further comprising producing a series of orthodontic appliances based at least on the modified schedule of movement, wherein each of the orthodontic appliances corresponds to a respective one of the treatment stages.
Claim 7	
7(a)	The method of claim 6, wherein the producing comprises: fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and
7(b)	thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.
Claim 8	
8(pre)	A computer-implemented method comprising:

8(a)	determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
8(b)	calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;
8(c)	identifying a collision between a first of the dental objects and a second of the dental objects based at least on the schedule of movement of the dental objects and the respective treatment paths;
8(d)	performing a first modification of the schedule of movement in response to the identifying,
8(e)	wherein the first modification comprises delaying initial movement of the first of the dental objects;
8(f)	determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and
8(g)	performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision.
Claim 9	
9	The method of claim 8, wherein the second modification comprises slowing or stopping movement of the first of the dental objects during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved.
Claim 10	
10(a)	The method of claim 9, further comprising:

	performing, after determining that the second modification does not avoid a collision, a modification of the schedule of movement of the dental objects, the modification comprising:
10(b)	moving the first of the dental objects away from the respective route of the second of the dental objects; and
10(c)	moving the first of the dental objects toward its respective final position after the second of the dental objects has sufficiently traversed its respective route to avoid the collision.
Claim 11	
11(pre)	A computer-implemented method comprising:
11(a)	determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
11(b)	calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;
11(c)	identifying a collision between a first of the dental objects and a second of the dental objects based at least on the schedule of movement of the dental objects and the respective treatment paths;
11(d)	performing a first modification of the schedule of movement in response to the identifying;
11(e)	determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and
11(f)	performing a second modification of the schedule of movement after the determining that the first modification does not avoid a

	collision, wherein the second modification comprises one or more of:
11(g)	delaying initial movement of the first of the dental objects; and
11(h)	slowing or stopping movement of the first of the dental objects during one or more of the treatment stages following a previous one of the treatment stages during which the first of the dental objects moved.
Claim 12	
12(pre)	A computer-implemented method comprising:
12(a)	determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
12(b)	calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;
12(c)	identifying a collision between a first of the dental objects and a second of the dental objects based at least on the schedule of movement of the dental objects and the respective treatment paths;
12(d)	performing a first modification of the schedule of movement in response to the identifying;
12(e)	determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and
12(f)	performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision, wherein the second modification comprises:
12(g)	moving the first of the dental objects away from the respective route of the second of the dental objects; and

12(h)	moving the first of the dental objects toward its respective final position after the second of the dental objects has sufficiently traversed its respective route to avoid the collision.
Claim 13	
13(pre)	A computer-implemented method comprising:
13(a)	determining a schedule of movement for dental objects during treatment stages, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
13(b)	calculating a respective route from an initial position toward a final position for each of the dental objects during the treatment stages;
13(c)	performing a first modification to the schedule of movement to avoid a collision or obstruction between a first dental object and a second dental object of the dental objects on their respective routes,
13(d)	the first modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages;
13(e)	determining that the first modification does not avoid the collision or obstruction between the first dental object and second dental object; and
13(f)	performing a second modification of the schedule of movement after determining that the first modification does not avoid the collision or obstruction, the second modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages.
Claim 14	
14	The computer-implemented method of claim 13, wherein determining the schedule of movement comprises selecting a

	movement pattern from a plurality of predetermined movement patterns.
Claim 15	
15	The computer-implemented method of claim 13, further comprising manufacturing at least two orthodontic aligners, each of the orthodontic aligners corresponding to a respective one of the treatment stages.
Claim 16	
16(a)	The computer-implemented method of claim 15, wherein the manufacturing comprises: fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and
16(b)	thermoforming an orthodontic aligner over each respective positive mold.
Claim 17	
17(pre)	A computer-implemented method comprising:
17(a)	determining a schedule of movement for dental objects during treatment stages, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
17(b)	calculating a respective route from an initial position toward a final position for each of the dental objects during the treatment stages;
17(c)	performing a first modification to the schedule of movement to avoid a collision or obstruction between a first dental object and a second dental object of the dental objects on their respective routes;
17(d)	determining that the first modification does not avoid the collision or obstruction between the first dental object and second dental object; and

17(e)	performing a second modification of the schedule of movement after determining that the first modification does not avoid the collision or obstruction; and
17(f)	recalculating at least one of the respective routes based on the first or second modified schedule of movement.
Claim 18	
18(pre)	A computer-implemented method comprising:
18(a)	determining a schedule of movement for dental objects during treatment stages, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
18(b)	calculating a respective route from an initial position toward a final position for each of the dental objects during the treatment stages;
18(c)	performing a first modification to the schedule of movement to avoid a collision or obstruction between a first dental object and a second dental object of the dental objects on their respective routes;
18(d)	determining that the first modification does not avoid the collision or obstruction between the first dental object and second dental object; and
18(e)	performing a second modification of the schedule of movement after determining that the first modification does not avoid the collision or obstruction, wherein the first modification or second modification comprises:
18(f)	moving the first dental object away from the respective route of the second dental object;
18(g)	stopping movement of the first of the dental objects; and

18(h)	moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective route to avoid the collision.
Claim 19	
19(pre)	A computer-implemented method comprising:
19(a)	determining a schedule of movement for dental objects during treatment stages, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;
19(b)	calculating a respective route from an initial position toward a final position for each of the dental objects during the treatment stages;
19(c)	performing a first modification to the schedule of movement to avoid a collision or obstruction between a first dental object and a second dental object of the dental objects on their respective routes;
19(d)	determining that the first modification does not avoid the collision or obstruction between the first dental object and second dental object; and
19(e)	performing a second modification of the schedule of movement after determining that the first modification does not avoid the collision or obstruction, wherein the first modification or second modification comprises:
19(f)	moving the first dental object away from the respective route of the second dental object;
19(g)	stopping movement of the first of the dental objects; and
19(h)	moving the first dental object toward its previous position.

I. INTRODUCTION

U.S. Patent No. 11,369,456 ("'456 patent") is directed to software for generating orthodontic treatment plans using clear aligners. Ex-1001, Abstract, 5:6-20, 5:27-43. The '456 patent admits that generating a treatment plan for clear aligners was well known when the patent was filed. Ex-1001, 1:39-45. The '456 patent does not assert any technical advancement or new methods of treatment. Instead, the "need" the patent purportedly met was "to increase automation of a tooth movement treatment planning process." Ex-1001, 2:7-11. But all the claimed automated techniques were known in the prior art.

The primary reference asserted (Chishti-511) discloses a computerized system that generates a treatment plan for clear aligners. The other cited references disclose well-known features that would have been obvious components of an automated software treatment-planning system. Chishti-876 discloses a database of established treatment patterns for creating treatment plans. Sachdeva, which was not considered during prosecution, discloses techniques that were the basis for allowance of many of the claims of the '456 patent, such as modifying whether or not teeth move to avoid collisions. And Becker, which was also not considered during prosecution, discloses a well-known collision-avoidance technique that was the basis for the allowance of several other claims.

A person of ordinary skill in the art ("POSITA") would have been motivated to combine Chishti-511 with the other references. The '456 patent's claims are invalid as obvious, and Petitioner requests that the Board institute an *inter partes* review of the '456 patent and cancel claims 1-19.

II. RELIEF REQUESTED

Petitioner ClearCorrect Operating LLC requests review and cancellation of claims 1-19 of the '456 patent based on the following prior art and grounds:

Exhibit	**Reference**	**Prior-Art Status**[1]
Ex-1004	U.S. Patent No. 6,471,511 ("Chishti-511"), issued October 29, 2002	§102(b)
Ex-1005	U.S. Patent No. 6,729,876 ("Chishti-876"), issued May 4, 2004	§102(b)
Ex-1006	Adrian Becker, *The Orthodontic Treatment of Impacted Teeth* ("Becker"), published 1998[2]	§102(b)
Ex-1007	U.S. Patent No. 6,250,918 ("Sachdeva"), issued June 26, 2001	§102(b)

[1] Prior-art status has been assessed under pre-AIA 35 U.S.C. §102. The '456 patent claims priority to a provisional application filed August 30, 2006. Ex-1001, p.2, (60). While Petitioner does not concede that the '456 patent is entitled to this priority date, all asserted references qualify as prior art under this date.

[2] Becker was publicly available at least by April 30, 1998. Ex-1020, ¶¶11-20.

Ground	Claims Challenged	35 U.S.C.	References
1	1-9, 11, 13-17	§103	Chishti-511, Chishti-876, and Sachdeva
2	10, 12, 18, 19	§103	Chishti-511, Chishti-876, Sachdeva, and Becker

III. THE '456 PATENT

A. Overview

The '456 patent describes a computerized system for scheduling the movement of teeth in stages. Ex-1001, 2:16-27, Abstract; Ex-1003, ¶37.

The computer generates a digital model from a scan of the patient's teeth. Ex-1001, 5:27-31. A model of the patient's teeth at a final position is then defined. Ex-1001, 3:61-4:1, 5:32-38. The computer determines a movement path for the patient's teeth from initial to final positions. Ex-1001, 3:58-4:7, 5:34-43; Ex-1003, ¶38.

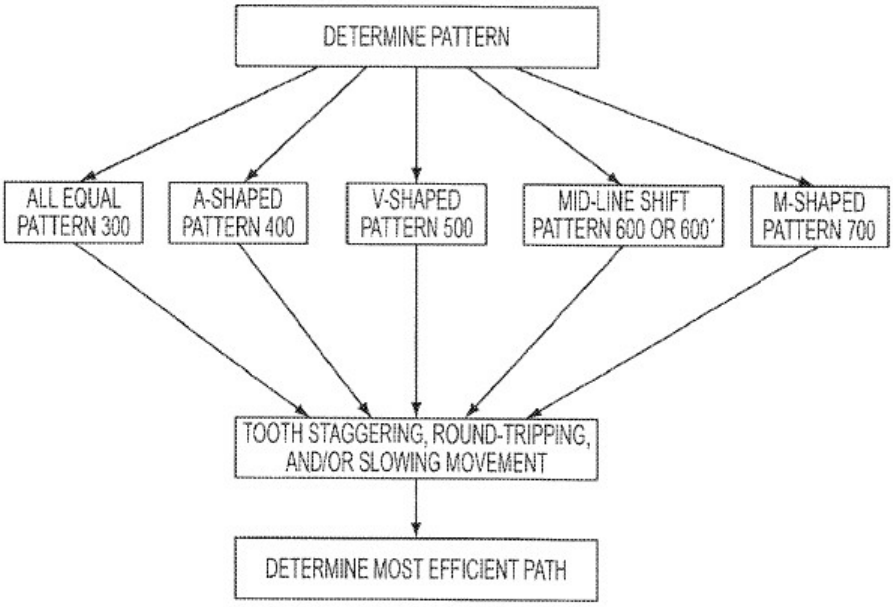


FIG. 2B

Ex-1001, Fig. 2B.

One of various patterns of movement is initially selected to be used by the system. Ex-1001, 5:57-6:16, Figs. 2B, 3-9. The system then determines whether the teeth movement would result in collisions between teeth. Ex-1001, 6:43-47. The '456 patent admits that both pattern selection and collision detection are disclosed in the prior art, such as Chishti-876. Ex-1001, 6:10-16, 6:47-54. If a collision is detected, the system modifies the treatment plan using well-known techniques for avoiding collisions. Ex-1001, 12:67-13:12; Ex-1003, ¶¶39-41.

B. Prosecution History

U.S. Application No. 16/723,706 issued as the '456 patent, and stems from two provisional patent applications filed by Align on August 30, 2006. Ex-1001,

p.1, (21) & p.2, (60). Align filed the first nonprovisional parent in 2007, and it issued in 2011 as U.S. Patent No. 8,038,444 ("'444 patent").

During prosecution, the Office rejected certain claims of the '706 application over two Chishti publications—Chishti-511 and U.S. Patent Publication No. 2004/0137400 ("Chishti-400")—and one to Phan (U.S. Patent No. 6,309,215). Ex-1002, 3296-305.

After multiple prior-art rejections and examiner interviews, the examiner allowed the claims only after Align added limitations requiring (1) a "first modification" and "second modification" to the schedule of teeth movement that modify "whether or not at least one of the dental objects move during at least one of the treatment stages", and (2) various techniques for avoiding teeth collisions, such as delaying and slowing the movement of teeth. Ex-1002, 3305, 3320-28. As explained below, the prior art cited in this Petition discloses all of these routine limitations.

Before Align filed the '706 application, ClearCorrect filed IPR2017-01829, challenging the '444 patent's claims in view of Chishti-876 alone and in combination with Chishti-511. Ex-1028. The Board declined to institute *inter partes* review based on, among other things, the claimed "round-tripping" as defined in the '444 patent, which it determined was not explicitly disclosed in the Chishti

references. *See generally* Ex-1008. But the '456 patent's claims do not recite "round-tripping." Ex-1001, 16:7-20:32.

IV. LEVEL OF ORDINARY SKILL IN THE ART

A POSITA pertinent to the '456 patent as of August 30, 2006 (the earliest claimed priority date), would have been part of an interdisciplinary team. This team would have included members with an advanced degree related to dentistry (e.g., BDS, MDS, DDS, DMD) with experience in orthodontics, including 1-3 years of orthodontic training or equivalent experience, and experience using clear aligners. The team may have also included members with a degree in a technical area related to software, graphics, computers, or a related discipline. This technical team member would have had 1-3 years of software development experience. For all team members, more education could substitute for experience and vice versa. Ex-1003, ¶24; Ex-1017, ¶24; Ex-1029; Ex-1030.

Previously, in the '444 IPR petition, ClearCorrect proposed that a person having at least a doctorate in dental science and 3-5 years of training and practical experience in orthodontics would qualify as a POSITA. While this person would qualify as a POSITA, additional information indicates that the level of ordinary skill would include members of an interdisciplinary team. Ex-1003, ¶¶27, 29.

For example, at least two inventors of the '456 patent (Ian Kitching and Alexander Dmitriev) appear to have backgrounds in computer science, but no dental degree. *See* Ex-1011; Ex-1012. Similarly, Sachdeva—a highly relevant prior-art reference—includes two inventors: Rohit Sachdeva (an orthodontist) and Rudger Rubbert (a mechanical engineer). Ex-1007, p.1, (75); Ex-1009; Ex-1010. The level of ordinary skill in the art proposed in this Petition is thus consistent with the '456 patent and the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art may reflect an appropriate skill level); *TikTok Inc. v. Cellspin Soft, Inc.*, IPR2024-00767, Paper 8, 19 (PTAB Oct. 1, 2024); Ex-1003, ¶¶28-29.

V. CLAIM CONSTRUCTION

The Board construes claims according to *Phillips v. AWH Corp*., 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. §42.200(b).

In the related district-court litigation, the parties agreed to the following constructions relevant to the '456 patent's claims:

Term	**Agreed Construction**
slowing / slow claims 9, 11	[having / have] one or more teeth scheduled to move at a rate less than the rate of other teeth, or even [stopping / stop] using interim key frames, so that collisions and/or obstructions do not occur
"all-equal pattern" claim 3	A pattern where all of a patient's teeth move in parallel with one another (i.e., all of the patient's teeth that need to move

	begin moving at the same stage, and finish moving at the same stage)

Ex-1013, 8; Ex-1003, ¶33.[3]

In the related district-court litigation, Petitioner also proposed constructions for the terms "V-shaped pattern," "A-shaped pattern," "M-shaped pattern" and "mid-line shift pattern," which appear in claim 3. Ex-1013, 2-3. Patent Owner contended that no construction is necessary. *Id.* The district court issued preliminary constructions of "plain and ordinary meaning" for these terms. Ex-1032, 2-3. Petitioner's proposed constructions mirror Align's definitions for those terms in the '456 patent's specification. *See* Ex-1001, 5:44-6:10, Figs. 3-7; Ex-1003, ¶35. The prior art renders the claims obvious under Petitioner's proposed constructions (which Petitioner adopts for purposes of this IPR), Align's litigation position, and the district court's preliminary constructions (plain and ordinary meaning), as discussed below.[4]

[3] While the district court also addressed other terms, this Petition addresses only terms in the '456 patent's claims.

[4] Petitioner does not concede that any claim term meets the statutory requirements of 35 U.S.C. §§101, 112.

VI. PRIOR-ART OVERVIEW

A. Chishti-511 (Ex-1004)

Chishti-511 discloses a system for segmenting an orthodontic treatment plan into a sequence of steps. Ex-1004, Abstract. The system generates a digital model of the patient's teeth and defines a series of treatment steps to be used with aligners, which incrementally move the teeth from initial to final positions. Ex-1004, 2:50-53, 3:32-5:6, Fig. 1; Ex-1003, ¶49.

Chishti-511 discloses that tooth path segments should be defined such that "moving from one point to the next in the sequence does not result in a collision of teeth." Ex-1004, 4:7-22. Chishti-511 discloses an iterative process for planning treatments. Ex-1004, 4:27-50, 5:21-43, 8:42-66, Figs. 1, 2; Ex-1003, ¶¶50-51.

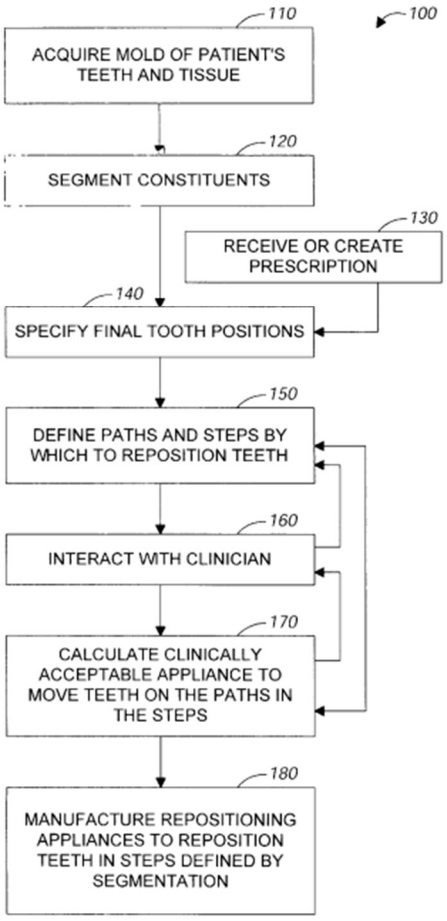


FIG. 1

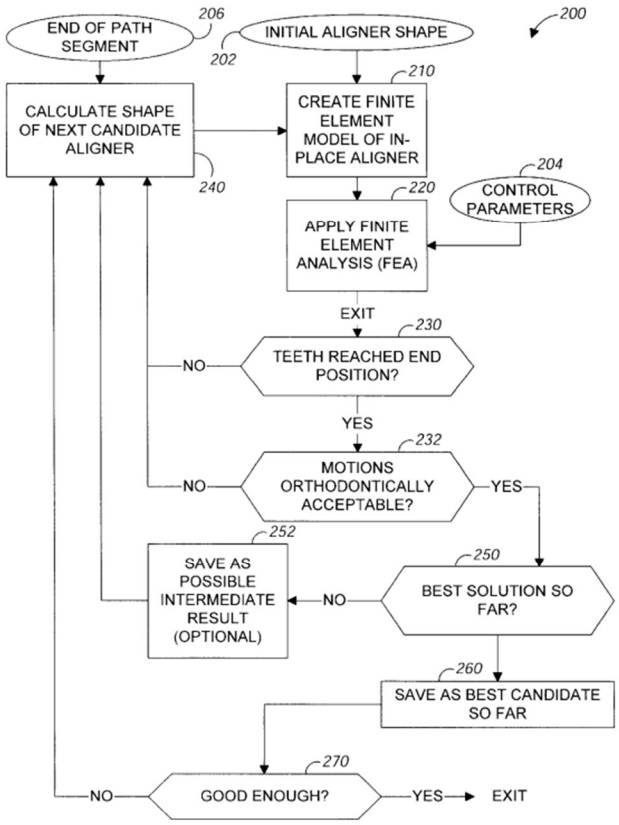


FIG. 2

If the proposed aligner shape does not satisfy the requisite criteria, or changes are made, the subprocess of defining the segmented paths is repeated. Ex-1004, 4:27-35, 8:42-66 ("After the treatment path has been redefined, the outer loop of the overall process is executed again."); Ex-1003, ¶¶49-51; Ex-1017, ¶¶35-39. This allows for repeated modifications "to redefine those parts of the treatment path having unacceptable aligners." Ex-1004, 8:42-66; Ex-1003, ¶51.

B. Chishti-876 (Ex-1005)

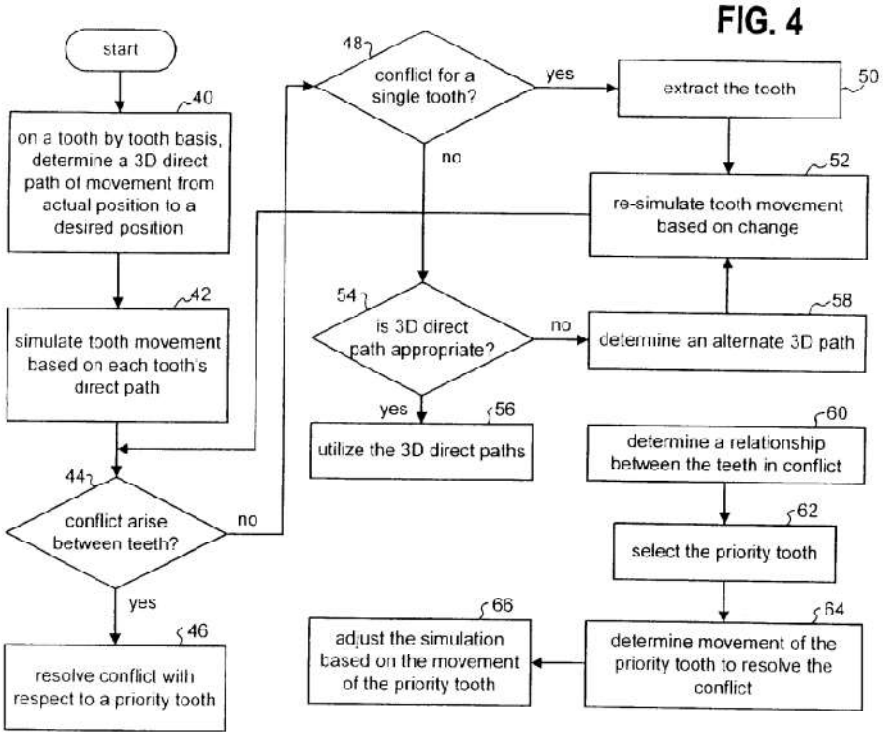
Chishti-876 discloses a treatment-planning system that involves selecting a treatment pattern. Ex-1005, Abstract, 2:15-19. Its algorithm "draw[s] upon a database of preferred treatments" from prior successful treatments. Ex-1005, 14:63-15:1. Chishti-876 also discloses the well-known technique of slowing a tooth to avoid a collision and the known and routine method of manufacturing aligners by thermoforming over a positive mold. Ex-1005, 7:54-64, 12:22-32; Ex-1003, ¶¶56-58; Ex-1017, ¶¶40-46.

C. Sachdeva (Ex-1007)

Sachdeva discloses an orthodontic treatment-planning system that simulates tooth movement, determining whether a collision arises between teeth. Ex-1007, Abstract, 4:50-5:8; Ex-1003, ¶60.

If a collision is detected, it is resolved by modifying the scheduled tooth movement. The system determines a priority tooth and moves the priority tooth before another conflicting tooth to avoid a collision. Ex-1007, 3:43-48, 4:50-5:32. Thus, whereas the teeth previously moved together, Sachdeva discloses modifying

"whether or not" teeth move to avoid a collision.[5] This is the feature that led to allowance of many of the '456 patent's claims. Ex-1003, ¶61.



Ex-1007, Fig. 4; Ex-1003, ¶61; Ex-1017, ¶¶47-51.

D. Becker (Ex-1006)

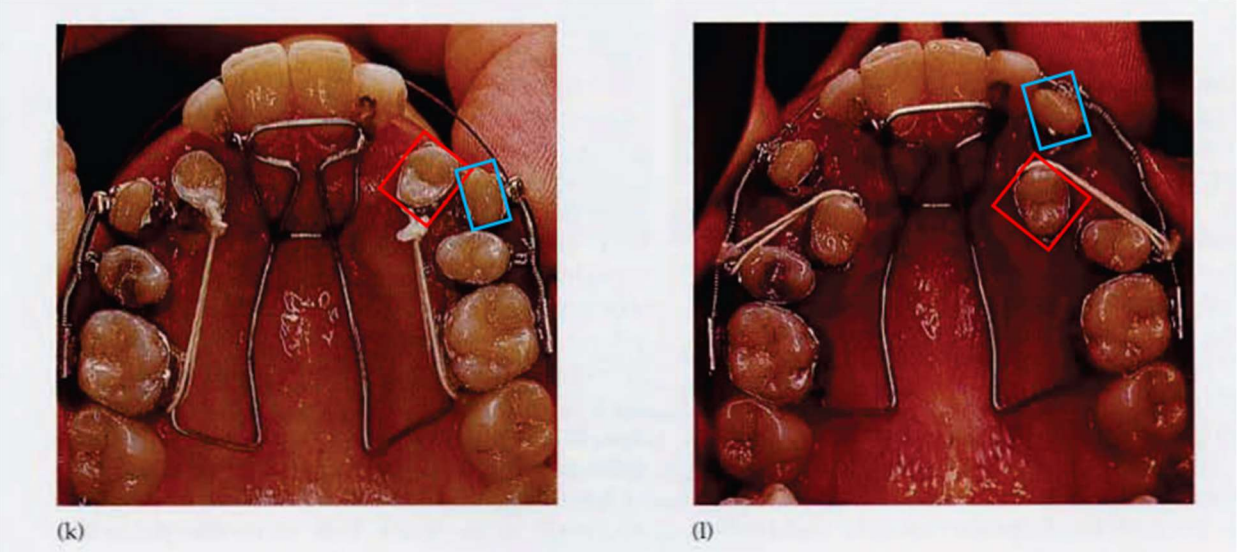
Becker discloses repositioning teeth using a technique known as round-tripping to avoid collisions between two teeth. Ex-1006, Title, 5. Becker explains that where a patient's teeth are "transposed"—an anomaly where a tooth is located

[5] This is also known as "delaying." as initial movement of the nonpriority tooth is delayed in favor of the priority tooth. Ex-1003, ¶61.

in a position normally occupied by a different tooth—the "preferred line of treatment" may include "retranspos[ing] [the teeth] to their ideal positions" rather than "align[ing] the teeth in their transposed positions." Ex-1006, 5; Ex-1003, ¶63.

Becker discloses images of a patient's teeth, where a more lingual tooth (a tooth closer to the tongue in red) is initially transposed with a more buccal tooth (ia tooth closer to the cheek) (in blue).[6]

[6] Becker describes the tooth shown in the upper dental arch as a "lingual" tooth and describes movement of that tooth toward the center of the mouth as "lingual" movement (toward the tongue). Ex-1006, 5. But a POSITA would understand that, when referencing teeth in the upper arch, movement to the center of the mouth is generally described as "palatal" movement, and that "lingual" movement is used when referencing teeth in the lower arch. Ex-1003, ¶64 n.3. Petitioner uses the "lingual" terminology from Becker, but a POSITA would recognize that Becker's technique applies to teeth in either the upper or lower dental arch. *Id.*

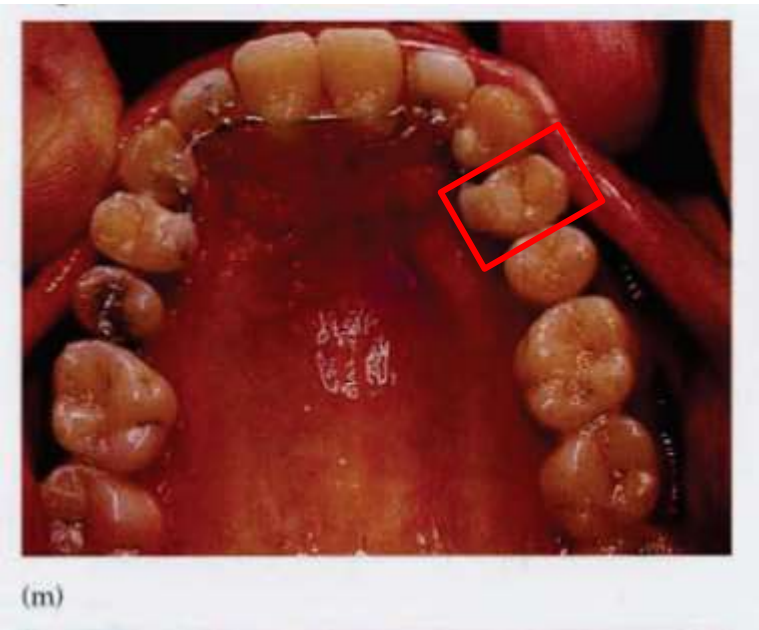


Ex-1006, 7 (Figs. 8.6(k), (l)). The more buccal tooth should be in the position shown on the right, but the more lingual tooth is blocking the direct path of the more buccal tooth. Ex-1003, ¶64.

Becker discloses using round-tripping to correct the transposition of the teeth. Ex-1003, ¶65. Becker describes "slid[ing]" the more buccal tooth toward the midline (i.e., "in the mesio-distal plane"). Ex-1006, 5. To allow for this, the more lingual tooth "must be moved further lingually" "to allow its partner to pass by." *Id.* Finally, the more lingual tooth "must be moved in the opposite mesio-distal direction and back in the line of the arch." *Id.*; Ex-1003, ¶65.

Moving the more lingual tooth in the "opposite" direction and "back in the line of the arch" would return the tooth to its previous position, after which the tooth

would proceed toward a desired final position. Ex-1003, ¶66. Figure 8.6(m) shows the more lingual tooth after it further moved to its final position.



Id. (annotating Ex-1006, 8 (Fig. 8.6(m))).

E. General Overview of Indirect Teeth Movement in the Prior Art

Indirect movement of teeth, as described in Becker, was a well-known technique at the time of the patent for avoiding collisions between teeth. Ex-1003, ¶67. Through such indirect movements, clinicians create sufficient space for a second tooth to move towards its final position while avoiding collisions. *Id*. Such indirect movement was understood to be sometimes necessary in cases involving crowding or impacted teeth, like Becker, where direct movement is not possible without a collision. *Id*.

The indirect movement of teeth is sometimes referred to as "round-tripping."[7] Ex-1003, ¶67. While the claims of the '456 patent do not recite the term round-tripping, the claims of Ground 2 include limitations related to that movement technique. But these types of movements were neither novel nor nonobvious (as shown by references such as Becker), and the '456 patent's disclosure reflects a widespread consensus that round-tripping was an option to be considered, with advantages and disadvantages, and that round-tripping would be used as necessary if it was the best (or potentially only) available treatment option. Ex-1003, ¶72.

A clinician presented with a patient where direct movement of a tooth towards its final position is not possible without causing a collision would consider various tooth-movement techniques, including round-tripping, to avoid a collision. Ex-1003, ¶68. A clinician would consider both the risks (such as root resorption, loss of periodontal support, and prolonged treatment time caused by the round-

[7] The '456 patent specification includes a specific, narrow definition of "round-tripping" such as that disclosed in Becker. Ex-1001, 13:8-12. Because the '456 patent claims do not refer to "round-tripping" or the specification's particular definition, the discussion in this section uses "round-tripping" in its more general sense of indirect movement.

tripping movement), as well as the benefits of achieving proper alignment while avoiding a collision. *Id*. Although indirect movement was understood to be avoided if possible, it was also understood to be a necessary option for some patients. Ex-1003, ¶69; *see* Ex-1004, 4:9-16; Ex-1001, 13:12-18.

Other publications also confirm that round-tripping was well known. Becker discloses it as a "preferred line of treatment" in certain cases. Ex-1006, 5; *supra* Section VI.D; Ex-1003, ¶¶62-66, 70. Similarly, Park discloses a known movement technique whereby anterior teeth are moved to a forward position and then "retracted back after creating space with the distal movement of the molars and premolars." Ex-1024, 5-6; Ex-1003, ¶70. DeAngelis also discloses a known technique where a tooth is tipped such that the root apex moves "from point *a* to point *b*'," and then is "brought back through point *a* to the desirable end-point *b*." Ex-1023, Fig. 1B; *see also* Ex-1023, Fig. 2-3; Ex-1003, ¶70.

VII. CHISHTI-511, CHISHTI-876, SACHDEVA, AND BECKER ARE ANALOGOUS ART

Each of the cited references is analogous art to the '456 patent and to each other. The '456 patent states that the "present invention is related generally to the field of orthodontics, and more particularly to staging a path of movement for correcting the position of one or more teeth." Ex-1001, 1:25-27. Like the '456 patent, each of Chishti-511, Chishti-876, Sachdeva, and Becker is in the same field

of endeavor, as each is directed to orthodontic treatment for repositioning misaligned teeth in patients. *See* Ex-1004, Abstract ("orthodontic treatment path into clinically appropriate substeps for repositioning the teeth of a patient"); Ex-1005, Abstract ("prepar[ing] a malocclusion treatment plan"); Ex-1007, Abstract ("simulating tooth movement for an orthodontic patient," including "a three-dimensional direct path of movement"); Ex-1006, 5 (discussing teeth movement); Ex-1003, ¶73.

Chishti-511, Chishti-876, Sachdeva, and Becker are also reasonably pertinent to the problem that the '456 patent purports to solve. Ex-1003, ¶74. The '456 patent purportedly addresses the problem of potential collisions of teeth along a path for correcting tooth positions. Ex-1001, 1:25-27, 6:43-54 ("determin[ing] if the pattern should be modified to accommodate the teeth movement … to avoid collision"), 6:55-62 (discussing avoiding collisions); Ex-1003, ¶74. The references are reasonably pertinent to this same problem. Ex-1003, ¶75. Chishti-511 discloses "defin[ing] a tooth path" such that the movement "does not result in a collision of teeth." Ex-1004, 4:7-9, 4:18-22. Chishti-876 discloses that "determining a tooth path includes finding a collision[-]free shortest path." Ex-1005, 2:28-30. Sachdeva determines a "path of movement," "determines whether a conflict arises between at

least two teeth," and resolves that conflict. Ex-1007, Abstract. Becker shows a known technique used to avoid collision of teeth. Ex-1006, 5; Ex-1003, ¶75.

VIII. MOTIVATION TO COMBINE CHISHTI-511, CHISHTI-876, SACHDEVA, AND BECKER

A POSITA would have been motivated to combine the Ground 1-2 references with a reasonable expectation of success. Ex-1003, ¶¶76-91.

A POSITA would have been motivated to use Sachdeva's collision identification and avoidance techniques to supplement Chishti-511's treatment-planning system. Chishti-511's system generates a "sequence of tooth positions, so that moving from one point to the next in the sequence does not result in a collision of teeth." Ex-1004, 4:15-22. Considering this express disclosure, a POSITA would have been motivated to look to teachings regarding techniques for identifying and avoiding collisions. Ex-1003, ¶77.

Sachdeva provides such a teaching. Like Chishti-511, Sachdeva recognizes that collisions are undesirable. *See* Ex-1007, 5:5-8 (conflicts "interfere[] with the direct path movement of another tooth[,] causing a particular tooth to not be able to obtain its desired position"). Sachdeva further discloses automatically identifying collisions and resolving them, including by giving one tooth priority to move before another tooth (delaying one tooth). *See* Ex-1007, 5:3-32, Fig. 4. Sachdeva explains

how the changes will cause adjustments or recalculations in the simulated treatment. *Id.*; Ex-1003, ¶78.

A POSITA would have recognized that integrating Sachdeva's automated collision identification, avoidance, and adjustment features into Chishti-511 would provide implementation details for the features disclosed in Chishti-511 and would help achieve the "clinically viable sequence of tooth positions" sought by Chishti-511—that is, helping prevent aligners that might cause a collision. Ex-1003, ¶79; Ex-1004, 4:15-22. Indeed, the type of collision avoidance disclosed by Sachdeva (delaying an initial movement of a tooth) was a well-known treatment technique at the time. *See, e.g.*, Ex-1014, 6 (describing repositioning canine teeth after "the central and lateral incisors are repositioned"); Ex-1015, 5 ("mandibular teeth should advance … somewhat ahead of the maxillary teeth"); Ex-1016, 123-24 & Fig. 12-10a (describing "[h]igh-anchorage pattern" where the anterior teeth are only moved after the posterior teeth have moved)[8]. A POSITA would have understood that such a system would improve patient results by avoiding unacceptable collisions and

[8] Tuncay (Ex-1016) was publicly available at least by August 17, 2006. Ex-1021, ¶¶ 21-37.

increase efficiency by reducing the need for a clinician to manually identify collisions. Ex-1003, ¶79.

A POSITA would have had a reasonable expectation of success in combining Chishti-511 and Sachdeva because each uses similar computer-implemented treatment-planning systems that use digital models of teeth to determine movement paths and avoid collisions between teeth. Ex-1017, ¶¶56-61 (citing Ex-1004, 4:7-22, 10:19-51; Ex-1007, 4:39-49, 5:3-32). Implementing Sachdeva's collision identification and avoidance technique would have merely involved modifying Chishti-511's algorithm for calculating new aligners to include Sachdeva's teachings. Ex-1017, ¶58. Chishti-511 states that new aligners will be calculated in various circumstances, including where the aligners are not acceptable. Ex-1004, 5:27-32; Ex-1017, ¶¶56-57. A POSITA would understand that aligners producing collisions would not be acceptable, and Sachdeva's collision-identification process would be an option for determining the acceptability of aligners (e.g., triggering whether a new aligner should be calculated). Ex-1003, ¶¶77-80; Ex-1017, ¶¶57-58. Chishti-511 explains that changes in teeth motion can be part of the path redefinition, and a POSITA would have understood that these changes may include Sachdeva's disclosed collision-avoidance process. Ex-1017, ¶59 (citing Ex-1004, 8:42-43, 8:54-61, Fig. 6). Sachdeva provides clear guidance on its collision-

avoidance process (Ex-1007, 5:3-32, Fig. 4), and integrating such a feature into Chishti-511 would have required little more than software modifications involving triggering an aligner recalculation if a collision is identified and modifying Chishti-511's "path definition process" (Ex-1004, 8:54-61) to include the movement technique disclosed in Sachdeva as one option for changing tooth motion, which would have been well within the skill of a POSITA. Ex-1017, ¶¶60-61.

A POSITA similarly would have been motivated to combine Chishti-511 with Becker's teachings regarding avoiding collisions using indirect tooth movement (i.e. round-tripping). Ex-1003, ¶¶81-86. Chishti-511 already discusses needing collision-free treatment paths (Ex-1004, 4:15-22), and a POSITA would have been motivated to look to techniques for avoiding collisions during treatment. Ex-1003, ¶81. A POSITA would have recognized that different patients may require different treatments and thus would been motivated to include multiple treatment methods to avoid potential collisions. *Id*. Becker provides one such teaching, illustrating how round-tripping can be used to avoid collisions of transposed teeth. Ex-1006, 5-7. In transposition cases involving canines, a POSITA would have understood that round-tripping might be preferable over a different treatment (e.g., extracting the tooth) because canine teeth play a critical role in preventing collapse of the dental arch. Ex-1003, ¶81.

While the treatment shown for Becker's patient is one example, a POSITA would have understood that, depending on the specifics of a patient's malocclusion, there are different ways to implement the collision-avoidance technique disclosed in Becker. Ex-1003, ¶82. A POSITA would have also understood that if only minor tooth movement is required to avoid a collision, aligners alone may be used to accomplish treatment. *Id.*

A POSITA would also recognize that in other cases, treatment where more significant tooth movement is needed to avoid a collision may utilize aligners with attachments, such as attachments shown in Becker, to achieve the desired movement. Ex-1003, ¶83. A POSITA would have understood that using such attachments was well known. *Id.* For example, Chishti-511 describes that its process for computing the shape of an aligner will also take into account hardware attachments if necessary to create the tooth motion. *See* Ex-1004, 8:42-53 (system "calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion"); *see also* Ex-1004, 10:1-6 (aligners account for "the position and selection of attachments, and the addition or removal of material (e.g., adding wires or creating dimples)"), 6:21-24. State of the art similarly confirms that use of attachments as shown in Becker was known. Ex-1003, ¶83; Ex-1016, 26, 30-38, 34, 35 (Fig. 2-24c); Ex-1018, Abstract, 11:45-

65; Ex-1019, Abstract, 3:21-48. Thus, a POSITA would have understood that, depending on the type of malocclusion, aligners alone or with attachments may be used to achieve Becker's round-tripping. Ex-1003, ¶83.

Although round-tripping can have disadvantages, a POSITA would have recognized that for some patients, round-tripping may be the only option, particularly if one wishes to avoid extracting one or more teeth. Ex-1003, ¶84. Indeed, Chishti-511 expressly discloses that round-tripping is "sometimes necessary to allow teeth to move past each other." Ex-1004, 4:13-15; Ex-1003, ¶84. Chishti-511, Becker, and the '456 patent are thus all consistent in understanding that round-tripping may be required to treat certain patients, even if it is, in the words of the '456 patent, "a last resort." Ex-1004, 4:9-16; Ex-1001, 13:12-18; Ex-1006, 5; Ex-1003, ¶84.[9]

A POSITA would have been motivated to include round-tripping as one feature in a system with robust software for generating treatment plans for a broad range of patients with different needs, and this would have been obvious, even if

[9] The prior art also discloses that some of the reasons clinicians tended to avoid round-tripping may have been based on only anecdotal evidence and were not supported by more rigorous research. *See* Ex-1022, 1, 3; Ex-1003, ¶71.

those features are only used in rare cases or as a last resort for patients that might otherwise not be able to be treated. Ex-1003, ¶84. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) ("[W]hen a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." (citation omitted)); *cf. Honeywell Int'l Inc. v. 3G Licensing, S.A.*, 124 F.4th 1345, 1355-56 (Fed. Cir. 2025) (obviousness "does not require that a particular combination must be the preferred, or the most desirable, combination"; "[r]ather, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness,' of the claimed invention." (citations omitted)).

Moreover, a POSITA would have had a reasonable expectation of success in combining these teachings for the same reasons discussed for Sachdeva. Ex-1017, ¶62; Ex-1003, ¶85. Like Sachdeva's technique, a POSITA would have been motivated to integrate Becker's round-tripping treatment technique as an option in Chishti-511's algorithm for calculating new aligners, such as when it is determined that the aligner is unacceptable (e.g., the treatment plan results in a collision). Ex-1004, 4:15-22; *see also* Ex-1004, 5:27-32, 8:42-61, Fig. 6; Ex-1017, ¶62. If a collision is detected, the combined system would have Becker's technique as an

option for use in Chishti-511's path-redefinition process, which already incorporates other types of changes to tooth movement. Ex-1017, ¶62. Adding the option to use Becker's technique to round-trip one or more teeth as part of generating a treatment plan would have involved a mere software modification to Chishti-511's algorithm for calculating new aligners (similar to that discussed for Sachdeva), which would have yielded predictable results and had a reasonable expectation of success. *Id.* Indeed, the '456 patent specification's discussion of round-tripping includes no implementation details, suggesting that including such a feature in treatment-planning software was well within a POSITA's skill. *Id.* The prior art cannot be held to a higher disclosure standard than the challenged patent itself.

If it is argued that the prior art teaches away from utilizing Becker, this argument fails because the prior art suggests a similar solution as that disclosed in the '456 patent. *See Adapt Pharma Operations Ltd. v. Teva Pharms. USA, Inc.*, 25 F.4th 1354, 1370 (Fed. Cir. 2022) ("[A] reference does not teach away if a skilled artisan, upon reading the reference, would *not* be 'discouraged from following the path set out in the reference,' and ***would not be 'led in a direction divergent from the path that was taken by the applicant***.'" (second emphasis added)). Chishti-511 recognizes some disadvantages of round-tripping and recommends avoiding such

movement when possible, but also recognizes that round-tripping may sometimes be necessary. Ex-1004, 4:9-16; Ex-1003, ¶86. This is the same teaching as the '456 patent, which refers to round-tripping as a matter of "last resort" when the collision cannot be resolved by other techniques. Ex-1003, ¶86; Ex-1001, 13:12-18.

A POSITA would have been motivated to combine Chishti-876's teachings regarding the use of movement patterns and the generation of schedules of movement with Chishti-511's treatment-planning system, as such a modification would improve efficiency by allowing a technician to generate a treatment plan more quickly. Ex-1003, ¶87. Chishti-511 already discloses the importance of tailoring the generated treatment plan to a clinician's preferences and proposing treatment plans for a clinician's approval, and the use of predetermined movement patterns would facilitate interactions with a clinician by providing repeatable, known treatment techniques. *See, e.g.*, Ex-1004, 3:59-64 (discussing receiving prescription and constraints from clinicians and allowing clinician interaction through a client), 2:45-53, 4:36-50. A POSITA would have understood that such a modification would improve efficiency by allowing a technician to generate a treatment plan more quickly and with potentially fewer modifications, improve treatment quality by applying treatment techniques that had been used successfully

for similar patients, and improve patient flexibility by providing multiple treatments appropriate for patients' needs. Ex-1003, ¶87.

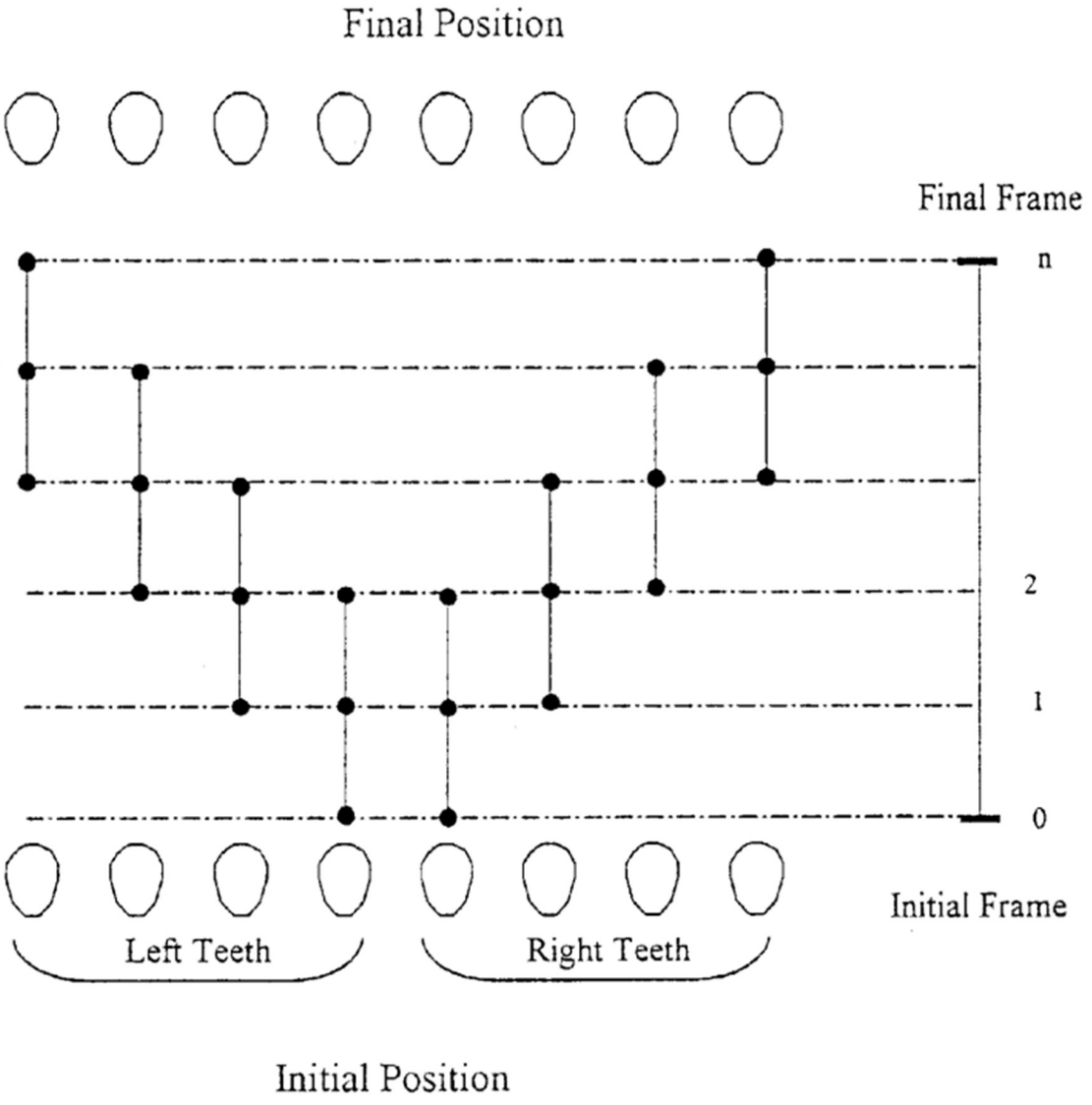
A POSITA would have had a reasonable expectation of success in combining Chishti-876's pattern features with Chishti-511's system, as both disclose similar computer-implemented systems for patient treatment planning. Ex-1017, ¶¶63-65 (citing Ex-1004, 2:45-53; Ex-1005, 15:1-3); Ex-1003, ¶88. Indeed, Chishti-876 and Chishti-511 have common inventors and overlapping details, so a POSITA would have expected that both disclosed systems teach compatible interactive treatment-planning tools and software that may readily be combined in a single system. Ex-1017, ¶63. Chishti-876 discloses a database of treatment patterns that can be selected, and a POSITA would have recognized this feature is equally applicable to Chishti-511's system. Ex-1017, ¶¶64-65 (citing Ex-1005, 14:63-15:1). Integrating this feature into Chishti-511 would allow selection from a plurality of treatment patterns that would affect the schedule of teeth movement, just as in Chishti-876. Ex-1017, ¶64. And such a combination would have required only standard, well-known software-development techniques that would have yielded predictable results, especially because Chishti-876 itself discusses flow charts for calculating movement paths based on patterns, which a POSITA would have been able to look

to when integrating these features. Ex-1017, ¶65 (citing Ex-1005, 18:1-18:23, 19:15-38, 20:4-60, Figs. 14, 15, 18, 20A, 20B).

A POSITA would have been motivated to combine Chishti-876's teachings regarding a schedule of movement indicating whether or not each dental object moves during each of the treatment stages and determining the number of stages, as this modification would provide transparency and predictability to the patient and clinician, as well as improve treatment efficiency. Ex-1003, ¶89. Chishti-511 already discloses calculating the movement of each dental object over the treatment plan to ensure that movement complies with orthodontically acceptable thresholds, and it further discloses calculating the steps of the treatment plan to accomplish the necessary repositioning in the quickest fashion. *See, e.g.*, Ex-1004, 4:15-22, 4:7-12. A POSITA would thus have been motivated to look to Chishti-876, which explains that the system determines whether or not teeth move during each discrete stage of the treatment plan. Ex-1005, 10:11-18. Such a change would beneficially allow both patients and clinicians to understand whether/when teeth would move during treatment, as well as how many stages would be required for each tooth (determining the number of stages). Determining the number of stages would also benefit the system, as it would allow it to compare treatments to see which is "quickest." Ex-1004, 4:7-12; Ex-1003, ¶89. A POSITA would understand that this

would benefit the patient, as plans with fewer treatment stages may achieve patient's goals more quickly, decrease patient discomfort, be more economical if fewer aligners or consultations are required, and increase potential for successful outcomes. Ex-1003, ¶89.

A POSITA would have had a reasonable expectation of success in making this combination, as Chishti-511 already includes data related to segmented paths through which teeth move. Ex-1004, 4:15-22; Ex-1017, ¶¶74-76; Ex-1003, ¶90. Integrating Chishti-876's teachings would merely involve software modifications relating to how existing data is represented in Chishti-511's system, such as graphically representing existing segment data as shown in Chishti-876 below:



Ex-1005, Fig. 11, 17:1-7; Ex-1017, ¶¶74-76. Moreover, Chishti-876 provides guidance in the use of a two-dimensional array to represent this data, which a POSITA would recognize is applicable to Chishti-511's system and would allow it to identify the number of stages and whether or not a tooth moved during each treatment stage. Ex-1017, ¶76.

Finally, for the various features of Chishti-876, Sachdeva, and Becker discussed in this Petition to be combined with Chishti-511, those features would not have interfered with one another when combined with Chishti-511's system. Ex-1003, ¶91; Ex-1017, ¶79.

IX. GROUND 1: CHISHTI-511 IN VIEW OF CHISHTI-876 AND SACHDEVA RENDERS OBVIOUS CLAIMS 1-9, 11, AND 13-17

A. Independent Claim 1

1. [1(pre)] A computer-implemented method comprising:

If the preamble is limiting, Chishti-511 discloses a "computer-implemented method" for orthodontic treatment planning. Ex-1004, Abstract, 1:33-39, 2:34-39, 10:19-51. Chishti-876 and Sachdeva similarly disclose that their relevant steps are computer implemented. *See* Ex-1005, 13:23-48, 23:7-32; Ex-1007, 4:39-49; Ex-1003, ¶96.

2. [1(a)] determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;

Chishti-511 alone or in view of Chishti-876 renders this feature obvious. Ex-1003, ¶¶97-103.

Chishti-511 discloses establishing beginning and final positions for each tooth (dental object) undergoing orthodontic treatment and "defin[ing] a tooth path

for the motion of each tooth." Ex-1004, 4:7-22. The "tooth paths are segmented," so the "end points of each path segment" represent a "clinically viable repositioning," and "the aggregate of segment end points constitute[s] a clinically viable sequence of tooth positions." *Id.*

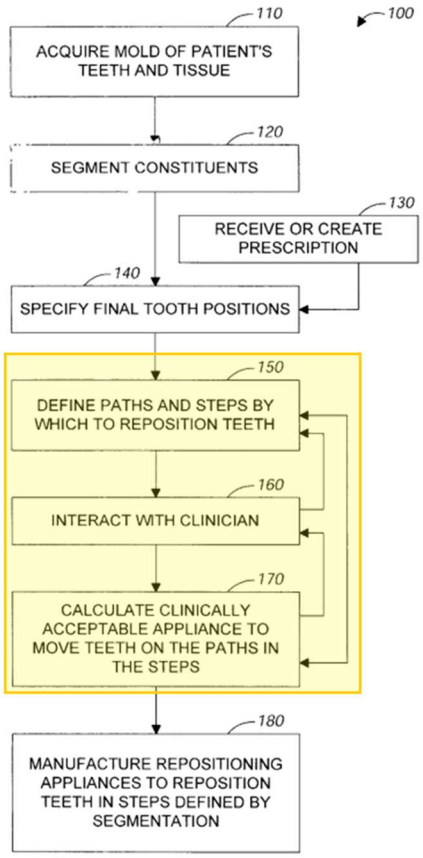


FIG. 1

Ex-1004, Fig. 1 (annotated); Ex-1003, ¶98.

The segmented tooth paths are "used to calculate clinically acceptable appliance configurations … that will move the teeth on the defined treatment path in the steps specified by the path segments." Ex-1004, 4:51-67. A POSITA would

have understood that the sequence of tooth positions and corresponding appliance configurations is a schedule of movement that indicates whether or not a dental object moves during each of the treatment stages. Ex-1003, ¶¶98-99 (citing Ex-1004, 6:63-66, noting that some teeth may be identified as immobile, further indicating that the schedule reflects whether or not a tooth moves).

If it is argued that this feature is not rendered obvious by Chishti-511, a POSITA would have been motivated to modify Chishti-511 to include Chishti-876's teachings regarding generating a schedule of movement indicating whether or not each dental object moves during each of the treatment stages, as explained in Section VIII. Ex-1003, ¶100. Chishti-876's system "define[s] or map[s] the movement of selected individual teeth from the initial position to the final position over a series of successive steps." Ex-1005, 9:13-19; *see also* Ex-1005, 7:13-19, Fig. 3. Chishti-876's system "takes into consideration" "[m]ovement: a detailed, sequential description of how the patient's teeth should be moved in order to accomplish the desired goals for final placement," which is a section of the treatment plan that "specifies an order [of] moving the patient's teeth." Ex-1005, 9:33-45, 10:12-14. Using these teachings, "a plan is generated for moving teeth" (a "schedule of movement"). Ex-1005, 10:29-34; Ex-1003, ¶100. Chishti-876 further explains that its system analyzes considerations "affect[ing] the tooth path

movement plan," including, for example: "[s]pace," "[t]eeth moving past each other," "[w]hich teeth are moving when?" and "[w]hich teeth need to be moved before others are moved?" Ex-1005, 11:32-65; Ex-1003, ¶100.

As shown below, Chishti-876's schedule of movement shows, for each treatment stage, whether each tooth is moving (annotated green for the leftmost tooth) or not moving (annotated red for the leftmost tooth).

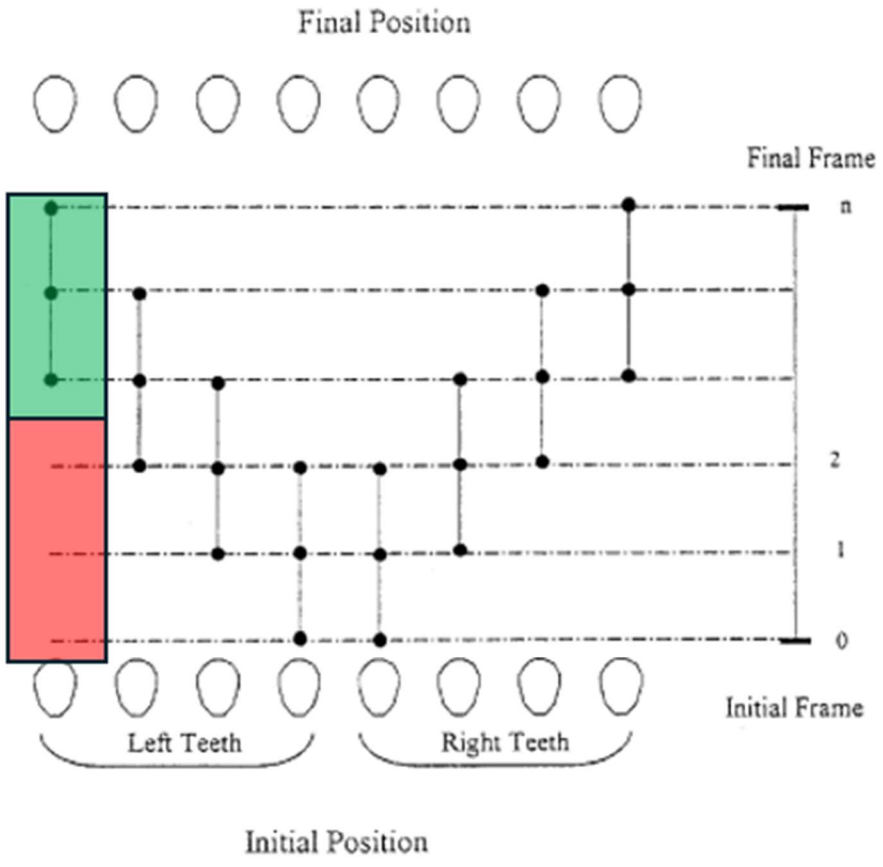


FIG. 11

Ex-1005, Fig. 11 (annotated), 17:1-7. Thus, Chishti-876's schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages. Ex-1003, ¶¶101-103.

3. [1(b)] calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;

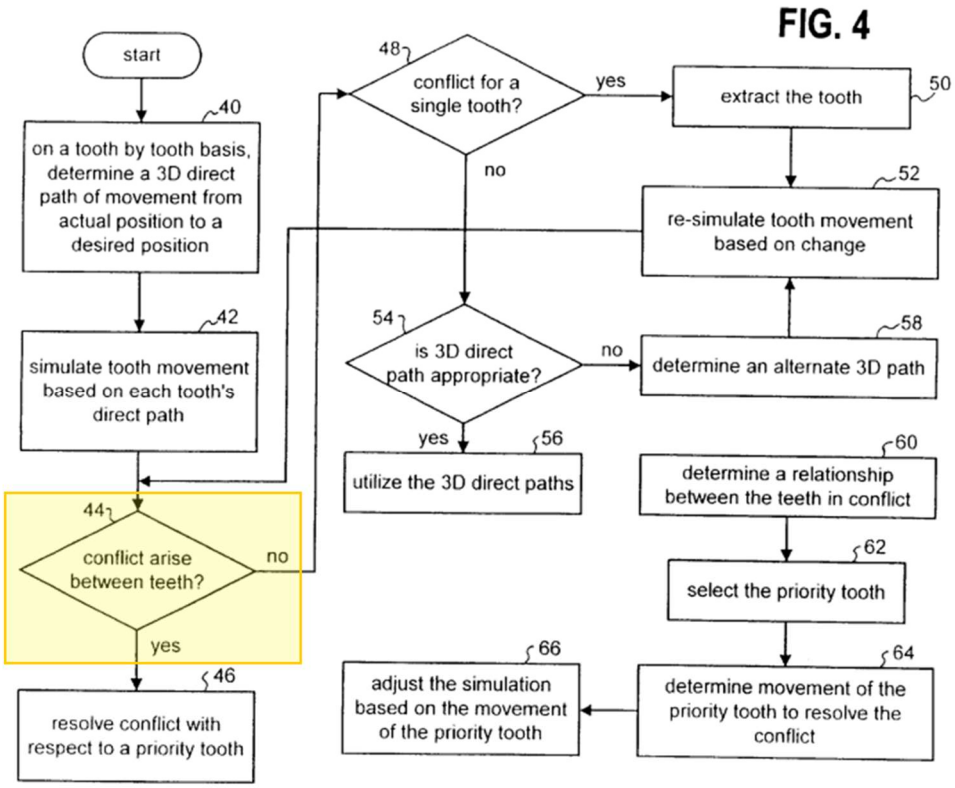
Chishti-511 discloses this feature, teaching that its system "defines a tooth path" (calculating a respective treatment path) "for the motion of each tooth," which includes "bring[ing] the teeth from their ***initial positions*** to their desired ***final positions***." Ex-1004, 4:7-22 (emphases added); *see also* Ex-1004, 4:51-67, 11:4-8; Ex-1003, ¶104.

4. [1(c)] identifying a collision between a first of the dental objects and a second of the dental objects based at least on the schedule of movement of the dental objects and the respective treatment paths;

Chishti-511 alone or in view of Sachdeva renders this limitation obvious. Ex-1003, ¶¶105-107. Chishti-511's solution seeks a "clinically viable sequence of tooth positions" that "do[] not result in a collision of teeth." Ex-1004, 4:7-22. Chishti-511 further states that new proposed aligners will be calculated if the system determines that teeth motion is not "orthodontically acceptable" or if "an acceptable end position is not reached by the teeth." Ex-1004, 5:25-32. A POSITA would have understood that a schedule of movement resulting in a collision would be

orthodontically unacceptable and unlikely to reach an acceptable end position. Ex-1003, ¶106. Chishti-511 further teaches that, when aligners are unacceptable, "the process transfers control to a path definition process … to redefine those parts of the treatment path having unacceptable aligners." Ex-1004, 8:42-61. Chishti-511 further discusses resolving this unacceptability by "changing the segmentation" or "changing the path followed by one or more teeth." Ex-1004, 8:54-61. Thus, during Chishti-511's treatment-planning process, the system identifies unacceptable movements, including those resulting in a collision based at least on the schedule of movement and respective teeth paths, so that the schedule of movement can be redefined. Ex-1003, ¶106.

A POSITA also would have been motivated to modify Chishti-511 to include Sachdeva's collision-identification teachings. *Supra* Section VIII. Sachdeva's treatment-planning system "simulate[s] tooth movement based on each tooth's direct path" and determines if "a conflict in movement arose between at least two teeth." Ex-1007, 5:3-8, Fig. 4; Ex-1003, ¶107.



Ex-1007, Fig. 4 (annotated); Ex-1003, ¶107.

Sachdeva explains that a conflict may arise if the "movement of one tooth interferes with the direct path movement of another tooth" (i.e., a collision), "causing a particular tooth to not be able to obtain its desired position." Ex-1007, 5:3-8. Moreover, Sachdeva recognizes that a conflict may arise by teeth scheduled to move together and may be resolved by the system changing the schedule of movement (as discussed below for limitations 1(d) and 1(e)). Ex-1003, ¶107 (citing Ex-1007, 5:9-26); *supra* Sections IX.A.5-.6. Thus, Sachdeva discloses a system identifying a collision between a first of the dental objects and a second of the dental

objects based at least on the schedule of movement of the dental objects and their respective treatment paths. Ex-1003, ¶107.

5. [1(d)] performing a first modification of the schedule of movement in response to the identifying,

Chishti-511 alone or in view of Sachdeva renders this feature obvious. Ex-1003, ¶¶108-111. Chishti-511 discloses that, when aligners are unacceptable, "the process transfers control to a path definition process … to redefine those parts of the treatment path having unacceptable aligners" Ex-1004, 8:42-61; *see also* Ex-1004, 4:7-50, 5:7-32, Figs. 1, 2, 4, 6; Ex-1003, ¶109 (citing Ex-1004, 6:57-7:8, 8:29-9:2). A POSITA would have understood this is performed in response to identifying a collision, as Chishti-511 discloses seeking a "sequence of tooth positions" that "does not result in a collision of teeth." Ex-1004, 4:7-22; *see also* Ex-1004, 8:42-9:14 (disclosing that "[a]ligners may be unacceptable for a variety of reasons"), 5:7-32; *supra* Section IX.A.4; Ex-1003, ¶109.

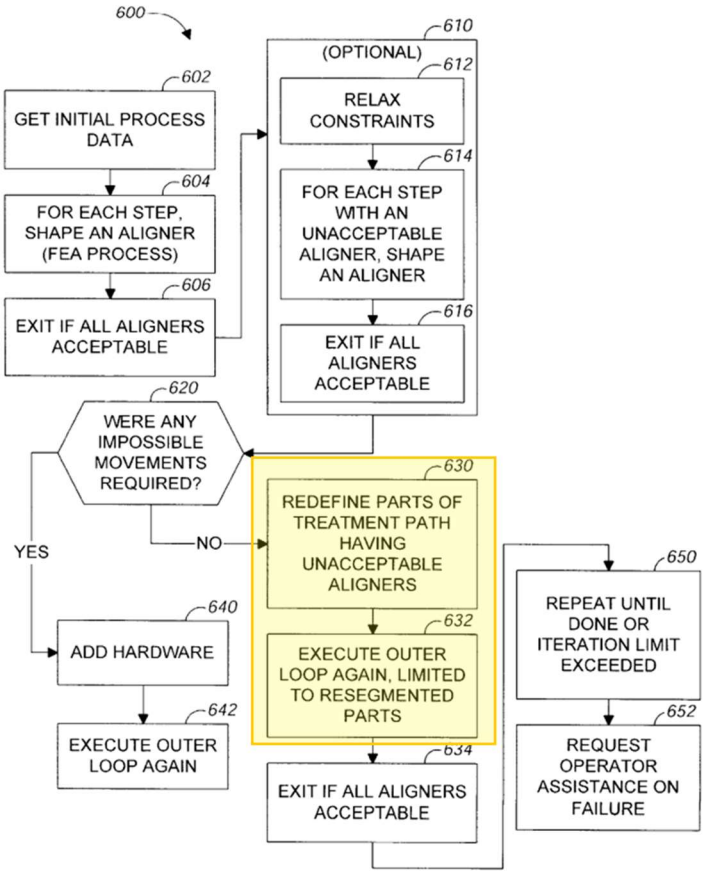
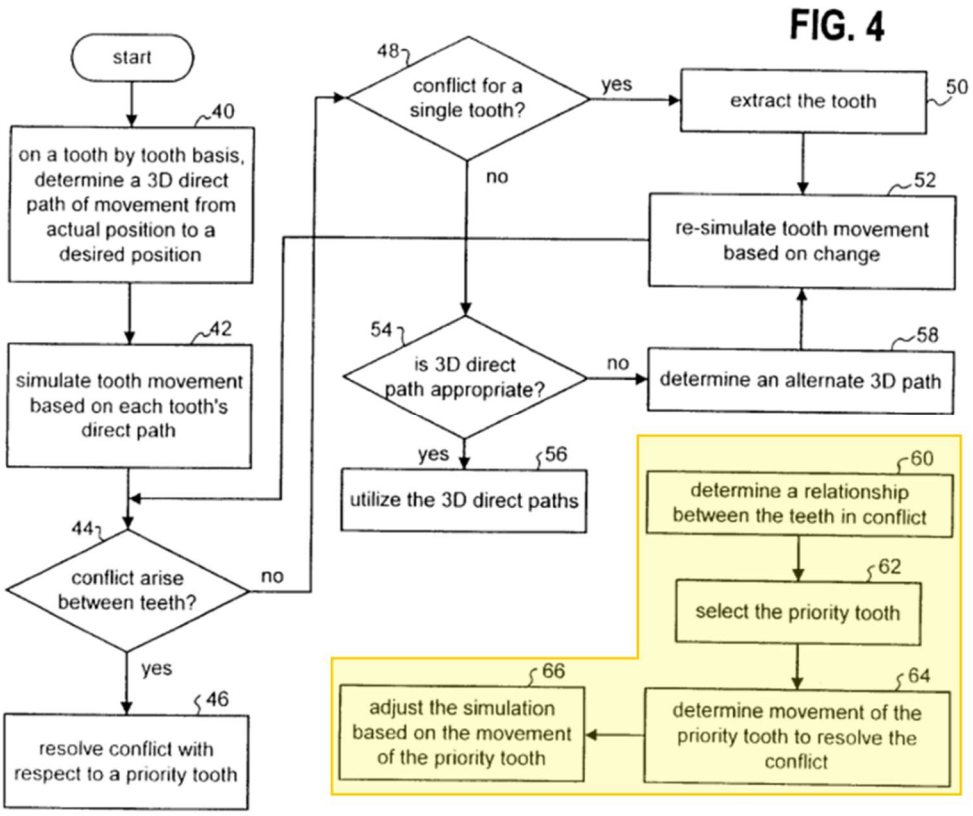


FIG. 6

Ex-1004, Fig. 6 (annotated). Thus, this path redefinition will be performed "in response to the identifying" of a collision. Ex-1003, ¶109.

After identifying a collision, the path-redefinition process will perform "a first modification of the schedule of movement" to avoid the collision, as Chishti-511 explains that its modifications include "changing the increments of tooth motion, i.e., changing the segmentation, on the treatment path, changing the path followed by one or more teeth in the treatment path, or both." Ex-1004, 8:54-61; *see also* Ex-1004, Figs. 4, 6; Ex-1003, ¶110.

If it is argued that Chishti-511 does not expressly disclose modifying the schedule of movement in response to "identifying a collision," Sachdeva does. *Supra* Section VIII; Ex-1003, ¶111. As discussed for limitation 1(c), Sachdeva identifies a collision. *Supra* Section IX.A.4. Sachdeva further explains that, "[i]f a conflict arose" (i.e., in response to the identifying), the system will change the "movement of the priority tooth … to resolve the conflict" (performing a first modification of the schedule of movement). Ex-1007, Fig. 4; *see also* Ex-1007, 5:9-36 (discussing delaying a tooth in response to identifying a collision); *infra* Section IX.A.6 (limitation 1(e), discussing Sachdeva's delaying modification); Ex-1003, ¶111.



Ex-1007, Fig. 4 (annotated). By delaying the nonpriority tooth that resulted in a collision (as discussed for limitation 1(e)), Sachdeva performs a first modification of the schedule of movement in response to the identifying (to avoid the collision). Ex-1003, ¶111. As discussed in Section VIII, a POSITA would have been motivated to implement Sachdeva's teachings in Chishti-511's system. *Id.*

6. [1(e)] the first modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages;

Sachdeva discloses this feature. Ex-1003, ¶¶112-115.

Sachdeva discloses that its collision-avoidance process selects a "priority tooth" between the colliding teeth and that "the actual position of the tooth will dictate" which tooth has "priority." Ex-1007, 5:9-26. "If the lower tooth protrudes[,] preventing the upper tooth from moving back, the lower tooth must be moved before the upper tooth can be positioned. Conversely, if the upper tooth is interfering with the lower tooth from being moved out, the upper tooth must first be moved." *Id.* A POSITA would have understood that, often, teeth will move at the same time if possible. Ex-1003, ¶114. In Sachdeva's examples, however, two teeth are prevented from initially moving together due to interfering with each other. *Id.* Sachdeva's system modifies the schedule of movement for the nonpriority tooth so that instead of moving with the priority tooth, the nonpriority tooth's initial movement is instead delayed and moved after the priority tooth in a later treatment stage. *Id.* Thus, Sachdeva's modification modifies "whether or not at least one of the dental objects move[s] during at least one of the treatment stages." *Id.*

As explained in Section VIII, a POSITA would have been motivated to modify Chishti-511 to include Sachdeva's collision-avoidance technique. Ex-1003, ¶115.

7. [1(f)] determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and

Chishti-511 alone or in view of Sachdeva discloses and renders this feature obvious. Ex-1003, ¶¶116-120. Chishti-511 discloses that "[a]fter the treatment path has been redefined" to account for the unacceptable aligners, the process is re-executed to ensure all aligners are now acceptable (e.g., collisions have been resolved and there are no further collisions). Ex-1004, 8:54-9:14. If the system determines that unacceptable aligners still remain, the process repeats, performing additional modifications "until an acceptable set of aligners is found or an iteration limit is exceeded." *Id.* Thus, Chishti-511 discloses an iterative process that continues to evaluate its planned treatment until it attains an acceptable treatment path without collisions.

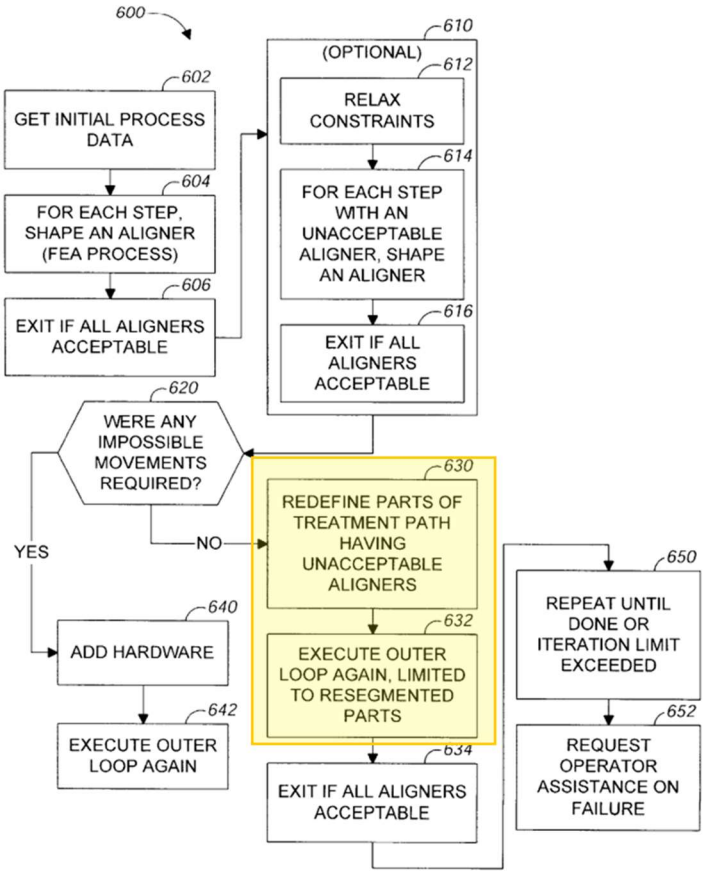


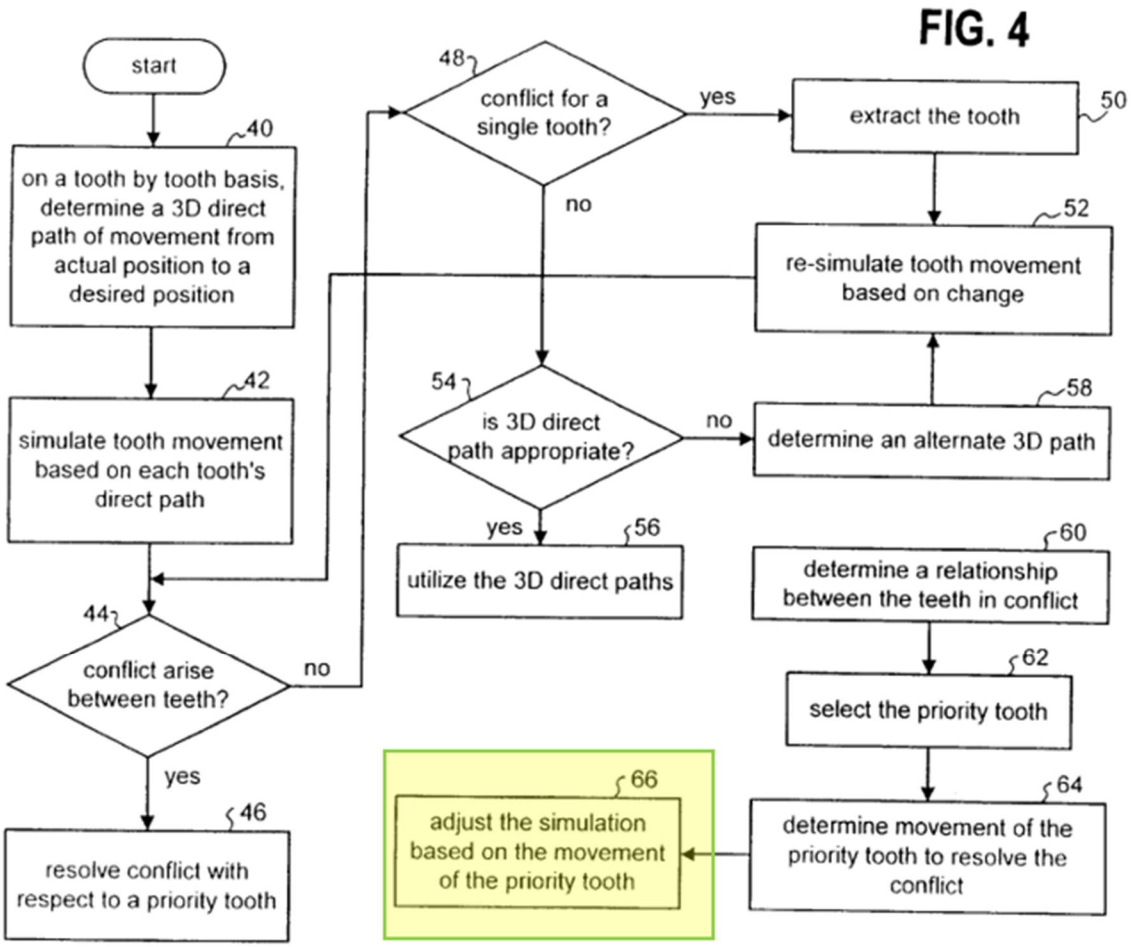
FIG. 6

Ex-1004, Fig. 6 (annotated); Ex-1003, ¶117.

Thus, the same steps of the combined system discussed in limitations 1(c)-1(d) will be iteratively performed to determine whether the treatment plan is acceptable. *Supra* Sections IX.A.4-.5. Because Chishti-511 (alone or in view of Sachdeva) continues to check if the aligners are acceptable as the process iterates, a POSITA would have understood that its process determines whether the first modification successfully avoided the collision between the first and second dental

objects, including determining if the modification did not avoid a collision. Ex-1004, 4:18-22, 4:51-56, 5:25-43, 8:29-35, Figs. 1, 2, 4, 6; Ex-1003, ¶118.

This understanding of the combined system is also consistent with Sachdeva, which discloses that "the simulation is adjusted based on the movement" previously performed to avoid a collision. Ex-1007, 5:29-32; *see also* Ex-1007, Fig. 4 (annotated below):



Thus, like Chishti-511, Sachdeva's system continues simulating results to detect additional potential collisions. Ex-1003, ¶119.

Chishti-876 likewise discloses its system "alters the path" when detecting a collision and the "program then samples the new path (1604) and again applies the collision detection algorithm (1606)." Ex-1005, 13:38-48, Fig. 6. Chishti-876 explains that "[t]he program continues in this manner until no collisions are detected." Ex-1005, 13:38-48.

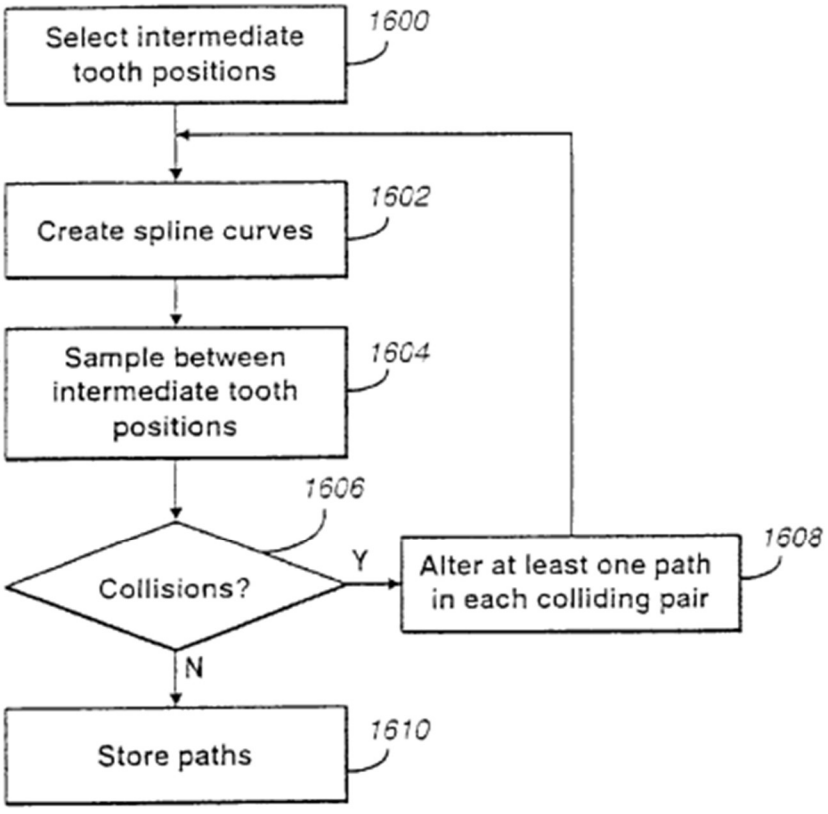


FIG._6

Ex-1005, Fig. 6. Thus, this feature was well known and would have been obvious in view of the combined system, and a POSITA would have been motivated to make the combination, as discussed in Section VIII. Ex-1003, ¶120.

8. [1(g)] performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision, the second modification of the schedule of movement modifying whether or not at least one of the dental objects move[s] during at least one of the treatment stages.

Chishti-511 in view of Sachdeva renders this limitation obvious. Ex-1003, ¶¶121-124. As explained above, Chishti-511 details an iterative process. *Supra* Section IX.A.7 (limitation 1(f)). Therefore, similar to limitation 1(d), the combination likewise includes performing a second modification "to redefine those parts of the treatment path [still] having unacceptable aligners." Ex-1004, 8:54-9:14; Ex-1003, ¶122; *supra* Section IX.A.5 (limitation 1(d)). The system "repeat[s] until an acceptable set of aligners is found or an iteration limit is exceeded." Ex-1004, 8:54-9:14. Thus, Chishti-511's path-definition process will repeat and unacceptable portions of the treatment path will be redefined if the first modification did not avoid a collision and the system will perform a second modification on subsequent iterations. *Id.*; Ex-1003, ¶¶122-123.

It would have been obvious to a POSITA to combine Chishti-511 with Sachdeva to likewise leverage Sachdeva's teachings that "[i]f a conflict arose" (i.e.,

in response to the identifying), the system will change the "movement of the priority tooth … to resolve the conflict" (perform a second modification of the schedule of movement). Ex-1007, 5:9-36. A POSITA would recognize that different parameters for Sachdeva's modification technique would be available depending on the needs of the patient. Ex-1003, ¶124. For example, if the nonpriority tooth was not delayed long enough to avoid the collision, the length of the delay of the nonpriority tooth could be extended to additional treatment stages (thus further modifying whether or not the dental object moved during a treatment stage). *Id.* Similarly, the system may adjust which tooth is the priority tooth, thereby delaying what was previously set as the priority tooth and moving what was previously the nonpriority tooth. *Id.* Similarly, the second modification may include stopping a tooth that was previously scheduled to move to avoid a collision. *Id.* These modifications would be understood to adjust "whether or not at least one of the dental objects move[s] during … [a] treatment stage[]." *Id.* A POSITA would have understood that modifying a schedule to include Sachdeva's delaying technique is one of a finite number of identified, predictable solutions, and they would have been motivated to do so as discussed in Section VIII. *Id.* It also would have involved no more than combining prior-art elements according to known methods to yield predictable results. *Id.*

B. Claim 2: The method of claim 1, wherein the schedule of movement is determined by selection by a user.

Chishti-876 renders this limitation obvious. Chishti-876 discloses that its process "allows a user to select one move pattern from a plurality of move patterns" to complete the desired dental repositioning. Ex-1005, 17:17-19, 17:65-67 (disclosing that "process depend[s] on the move pattern that is ***specified by the user***." (emphasis added)); Ex-1003, ¶¶125-127.

Chishti-876 also discloses that its schedule of movement can be determined by the user-selected pattern. Chishti-876 explains that each treatment pattern presents a "transformation curve" applied to each tooth in order "to move th[at] tooth from its initial position to its final position." Ex-1005, 12:38-43. Chishti-876 further explains that its system "generat[es] the malocclusion treatment plan in accordance with the selected treatment pattern." Ex-1005 2:63-3:5, 2:20-25. Using these patterns, Chishti-876's system "define[s] or map[s] the movement of selected individual teeth from the initial position to the final position over a series of successive steps." Ex-1005, 9:13-19; *see also* Ex-1005, Abstract, 2:63-3:5, 3:24-33; Ex-1003, ¶126.

As discussed in Section VIII, a POSITA would have been motivated to modify Chishti-511 to include Chishti-876's teachings regarding generating a schedule of movement using selected movement patterns. Ex-1003, ¶127.

C. Claim 3: The method of claim 1, wherein the schedule of movement includes one of an all-equal pattern, an A-shaped pattern, a V-shaped pattern, a mid-line shift pattern, or a[n] M-shaped pattern.

Chishti-876 discloses and renders obvious this limitation. Ex-1003, ¶¶128-133. As discussed for claim 2, Chishti-876's system uses treatment patterns to generate a schedule of movement. *Supra* Section IX.B; *see also* Ex-1005, Abstract, 2:63-3:5, 3:24-33. It discloses "exemplary movement patterns," "[a]ll [e]qual," A-type, and V-type patterns. Ex-1005, 16:53-17:13; Ex-1003, ¶129.

With the "[a]ll [e]qual [m]ovement" pattern, "all teeth in a given group are moving at the same time." Ex-1005, 16:57-67. Figure 10 illustrates a schedule of movement using an all-equal pattern:

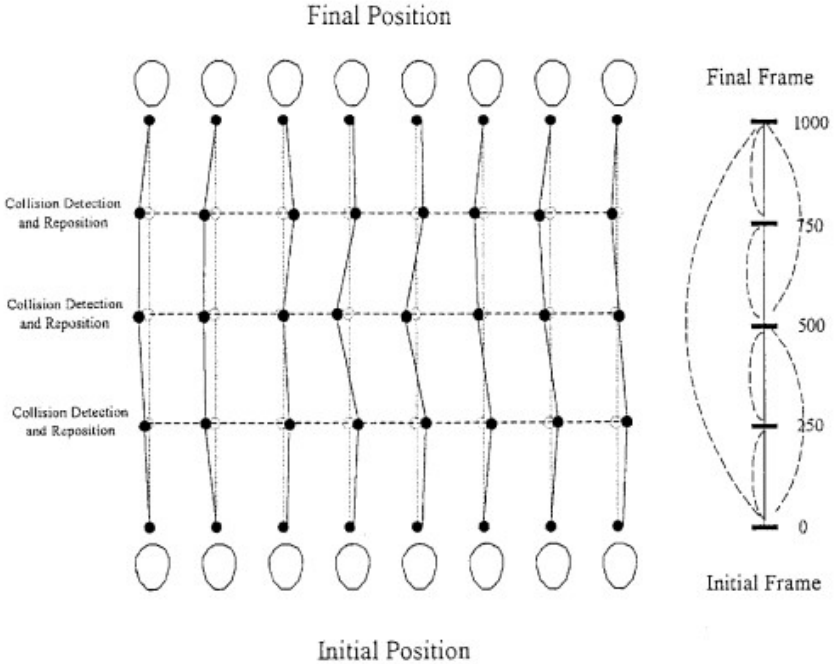


FIG. 10

Ex-1005, Fig. 10. As shown, all the patient's teeth move in parallel with one another, as all of the patient's teeth that need to move begin moving at the same stage and finish moving at the same stage. Ex-1003, ¶130. This satisfies the parties' agreed construction of an "all-equal pattern." *Id.*; Ex-1013, 8. This is also the same general pattern shown in the '456 patent. *See* Ex-1001, 2:50-52, Fig. 3; Ex-1003, ¶130.

Chishti-876 also discloses an A-shaped pattern, which it calls an "A-type movement," explaining that with "this type of movement, the anterior tooth moves first, followed by the posterior teeth." Ex-1005, 17:1-7. This pattern is shown below:

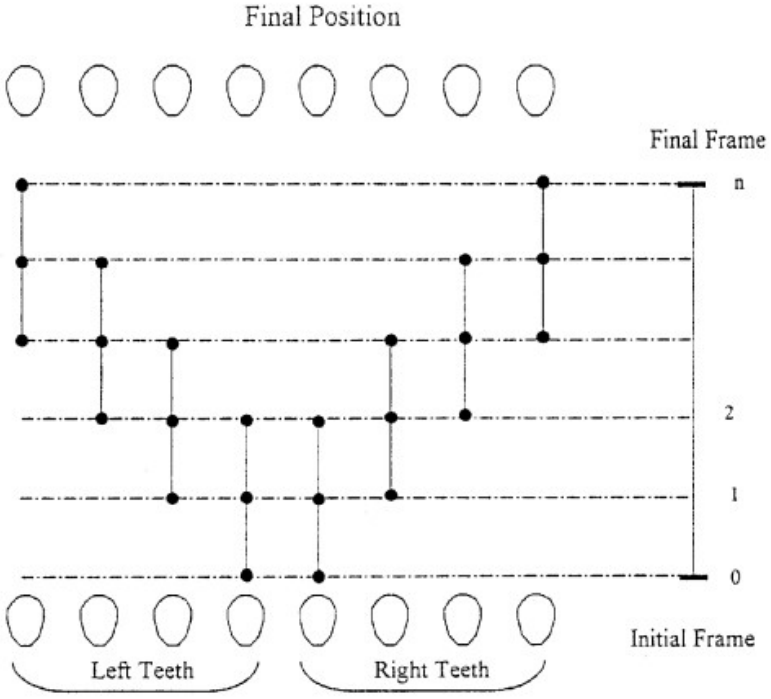
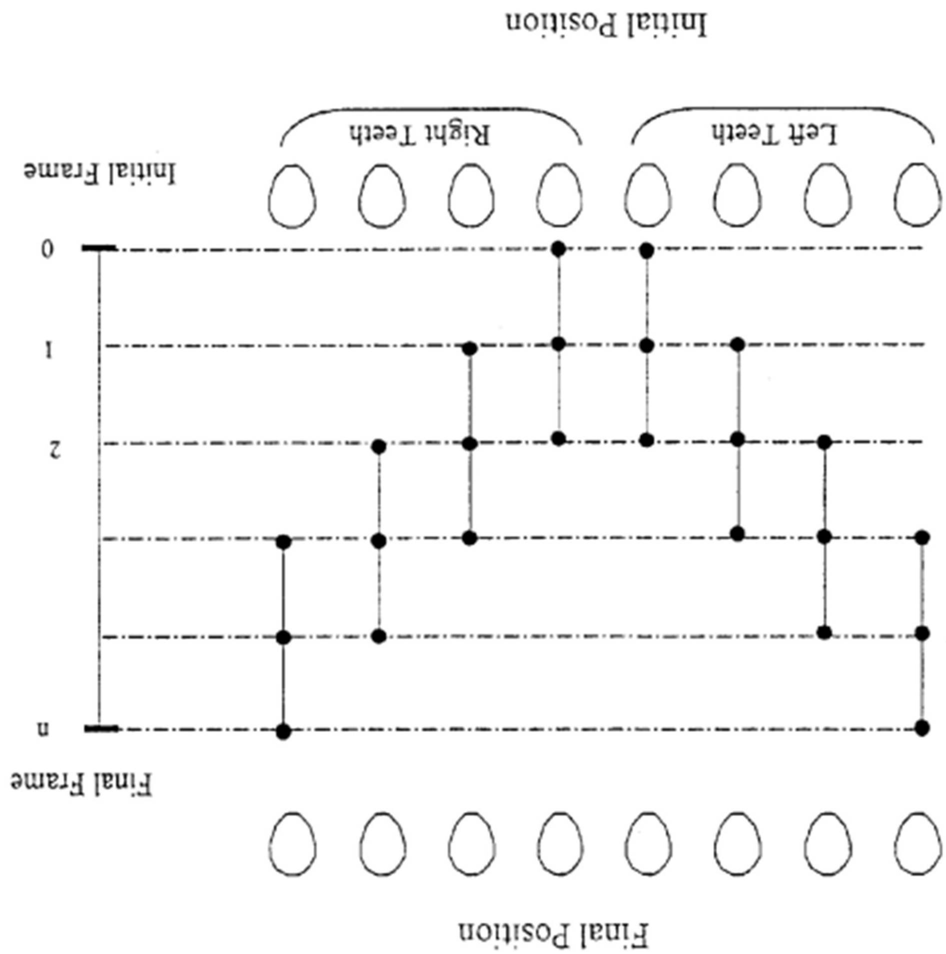


FIG. 11

Ex-1005, Fig. 11. This satisfies the construction for A-shaped pattern, which is "A pattern where teeth having the same and/or similar positions on the arch will be moved beginning at the same stage, and will move continuously until they reach their final position, with the most anterior-positioned teeth (e.g., the incisors, or teeth in positions 1 and/or 2) moving first and then the next posterior-positioned teeth sequentially moving until all of the teeth reach their final position." As shown, the most anterior-positioned teeth begin moving first, with next posterior-positioned teeth sequentially moving until all of the teeth reach their final position. Ex-1003,

¶¶131-132. Also, teeth with similar positions are moved together beginning at the same stage and are moved continuously until they reach their final position. Ex-1003, ¶132. Thus, Chishti-876 discloses this pattern under ClearCorrect's construction or plain and ordinary meaning. *See* Ex-1013, 2-3; Ex-1003, ¶132. While Chishti-876 shows its pattern with the first stages depicted on the bottom, a reorientation of the image with the first stages depicted on top shows why Chishti-876 states that the "movement looks like an A character." Ex-1005, 17:3-4.

FIG. 11



Ex-1005, Fig. 11 (reoriented). The ’456 patent depicts its A-shaped pattern with the same shape. *See* Ex-1001, 2:53-55, Fig. 4. Thus, regardless of the construction of “A-shaped pattern,” the prior art shows at least as much as is disclosed in the ’456 patent itself. Ex-1003, ¶132. Chishti-876 similarly discloses a V-shaped pattern. *See* Ex-1005, 17:8-13, Fig. 12; Ex-1003, ¶132.

As explained in Section VIII, it would have been obvious to modify Chishti-511 to include Chishti-876's teachings regarding use of the disclosed movement patterns. Ex-1003, ¶133.

D. Claim 4: The method of claim 1, wherein the determining the schedule of movement comprises analyzing, by a computer processor, the dental objects in their respective initial positions and respective final positions.

Chishti-511 alone or in view of Chishti-876 renders this limitation obvious. Ex-1003, ¶¶134-137. Chishti-511 explains that, after "[h]aving both a beginning position and a final position for each tooth, the process next defines a tooth path for the motion of each tooth." Ex-1004, 4:7-22. These initial and final tooth positions are analyzed by the system to "optimize[]" the tooth paths "so that the teeth are moved in the quickest fashion … to bring the teeth from their initial positions to their desired final positions." *Id.* Chishti-511 also explains that the steps of its method may be performed on a computer by a computer processor. Ex-1004, 2:34-39, 3:31-39, 10:19-51. A POSITA would have understood that, while creating the acceptable tooth paths, Chishti-511's processor analyzes the dental objects in their respective initial positions and respective final positions. Ex-1003, ¶135.

If it is argued that Chishti-511 does not disclose this limitation, it would have been obvious in view of Chishti-876. Ex-1003, ¶136. Chishti-876 teaches that when selecting a movement pattern, its system "takes into consideration … 1. ***Initial***

Position: a detailed description of the initial maloclussion [sic]," and "2. ***Final Position***: a detailed description of treatment goals for the patient." Ex-1005, 9:34-67 (emphases added). Indeed, Chishti-876 explains that its "program receives as input ***the initial and final positions*** of the patient's teeth and uses this information to select intermediate positions for each tooth to be moved." Ex-1005, 13:27-30 (emphasis added). Thus, Chishti-876's determination of the schedule of movement includes analyzing the dental objects in their respective initial and final positions. Ex-1003, ¶136. Chishti-876 also discloses a computer processor for executing instructions to perform its steps. *See* Ex-1005, 13:23-48, 23:7-32; Ex-1003, ¶136.

A POSITA would have been motivated to analyze the dental objects in their initial and final positions because this data would assist in analyzing whether the dental objects started and ended in their correct locations and to determine if the paths are "optimized" as Chishti-511 teaches. Ex-1004, 4:7-12; Ex-1003, ¶137. A POSITA also would have had a reasonable expectation of success in combining Chishti-511 and Chishti-876 because it would involve a mere software modification, as Chishti-511 already has access to the initial and final positions. *See* Ex-1004, 3:40-4:1. Moreover, Chishti-511 also recognizes that those positions can be used in "defin[ing] a tooth path." Ex-1004, 4:7-22. Thus, incorporating Chishti-876's teachings would merely involve analyzing those positions when determining

tooth paths to ensure that the teeth travel from the initial to final positions. Ex-1017, ¶¶77-78.

E. Claim 5: The method of claim 4, wherein the analyzing comprises determining a respective distance needed to move each of the dental objects from their respective initial positions to their respective final positions.

Chishti-876 discloses this feature. Ex-1003, ¶¶138-140. The '456 patent admits that "the computer program can suitably calculate distances between a first tooth and a second tooth and then apply geometrical techniques, such as those disclosed in [Chishti-876]." Ex-1001, 6:47-54.

Chishti-876 discloses that "determining a tooth path comprises finding a collision[-]free shortest path between an initial position and a final position for one or more teeth." Ex-1005, 23:65-67; *see also* Ex-1005, 2:28-30, 13:33-35, 14:25-40, Fig. 7. A POSITA would have understood that determining a "shortest" path would include determining a distance between an initial position and final position to determine which collision-free path is shortest. Ex-1003, ¶139. Chishti-876 also discloses that, in connection with its X-type or "all equal" movement pattern, the system determines the schedule of movement by first analyzing, for each tooth, a beginning frame and ending frame, determining if the "moving distance" from the beginning frame to the mid frame (i.e., the first half of the distance) "meets a given criterion," and determining whether the "moving distance" from the mid frame to

the end frame (i.e., the second half of the distance) "meets a given criterion." Ex-1005, 16:57-67, 18:1-42, Figs. 15-16. A POSITA would recognize that together, these values constitute the "respective distance needed to move each of the dental objects from [its] respective initial position[] to [its] respective final position[]," which is determined and analyzed by Chishti-876's system. Ex-1003, ¶139.

If it is argued that Chishti-876's system does not determine the claimed distance, it would have been obvious to do so to ensure that the shortest path is found, as Chishti-876 discloses. Ex-1005, 23:65-67, 2:28-30, 13:33-35; *see also* Ex-1005, 14:25-40, Fig. 7. A POSITA would have been motivated to implement such a calculation with Chishti-511's system to improve patient results by allowing the system to determine which paths have shorter distances and to avoid the use of paths that may violate safe movement limits, especially because Chishti-511 expresses a desire to move teeth "in the quickest fashion." Ex-1004, 4:9-12; Ex-1003, ¶140. A POSITA would have had a reasonable expectation of success in such a combination because Chishti-511's system already includes the necessary information (e.g., initial and final positions, tooth paths, and segments) (Ex-1004, 4:7-22). Calculating the claimed distance determination into Chishti-511 would merely involve using data already present in Chishti-511, such as calculating the distance of each tooth segment, as the teeth move from initial to final positions.

Such a change would involve a mere software modification that would permit choosing a "shortest" path as disclosed in Chishti-876. Ex-1017, ¶¶66-69.

F. Claim 6: The method of claim 1, further comprising producing a series of orthodontic appliances based at least on the modified schedule of movement, wherein each of the orthodontic appliances corresponds to a respective one of the treatment stages.

Chishti-511 discloses this feature. Chishti-511's system uses a "series" of adjustments "using appliances," where "[e]ach appliance configuration represents a step along the treatment path." Ex-1004, 4:51-67, 1:33-58. Thus, Chishti-511 discloses a series of orthodontic appliances, each corresponding to a respective treatment stage. Ex-1003, ¶¶141-142.

Chishti-511 discloses that the appliances are manufactured (produced) after the schedule of movement is redefined and acceptable. Ex-1004, 4:51-5:6.

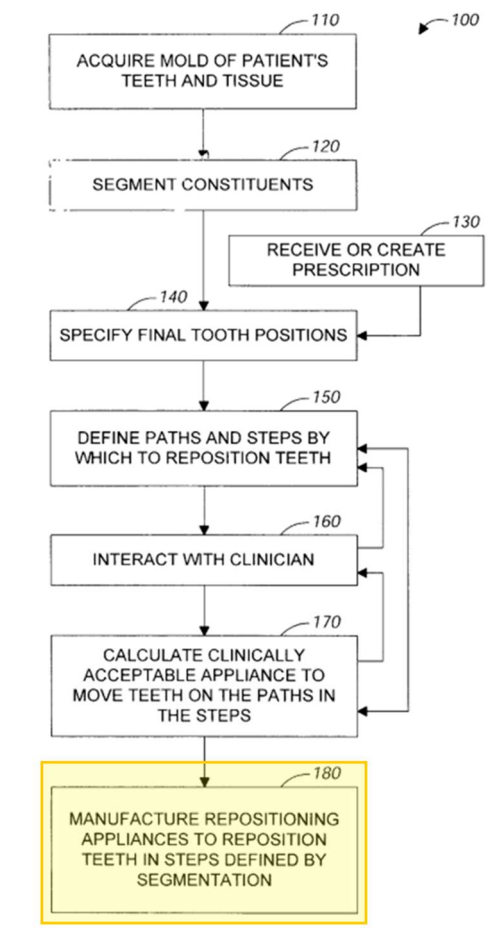


FIG. 1

Ex-1004, Fig. 1 (annotated). Thus, the series of orthodontic appliances that is produced "reposition[s] teeth in steps" based at least on the modified schedule of movement, and thus each of the orthodontic appliances corresponds to a respective one of the treatment stages. *Id.*; Ex-1003, ¶142.

G. Claim 7

1. [7(a)] The method of claim 6, wherein the producing comprises: fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

Chishti-511 discloses this feature, including fabricating "positive models to produce the repositioning appliance[s]," and that "adding a wax patch to the digital model will generate a positive mold that has the same added wax patch geometry." Ex-1004, 9:43-56. Each appliance configuration represents one stage (of multiple) along the treatment path. Ex-1004, 4:51-67. A POSITA would have understood that because this manufacturing of "positive models" is used to produce aligners for each stage of the movement pattern, "positive models" would be fabricated for at least two of the treatment stages, as claimed. Ex-1003, ¶143.

2. [7(b)] thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

Chishti-511 alone or in view of Chishti-876 renders this feature obvious. Ex-1003, ¶¶144-148. Chishti-511 discloses its aligners are "manufactured by pressure fitting polymeric material over a positive physical model of the digital teeth." Ex-1004, 9:43-56. The claimed "thermoforming" is disclosed by Chishti-511's pressure-fitting manufacturing process. Ex-1003, ¶145. A POSITA would have understood that thermoforming is a well-known manufacturing process whereby a plastic sheet is heated to a pliable temperature, shaped into a specific

form using a mold, and then cooled to maintain its new shape. Pressure-fitting a polymeric material over a positive physical model of teeth—as disclosed in Chishti-511—would be understood by a POSITA to be a type of thermoforming, as pressure-fitting uses air pressure in conjunction with the heated plastic sheet to help shape the appliance in the form of the mold. Indeed, the '456 patent admits this was known—the specification's only mention of a manufacturing technique describes "using a ***conventional pressure molding*** technique to form the appliance around the positive mold." Ex-1001, 3:42-46 (emphasis added)). Thus, the '456 patent admits that the required fabrication process was merely "conventional," (*id.*), and a POSITA would have understood that the '456 patent's conventional manufacturing process, which is consistent with and matches Chishti-511's disclosure of pressure-fitting, makes this limitation both disclosed and rendered obvious by Chishti-511. Ex-1003, ¶145.

If it is argued that Chishti-511 does not disclose this feature, this limitation is rendered obvious by Chishti-876, which discloses that dental appliances may be a "polymeric shell" manufactured "from a thin sheet of a suitable elastomeric polymer, such as Tru-Tain 0.03 in, ***thermal forming*** dental material." Ex-1005, 7:54-64 (emphasis added), 7:1-19; Ex-1003, ¶146. A POSITA would have understood that Chishti-876's disclosed thermal forming dental material would be

used to form Chishti-876's polymeric shells through the process of thermoforming the dental material over a respective positive mold (as described in Chishti-511). Ex-1003, ¶146.

Because Chishti-511 discloses manufacturing dental aligners using a conventional technique (Ex-1004, 9:43-56), a POSITA would have been motivated to look to known ways to manufacture the generated aligners, and Chishti-876 discloses known methods for manufacturing these dental appliances. Ex-1005, 7:54-64; Ex-1003, ¶147.

A POSITA would have had a reasonable expectation of success in using thermoforming for dental-appliance manufacturing, as thermoforming is just one of a finite number of identified, predictable solutions, and was a well-known and routine technique for dental-aligner manufacturing at the relevant time. Ex-1003, ¶148. The '456 patent's specification does not purport to have invented the technique. *See, e.g.*, Ex-1001, 3:38-48. The state of the art also confirms this technique was known. Ex-1016, 198 ("A thermoforming process is used for aligner fabrication."); Ex-1016, 18-23 (describing thermoforming to fabricate dental appliances in 1959). Accordingly, a POSITA would have been motivated to combine Chishti-876's disclosure of thermoforming with Chishti-511's disclosure of manufacturing dental aligners. Ex-1003, ¶148.

H. Independent Claim 8

Claim 8 is obvious based on Chishti-511 in view of Chishti-876 and Sachdeva. Most of claim 8 repeats or recites features that are substantively identical to features recited in claim 1. *Compare* Ex-1001, 16:7-33, *with* Ex-1001, 16:59-17:14; *see also* Ex-1003, ¶¶149-150 (comparing claims). One minor variation is claim limitation 8(e) recites that the first modification "comprises delaying initial movement of the first of the dental objects." But as discussed with respect to limitation 1(e), Sachdeva discloses "delaying initial movement of the first of the dental objects." *Supra* Section IX.A.6. Similarly, limitation 1(g) contains more limitations than limitation 8(g), but the overlapping limitations are identical. Ex-1003, ¶150. Accordingly, claim limitations 8(pre)-8(g) are taught or suggested for the reasons discussed in Sections IX.A.1-.8, which discuss the corresponding portions of claim 1. Ex-1003, ¶¶96-124, 149-150.

I. Claim 9: The method of claim 8, wherein the second modification comprises slowing or stopping movement of the first of the dental objects during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved.

Chishti-511 in view of Chishti-876 renders this limitation obvious. Ex-1003, ¶¶151-155. Chishti-511 teaches performing a second modification "to redefine those parts of the treatment path [still] having unacceptable aligners." Ex-1004,

8:54-9:14; Ex-1003, ¶¶116-124, 152; *supra* Sections IX.A.7-.8 (limitations 1(f)-1(g)).

Chishti-876 details a flexible system "allow[ing] a great deal of freedom in planning a patient's treatment," including the slowing or stopping of dental objects. Ex-1005, 12:22-32. In particular, Chishti-876 discloses how movement plans may accelerate and decelerate teeth movement as necessary, and it would have been obvious, when developing a treatment plan, to make modifications that slow a tooth's movement after a previous stage in which the tooth moved. Ex-1005, 12:25-32 ("One component may accelerate … between one pair of stages … while another moves linearly between another pair of stages (e.g., stages 1 to 5), and then changes direction suddenly and slows down along a linear path to a later stage (e.g., stage 10)."); Ex-1003, ¶153. Thus, in Chishti-876, the one tooth (first tooth) slows—it is "scheduled to move at a rate less than the rate of other teeth" (Ex-1001, 13:4-8)—as the other tooth accelerates (whereas the first tooth moves linearly), and thereafter, the first tooth "slows down" even further relative to the other tooth, consistent with the parties' agreed-upon construction for slowing. Ex-1005, 12:25-31; Ex-1013, 8 Ex-1003, ¶153. Moreover, the disclosed slowing also takes place "following a previous one of the treatment stages in which the first dental object moved," as the first tooth further slows in a later stage. Ex-1005, 12:25-31; Ex-1003, ¶153.

A POSITA would have been motivated to combine Chishti-876's slowing technique with Chishti-511 and would have understood that slowing movement during subsequent treatment stages may be used to avoid a collision, as it would alter the rate on which one of the soon-to-collide dental objects is moved. Ex-1003, ¶154. Chishti-876's slowing technique is one tool in a POSITA's toolbox to avoid a collision if a collision remains after the initial modification. *See AstraZeneca LP v. Breath Ltd.*, 603 F. App'x 999, 1002 (Fed. Cir. 2015), aff'g 88 F. Supp. 3d 326 (D.N.J. 2015) (claims obvious where claim elements were among known prior art features in POSITA "toolbox"). Because Chishti-511 and Chishti-876 describe iterative processes, a POSITA would have understood that the subsequent modification may be required to resolve the collisions one at a time until no issues remain. For example, after the first tooth is delayed in a first modification, a collision may potentially be detected in a later stage after the first tooth began its initial movement. *Id.* To resolve this, the first tooth may initially be set to move after delaying; however, at a later stage, the first tooth may be slowed relative to other teeth to ensure that it avoided colliding with other teeth. *Id*. A POSITA would have found this to be beneficial because, if the rate of movement of the tooth was slowed, it could help avoid a collision while still progressing toward its final position, potentially leading to faster overall treatment. *Id*. It would have been

obvious to use Chishti-876's slowing feature as a "second modification" following a previous one of the treatment stages in which the first dental object moved. Ex-1003, ¶154.

A POSITA would have understood that performing a second modification including the claimed slowing would mean simply choosing from a finite number of identified, predictable solutions, and would involve no more than combining prior-art elements according to known methods to yield predictable results. Ex-1003, ¶155.

A POSITA would have had a reasonable expectation of success in modifying Chishti-511 to include slowing. Chishti-511 already discloses that each of its segments includes an "end point[]." Ex-1017, ¶¶70-71 (citing Ex-1004, 4:15-22). A POSITA would recognize based on Chishti-876's disclosure that teeth often move an equal distance, but that the distance traveled may be set to a lesser amount to slow the dental object. Ex-1005, 12:6-32; Ex-1017, ¶71. A POSITA would understand that implementing slowing in subsequent stages after previous movement stages would merely involve a slowed tooth traveling a lesser distance to the next "end point" in slowed segments relative to non-slowed teeth. Ex-1017, ¶¶70-71. Implementing this feature would be a mere software modification that

would alter distance parameters to travel a lesser distance for a slowed tooth, which would have been well within the skill of a POSITA. *Id.*

J. Independent Claim 11

Claim 11 is obvious based on Chishti-511 in view of Chishti-876 and Sachdeva. Most of claim 11—including limitations 11(pre)-11(e)—repeats or recites features that are substantively identical to features recited in claim 1. *Compare* Ex-1001, 16:7-21, 16:25-27, *with* Ex-1001, 17:31-48; *see also* Ex-1003, ¶¶156-157 (comparing claims). Accordingly, claim limitations 11(pre)-11(e) are taught or suggested for the reasons discussed in Sections IX.A.1-.5 and IX.A.7, which discuss the corresponding portions of claim 1. As discussed below, the prior art also discloses or suggests the remaining limitation 11(f). Ex-1003, ¶157.

1. [11(f)] performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision, wherein the second modification comprises one or more of: delaying initial movement of the first of the dental objects; and slowing or stopping movement of the first of the dental objects during one or more of the treatment stages following a previous one of the treatment stages during which the first of the dental objects moved.

Chishti-511 in view of Chishti-876 and Sachdeva renders this limitation obvious for the same reasons provided for limitations 1(e) and 1(g). Ex-1003, ¶158; *supra* Sections IX.A.6, .8. As discussed for limitation 1(g), Chishti-511 in view of Sachdeva renders obvious "performing a second modification of the schedule of

movement after the determining that the first modification does not avoid a collision." Moreover, for the reasons discussed with respect to limitations 1(e) and 1(g), Chishti-511 in view of Sachdeva renders obvious that the second modification comprises "delaying initial movement of the first of the dental objects." *Supra* Sections IX.A.6, .8; Ex-1003, ¶¶112-115, 121-124, 158.

Limitation 11(f) recites "one or more of[] delaying … and slowing or stopping." Addressing similar language in the '444 patent, the PTAB interpreted that language to require one "and/or" the other listed steps. *See* Ex-1008, 8-9. If a similar interpretation is applied here, requiring only one of either (i) delaying ***and/or*** (ii) slowing or stopping, Sachdeva discloses the portion requiring delaying initial movement of the first of the dental objects, and thus satisfies this limitation. *Supra* Sections IX.A.6, .8; Ex-1003, ¶159.

To the extent it is argued that both are required, the claimed slowing is taught by Chishti-876 as discussed for claim 9, and a POSITA would have understood that both techniques may be used to avoid collisions. *Supra* Section IX.I; *see also* Section VIII. Thus, this claim is rendered obvious regardless of whether one or both of delaying and slowing are required. *Supra* Sections IX.A.6, .8, IX.I; Ex-1003, ¶160.

Indeed, a POSITA would have understood that modifying a schedule of movement using these techniques would mean simply choosing from a finite number of identified, predictable solutions, and would involve no more than combining prior-art elements according to known methods to yield predictable results. Ex-1003, ¶161.

K. Independent Claim 13

Claim 13 is obvious based on Chishti-511 in view of Chishti-876 and Sachdeva. Claim 13 repeats or recites features that are substantively identical to features recited in claim 1. *Compare* Ex-1001, 16:7-33, *with* Ex-1001, 18:22-45; *see also* Ex-1003, ¶¶162-163 (comparing claims). Limitations 13(pre)-13(b) are substantively identical to 1(pre)-1(b), and 13(d)-13(f) are substantively identical to 1(e)-1(g). Finally, 13(c) is substantively identical to 1(c) and 1(d) together. Limitation 13(c) recites a modification is performed "to avoid a collision" and 1(c) and 1(d) recite identifying a collision and performing a modification "in response to identifying" the collision (and limitation 1(d)'s analysis discusses modifications made to avoid a collision). Ex-1003, ¶163. Accordingly, claim limitations 13(pre)-13(f) are taught or suggested for the reasons discussed in Sections IX.A.1-.8, which discuss the corresponding portions of claim 1. *Id.*

L. Claim 14: The computer-implemented method of claim 13, wherein determining the schedule of movement comprises selecting a movement pattern from a plurality of predetermined movement patterns.

Chishti-876 renders this limitation obvious. Ex-1003, ¶¶164-165. As explained for claim 2, Chishti-876 explains that its algorithm allows for the selection of a movement pattern from a plurality of movement patterns from a predetermined library, which determine a schedule of movement. Ex-1005, Abstract, 2:63-3:10, 3:24-33, 3:38-40, 3:49-51, 14:63-15:4. Chishti-876 provides several exemplary movement patterns, including how the schedule of movement will be generated based on the selected pattern. Ex-1005, 2:44-62, 3:6-10, 3:24-27, 3:38-40, 3:49-51, 16:48-17:17, Figs. 10-14; 14:63-15:4; Ex-1003 ¶65. Thus, claim 14 would have been obvious, for reasons provided here and for claim 2. *Supra* Sections VIII, IX.B; Ex-1003, ¶¶125-127.

M. Claims 15: The computer-implemented method of claim 13, further comprising manufacturing at least two orthodontic aligners, each of the orthodontic aligners corresponding to a respective one of the treatment stages.

Chishti-511 discloses this feature, disclosing using a "series of aligners" or "appliances" (at least two orthodontic aligners), where "each appliance configuration represents a step along the treatment path" (each … corresponding to a respective one of the treatment stages). Ex-1004, 8:22-28, 1:33-58, 4:51-67, 5:7-12; Ex-1003, ¶ 166.

Chishti-511 discloses that the aligners are manufactured. Ex-1004, 3:32-39, 4:51-6:6, 10:19-51; Ex-1003, ¶ 167.

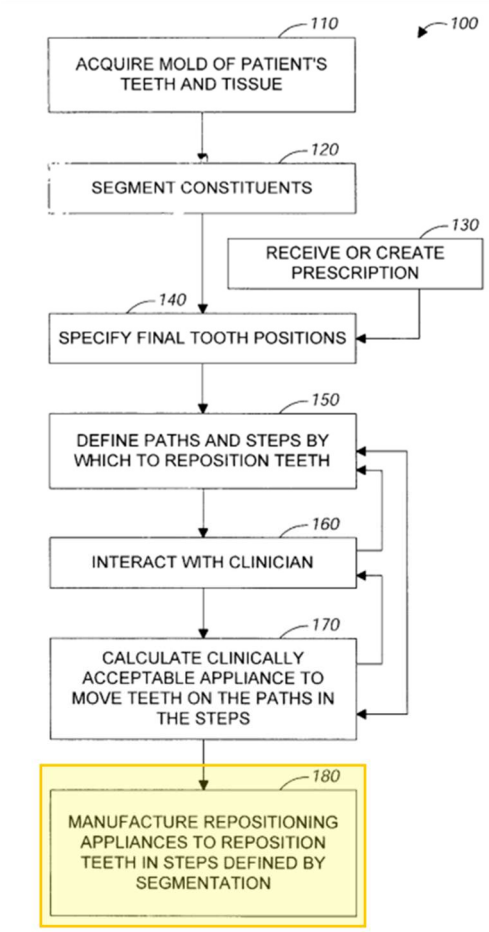


FIG. 1

Ex-1004, Fig. 1 (annotated); *see also* Section IX.F; Ex-1003, ¶ 167.

N. Claim 16

Claim 16 repeats or recites features that are substantively identical to features recited in claim 7. Ex-1003, ¶¶168-169. *Compare* Ex-1001, 16:53-58, *with* Ex-1001, 18:54-59; *see also* Ex-1003, ¶¶168-169 (comparing claims).

Accordingly, claim 16 is obvious based on Chishti-511 alone or in view of Chishti-876 for the reasons discussed in Sections IX.G, which discusses claim 7. Ex-1003, ¶169.

O. Independent Claim 17

Claim 17 is obvious based on Chishti-511 in view of Chishti-876 and Sachdeva. Ex-1003, ¶¶170-171. Most of claim 17 repeats or recites features that are substantively identical to features recited in claim 13. *Compare* Ex-1001, 18:22-45, *with* Ex-1001, 18:60-19:10; *see also* Ex-1003, ¶¶170-171 (comparing claims). Limitations 13(c) and 13(e) contain more limitations than limitations 17(c) and 17(e), respectively, but the overlapping limitations are identical. Ex-1003, ¶171. Accordingly, claim limitations 17(pre)-17(e) are taught or suggested for the reasons discussed for claim 13 (which refers to claim 1). *See* Sections IX.K, IX.A.1-.5, IX.A.7-.8. As discussed below, the prior art also discloses or suggests the remaining limitation 17(f). Ex-1003, ¶171.

1. [17(f)] recalculating at least one of the respective routes based on the first or second modified schedule of movement.

Chishti-511 discloses this limitation. Ex-1003, ¶¶172-173. If aligners are unacceptable, Chishti-511's system "transfers control to a path definition process … to redefine those parts of the treatment path having unacceptable aligners." Ex-1004, 8:54-65. Chishti-511 explains that this includes "changing the increments

of tooth motion, i.e., changing the segmentation, on the ***treatment path***, ***changing the path*** followed by one or more teeth in the treatment path, or both." *Id.* (emphasis added). Chishti-511 further explains that "th[is] ***recalculation***" is performed for "those aligners on the ***redefined*** portions of the ***treatment path***." *Id.* (emphases added). Thus, Chishti-511 discloses recalculating at least one respective route based on the modified schedule of movement. Ex-1003, ¶173.

X. GROUND 2: CHISHTI-511 IN VIEW OF CHISHTI-876, SACHDEVA, AND BECKER RENDERS OBVIOUS CLAIMS 10, 12, 18, AND 19

A. Claim 10

Claim 10 is obvious based on Chishti-511 in view of Chishti-876, Sachdeva, and Becker. Ex-1003, ¶¶173-182.

1. [10(a)] The method of claim 9, further comprising: performing, after determining that the second modification does not avoid a collision, a modification of the schedule of movement of the dental objects, the modification comprising:

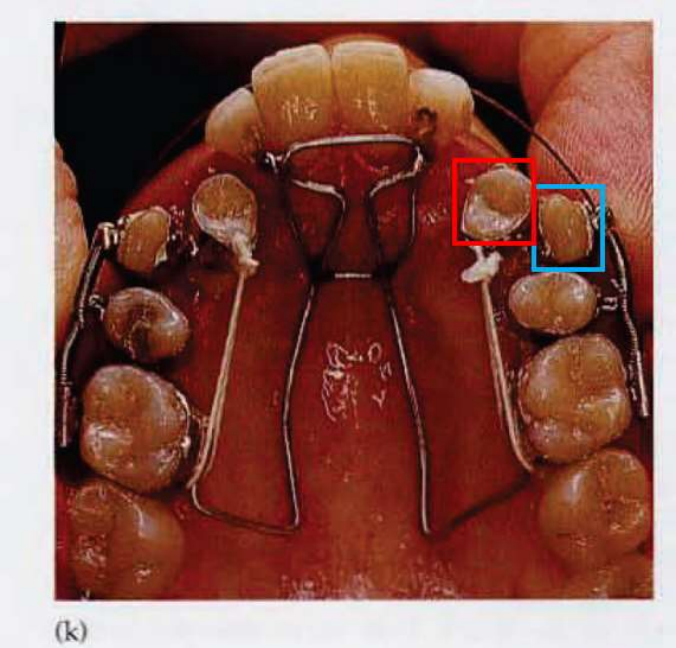
Chishti-511 renders this limitation obvious for the same reasons provided for limitations 1(f) and 1(g). *Supra* Sections IX.A.7-.8; Ex-1003, ¶175. Chishti-511 discloses an iterative process where, "[a]fter the treatment path has been redefined" to attempt to resolve remaining collisions, the collision-detection and avoidance process is re-executed to determine whether collisions remain. Ex-1004, 8:54-9:14. If the system determines that unacceptable aligners still remain, the process repeats,

performing additional modifications "until an acceptable set of aligners is found or an iteration limit is exceeded." *Id.* Thus, for the same reasons that the system determines that the first modification did not avoid a collision and performs a second modification, the system likewise determines that the second modification does not avoid a collision and performs another modification. *Supra* Sections IX.A.7-.8; Ex-1003, ¶175.

2. [10(b)] moving the first of the dental objects away from the respective route of the second of the dental objects; and

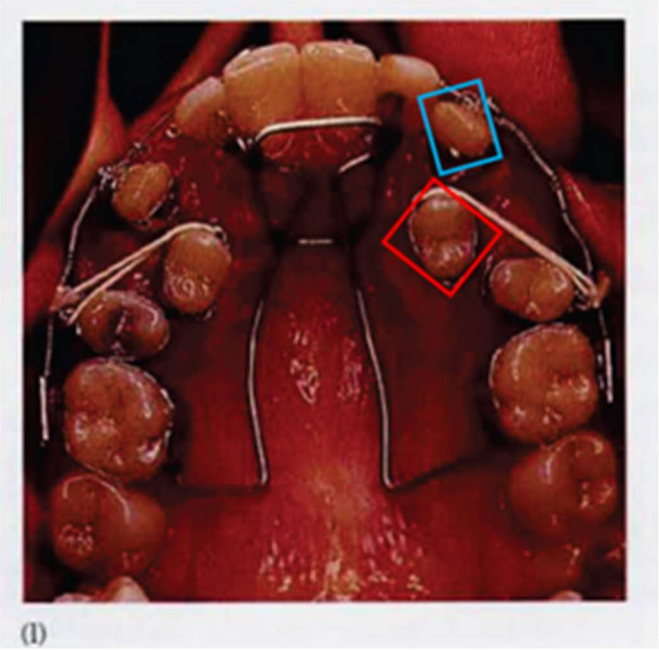
Chishti-511 in view of Becker renders this limitation obvious. Ex-1003, ¶¶176-178.

While Chishti-511 explains that the treatment path would be modified in light of an unresolved collision, it leaves open to a POSITA the methods for how to alter tooth movement to avoid the collision. One such avoidance method is disclosed in Becker. Becker presents a malocclusion in which a more lingual tooth ("first dental object," red) is transposed in position with a more buccal tooth ("second dental object," blue)—such that the more buccal tooth needs to be moved toward the incisors and the midline of the mouth. Ex-1006, 5; Ex-1003, ¶177.



Ex-1006, 7 (Fig. 8.6(k) (annotated)).

As shown, moving the more buccal tooth to its proper position would cause a collision between the two teeth. Ex-1003, ¶177. To resolve the transposition, Becker discloses "slid[ing] the more buccal of the transposed teeth" (the tooth closer to the cheek) "in the mesio-distal plane" (i.e., toward the midline or center of the dental arch). Ex-1006, 5. To allow this movement, Becker discloses that the more lingual tooth "must be moved further lingually to allow its partner to pass by." *Id.* Figure 8.6(l) below depicts the more lingual tooth after it has moved lingually ("moving the first of the dental objects away from the respective route of the second of the dental objects") and allowed the more buccal tooth to pass by. Ex-1006, 5; Ex-1003, ¶¶177-178.



Ex-1006, 7 (Fig. 8.6(l) (annotated)).

A POSITA would have been motivated to modify the combined system to implement Becker's collision-avoidance technique, as discussed in Section VIII. Ex-1003, ¶178.

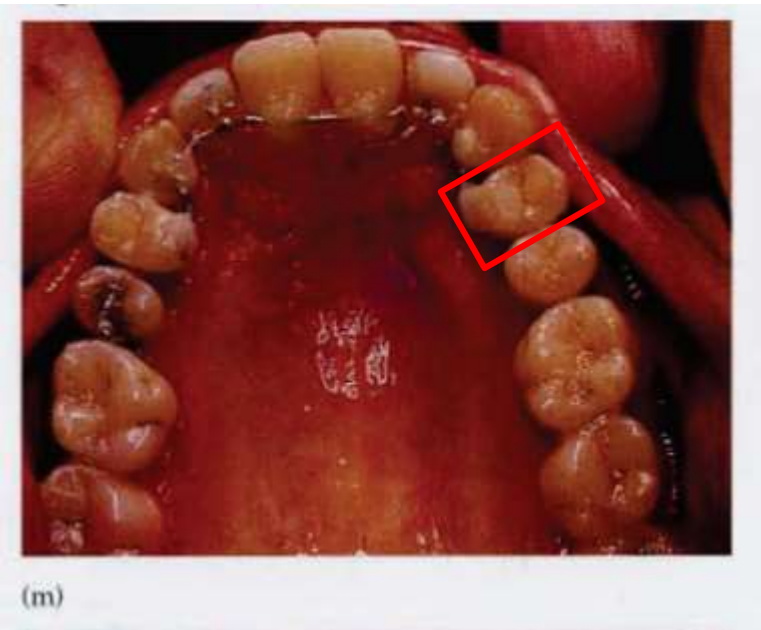
3. [10(c)] moving the first of the dental objects toward its respective final position after the second of the dental objects has sufficiently traversed its respective route to avoid the collision.

Chishti-511 in view of Becker renders this limitation obvious. Ex-1003, ¶¶179-182.

Becker explains that after the more lingual tooth has "allow[ed] its partner to pass by" ("after the second of the dental objects has sufficiently traversed its respective route to avoid the collision"), the more lingual tooth moves back to its

previous position before moving toward its respective final position. Ex-1006, 5; Ex-1003, ¶180.

Becker shows that after the more buccal tooth has sufficiently traversed its route to avoid collision, the more lingual tooth moves towards its respective final position. Ex-1006, 5; Ex-1003, ¶181. Indeed, Figure 8.6(m) below shows the more lingual tooth in its desired final position.



Ex-1003, ¶181 (annotating Ex-1006, 8 (Fig. 8.6(m))).

A POSITA would have been motivated to modify the combined system to implement Becker's round-tripping collision avoidance, as discussed in Section VIII. Ex-1003, ¶182.

B. Independent Claim 12

Claim 12 is obvious based on Chishti-511 in view of Chishti-876, Sachdeva, and Becker. Ex-1003, ¶¶183-185. Limitations 12(pre)-12(f) repeats or recites features that are substantively identical to features recited in 1(pre)-1(d), and 1(f)-1(g), and limitation 12(g)-12(h) recites features that are substantively identical to features recited in 10(b)-10(c). *Compare* Ex-1001, 16:7-33 and 17:20-30, *with* Ex-1001, 17:59-18:21; *see also* Ex-1003, ¶¶183-185 (comparing claims). Accordingly, limitations 12(pre)-12(f) are taught or suggested for the reasons discussed in Sections IXA.1-.5 and IX.A.7-.8, which discuss the corresponding portions of claim 1, and limitations 12(g)-12(h) are taught or suggested for the reasons discussed in Sections X.A.2-.3, which discuss the corresponding portions of claim 10.

A difference between claims 10 and 12 is that claim 12 recites certain steps (limitations 12(g)-12(h)) as part of performing a ***second*** modification of the schedule of movement, whereas claim 10 recites a modification ***after*** the second modification (e.g., a third modification). As discussed for limitation 10(a), Chishti-511's iterative process will continue to re-execute until there are no further collisions. *Supra* Section X.A.1. Thus, regardless of whether the modifications described in claims 10 and 12 are performed as a second or third modification, both

are disclosed and rendered obvious for the reasons discussed with respect to limitations 1(g) and 10(a)-10(c). Ex-1003, ¶185; *supra* Sections IX.A.8, X.A.1-.3.

C. Independent Claim 18

Claim 18 is obvious based on Chishti-511 in view of Chishti-876, Sachdeva, and Becker. Most of claim 18—including elements 18(pre)-18(f) and 18(h)—repeats or recites features that are substantively identical to features recited in 1(pre)-1(d), 1(f)-1(g), and 10(a)-10(c).. *Compare* Ex-1001, 16:7-33 and 17:20-30, *with* Ex-1001, 19:13-20:6; *see also* Ex-1003, ¶186 (comparing claims).

Similar to claim 12, a difference between claims 10 and 18 is that claim 18 recites certain steps (limitations 18(g)-18(h)) as part of performing a ***first or second*** modification of the schedule of movement, whereas claim 10 recites a modification ***after*** the second modification (e.g., a third modification). Ex-1003, ¶187. But as discussed for limitation 10(a), Chishti-511's iterative process will continue to re-execute until there are no further collisions. *Supra* Section X.A.1. Thus, regardless of whether the modifications described in limitations 10(a)-10(c) and in claim 18 are performed as a first, second, or third modification, each is disclosed and rendered obvious for the reasons discussed with respect to limitations 1(g), and 10(a)-10(c). *supra* Sections IX.A.8, X.A.1-.3. Additionally, similar to the discussion for claim 13, 18(c) recites that a modification is made "to avoid a

collision," and 1(c) and 1(d) recite identifying a collision and performing a modification "in response to identifying" the collision (and limitation 1(d)'s analysis discusses modifications made to avoid a collision). Ex-1003, ¶187.

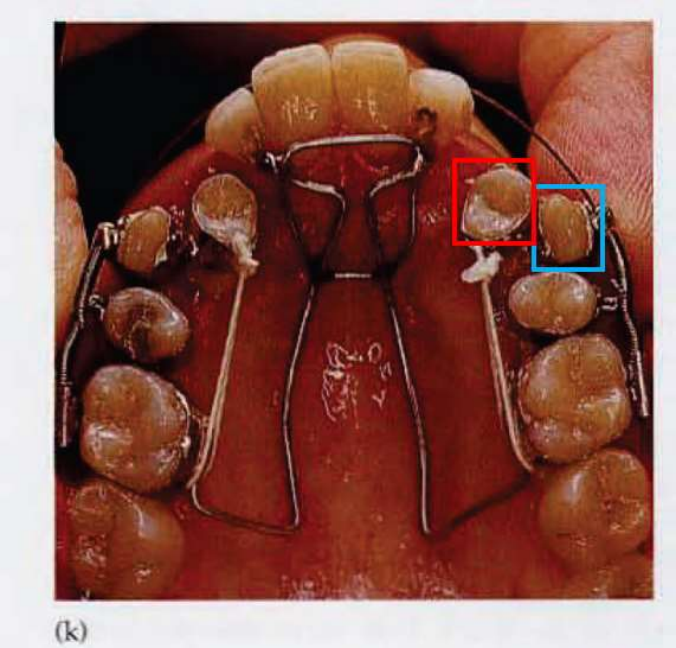
Accordingly, limitations 18(pre)-18(f) and 18(h) are taught or suggested for the reasons discussed in Sections IX.A.1-.5, IX.A.7-.8, and X.A.1-.3, which discuss the corresponding portions of claims 1 and 10. Ex-1003, ¶188.

As discussed below, the prior art also discloses or suggests the remaining limitation 18(g). Ex-1003, ¶189.

1. [18(g)] stopping movement of the first of the dental objects; and

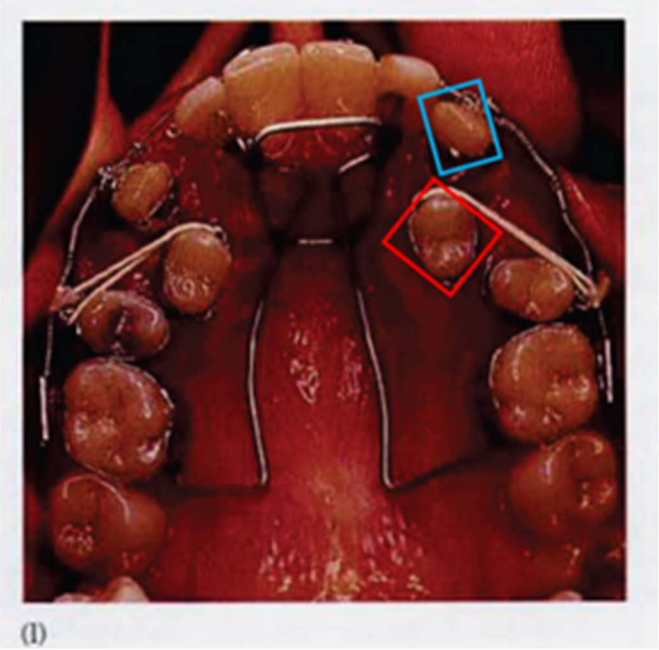
Chishti-511 in view of Becker renders this limitation obvious. Ex-1003, ¶¶190-193.

Becker discloses that the more lingual of the transposed teeth "must be moved further lingually to allow its partner to pass by." Ex-1006, 5; Ex-1003, ¶191.



Ex-1006, 7 (Fig. 8.6(k) (annotated)).

A POSITA would understand that Becker's more lingual tooth is stopped while it awaits "its partner to pass by" ("stopping movement of the first of the dental objects"). *Id.* As shown below, Becker's more lingual tooth is only moved again after the more buccal tooth has "pass[ed] by" and corrected the transposition. *Id.*



Ex-1006, 7 (Fig. 8.6(l) (annotated)); Ex-1003, ¶192. A POSITA would have been motivated to modify the combined system to implement Becker's teachings, as discussed in Section VIII. Ex-1003, ¶¶192-193.

D. Independent Claim 19

Most of claim 19—including elements 19(pre)-19(g)—repeats or recites features that are substantively identical to features recited in limitations 1(pre)-1(d), 1(f), and 18(e)-18(g) (referring to claim 10). *Compare* Ex-1001, 16:7-27 and 19:28-20:2, *with* Ex-1001, 20:7-32; *see also* Ex-1003, ¶¶194-196 (comparing claims). Like the discussion for claim 13, 19(c) recites that a modification is made "to avoid a collision" and 1(c) and 1(d) recite identifying a collision and performing a modification "in response to identifying" the collision (and limitation 1(d)'s

analysis discusses modifications made to avoid a collision). Ex-1003, ¶195. Accordingly, limitations 19(pre)-19(g) are taught or suggested for the reasons discussed in Sections IX.A.1-.5, IX.A.7, and X.C, which discuss the corresponding portions of claims 1 and 18. Ex-1003, ¶¶194-196; *supra* Sections X.A.1-.3.

As discussed below, the prior art also discloses or suggests the remaining limitation 19(h). Ex-1003, ¶196.

1. [19(h)] moving the first dental object toward its previous position.

Chishti-511 in view of Becker renders this limitation obvious. Ex-1003, ¶¶197-199.

After the more lingual tooth has "allow[ed] its partner to pass by," Becker's more lingual tooth moves back to its previous position before moving toward a desired final position. Ex-1006, 5; Ex-1003, ¶199. Becker explains that once the more buccal tooth has moved sufficiently, the more lingual tooth "must be moved in the opposite mesio-distal direction and back in the line of the arch." Ex-1006, 5. A POSITA would understand that moving the more lingual tooth in the "opposite" direction that it previously moved and "back" to where it was before ("in line of the arch") would involve moving the more lingual tooth back to its previous position (Ex-1001, 13:8-12). Ex-1003, ¶199. The more lingual tooth then moves toward its respective final position as explained for limitation 10(c). *Supra* Section X.A.3; Ex-

1003, ¶199. A POSITA would have been motivated to modify the combined system to implement Becker's teachings, as discussed in Section VIII. Ex-1003, ¶199.

XI. THE BOARD SHOULD NOT EXERCISE DISCRETION TO DENY INSTITUTION

Petitioner stipulates that if institution is granted for the '456 patent, it will not pursue in the parallel district court case for the '456 patent any ground raised or that could have been reasonably raised in this Petition, and all defendants to the litigation have agreed to be bound by this stipulation. *See Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12, 19 (PTAB Dec. 1, 2020) (precedential as to § II.A) ("Petitioner's stipulation here mitigates any concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions.… Thus, we find that this factor weighs strongly in favor of not exercising discretion to deny institution under 35 U.S.C. § 314(a).").

Petitioner reserves its right to oppose any argument Patent Owner may make regarding discretionary denial of this Petition pursuant to the procedures set out in the Office's March 26, 2025, Memorandum ("Interim Processes for PTAB Workload Management").

XII. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties-in-Interest

The real parties-in-interest are ClearCorrect Operating, LLC; ClearCorrect Holdings, Inc.; Straumann USA, LLC; and Institut Straumann AG.

B. Related Matters

To the best of Petitioner's knowledge, the '456 patent is involved in:

Align Technology, Inc. v. ClearCorrect Operating, LLC, Case No. 6:24-cv-00187-ADA-DTG (W.D. Tex. Apr. 11, 2024).

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Petitioner consents to electronic service at the email addresses shown above and ClearCorrect-IPR-Attorneys@finnegan.com.

XIII. GROUNDS FOR STANDING

The '456 patent is available for *inter partes* review. Petitioner is not barred or estopped from requesting such review.

XIV. CONCLUSION

Petitioner requests the Board institute *inter partes* review and find each challenged claim unpatentable.

Respectfully submitted,

Dated: April 12, 2025

By: /Luke McCammon/
Luke McCammon, Lead Counsel
Reg. No. 70,691

CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing Petition contains 13,943 words, excluding those portions identified in 37 C.F.R. § 42.24(a), as measured by the word-processing system used to prepare this paper.

Respectfully submitted,

Dated: April 12, 2025

By: /Luke McCammon/
Luke McCammon, Lead Counsel
Reg. No. 70,691

CERTIFICATE OF SERVICE

The undersigned certifies that, in accordance with 37 C.F.R. §§ 42.6(e) and 42.105(a), the **Petition for *Inter Partes* Review of U.S. Patent No. 11,369,456, the associated Power of Attorney, and Exhibits 1001-1024, 1028-1030, 1032** were served via FedEx Priority Overnight delivery on April 12, 2025, on the correspondence address of record below indicated in the U.S. Patent Office's Patent Center for U.S. Patent No. 11,369,456:

Kevin Broyles
FISHERBROYLES, LLP – Align Technology, Inc.
3340 Peachtree Road NE, Suite 1800
Atlanta, GA 30326

A courtesy copy has been concurrently served by the same means on Patent Owner's litigation counsel at:

Brian C. Nash
MORRISON & FOERSTER LLP
300 Colorado Street, Suite 1800
Austin, TX 78701

Dated: April 12, 2025

By: /Lisa C. Hines/
Lisa C. Hines
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