



**ClearCorrect Operating, LLC**  
**Petitioner,**  
**v.**  
**Align Technology, Inc.**  
**Patent Owner.**

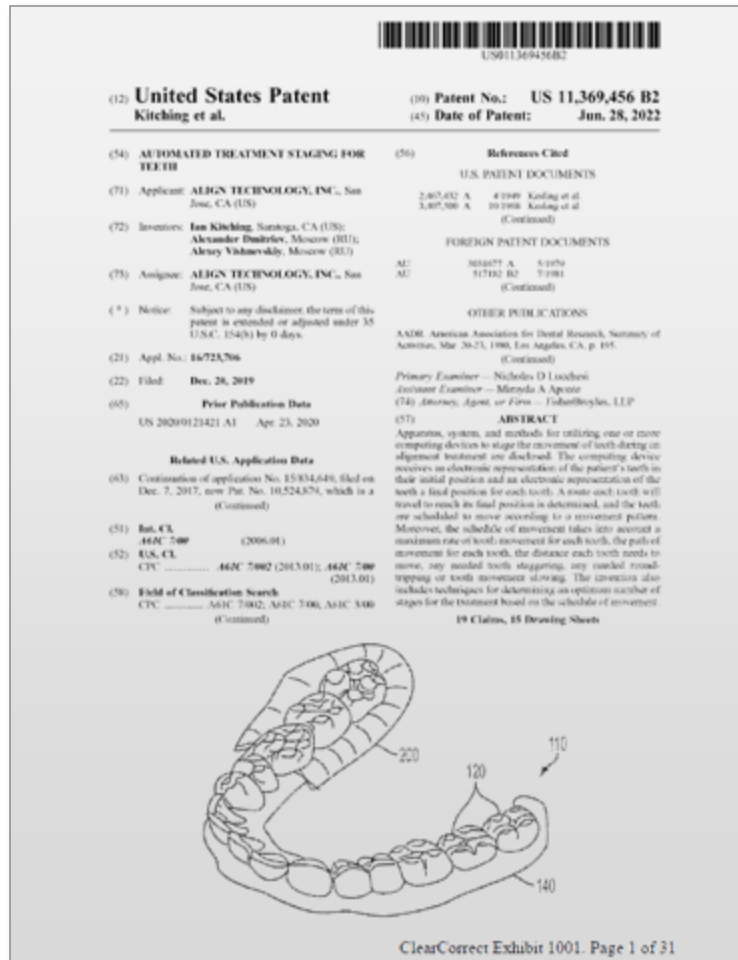
**Case No. IPR 2025-00816**  
**U.S. Patent 11,369,456**

Petitioner's Demonstratives

July 31, 2026

# The '456 Patent

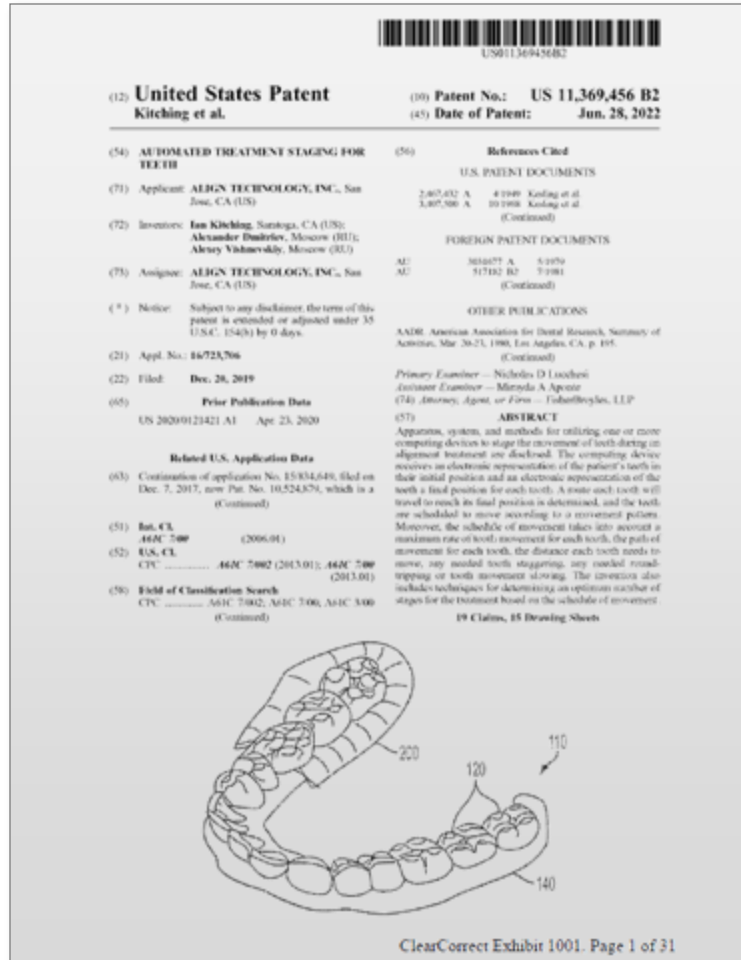
## BACKGROUND



Apparatus, systems, and methods have been developed to facilitate teeth movement utilizing clear, removable teeth aligners as an alternative to braces. A mold of the patient's bite is initially taken and desired ending positions for the patient's teeth (i.e., a functionally and aesthetically optimum position) are determined, based on a prescription provided by an orthodontist or dentist. Corrective paths between the

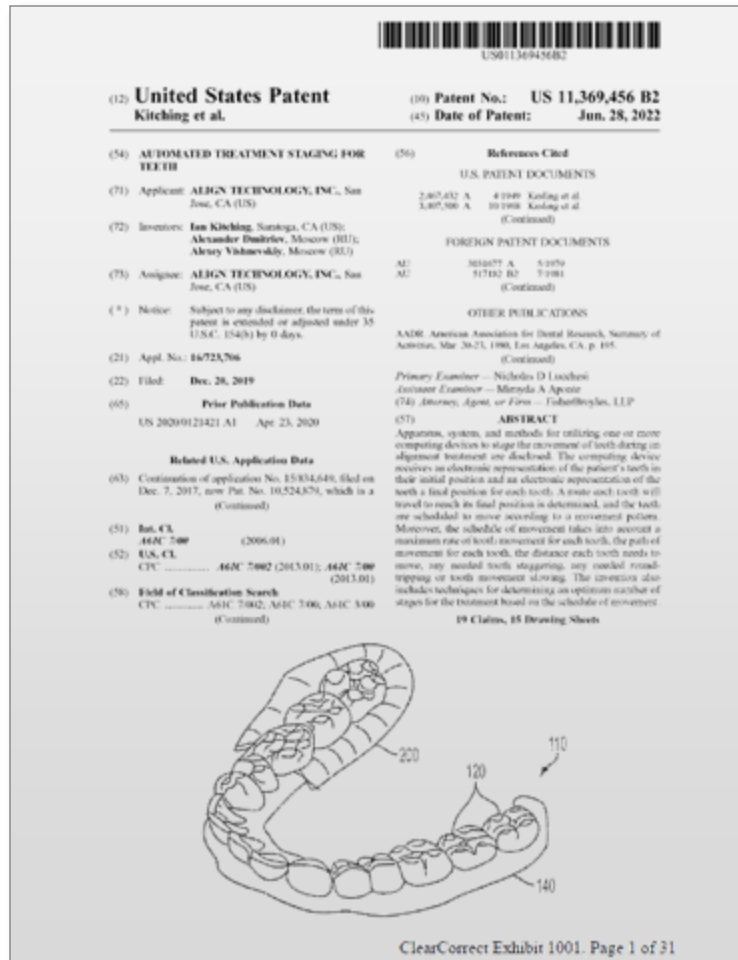
Therefore a need clearly exists for apparatus, systems, and methods to increase automation of a tooth movement treatment planning process. Ideally, such automation would reduce the time and resources needed to stage the movement of teeth during an alignment treatment. At least some of these objectives will be met by the present invention.

# The '456 Patent



After the system user and/or computer program has decided which pattern to utilize, the system user can determine, and/or computer program is configured to determine, if the pattern should be modified to accommodate the teeth movement of the current patient to avoid collision. In accordance with an exemplary embodiment, to determine whether a collision is likely, 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 disclosed in U.S. Pat. No. 6,729,876, entitled “Tooth Path Treatment Plan” issued on May 4, 2004 and assigned to Align Technology, Inc.

# The '456 Patent



What is claimed is:

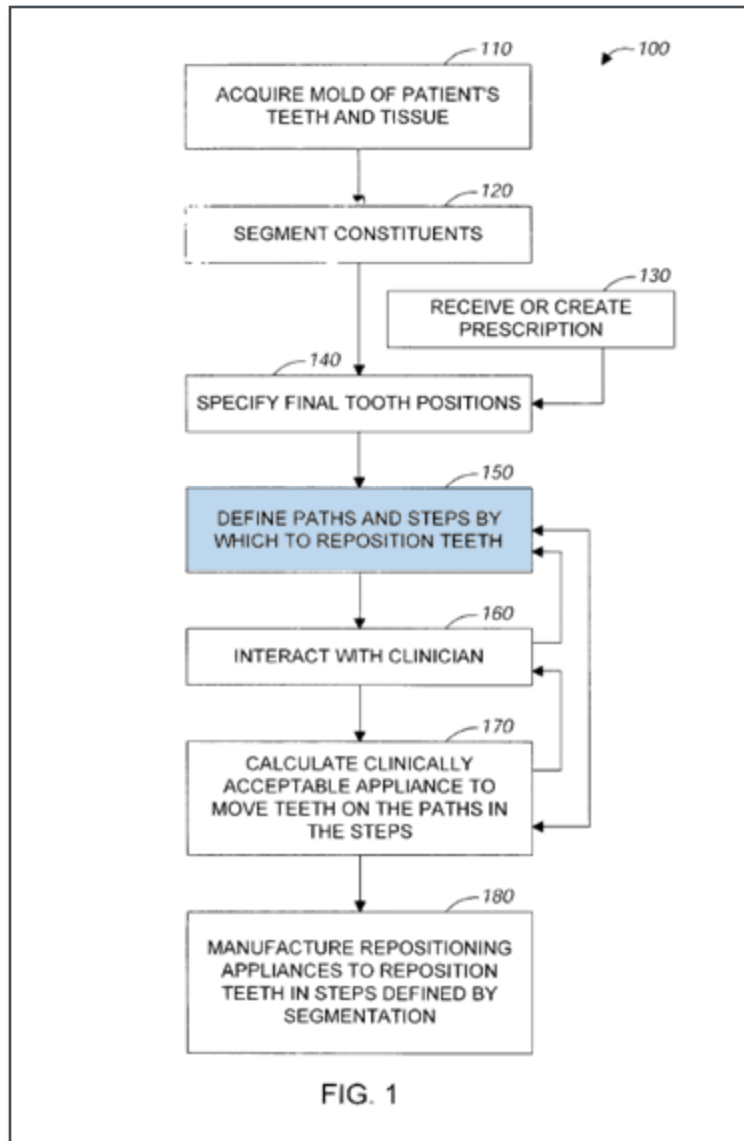
1. A computer-implemented method comprising:  
determining a schedule of movement for dental objects during treatment stages of an orthodontic treatment, wherein the schedule of movement indicates whether or not each of the dental objects moves during each of the treatment stages;  
calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;  
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;  
performing a first modification of the schedule of movement in response to the identifying, the first modification of the schedule of movement modifying whether or not at least one of the dental objects move during at least one of the treatment stages;  
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  
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 during at least one of the treatment stages.

# Instituted Grounds

| <u>Ground</u> | <u>Claims Challenged</u> | <u>35 U.S.C.</u> | <u>References</u>                              |
|---------------|--------------------------|------------------|------------------------------------------------|
| 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 |

- **Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva**
  - **Identifying a collision and performing a modification in response**
  - Motivation to Combine
- Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker
  - Indirect movement
  - The prior art does not teach away
  - Applicability to clear aligners
- Level of Ordinary Skill in the Art

# Chishti-511 Overview



Having both a beginning position and a final position for each tooth, the process next defines a tooth path for the motion of each tooth. The tooth paths are optimized in the aggregate so that the teeth are moved in the quickest fashion with the least amount of round-tripping to bring the teeth from their initial positions to their desired final positions. (Round-tripping is any motion of a tooth in any direction other than directly toward the desired final position. Round-tripping is sometimes necessary to allow teeth to move past each other.) The tooth paths are segmented. The segments are calculated so that each tooth's motion within a segment stays within threshold limits of linear and rotational translation. In this way, the end points of each path segment can constitute a clinically viable repositioning, and the aggregate of segment end points constitute a clinically viable sequence of tooth positions, so that moving from one point to the next in the sequence does not result in a collision of teeth.

# Chishti-511 Overview

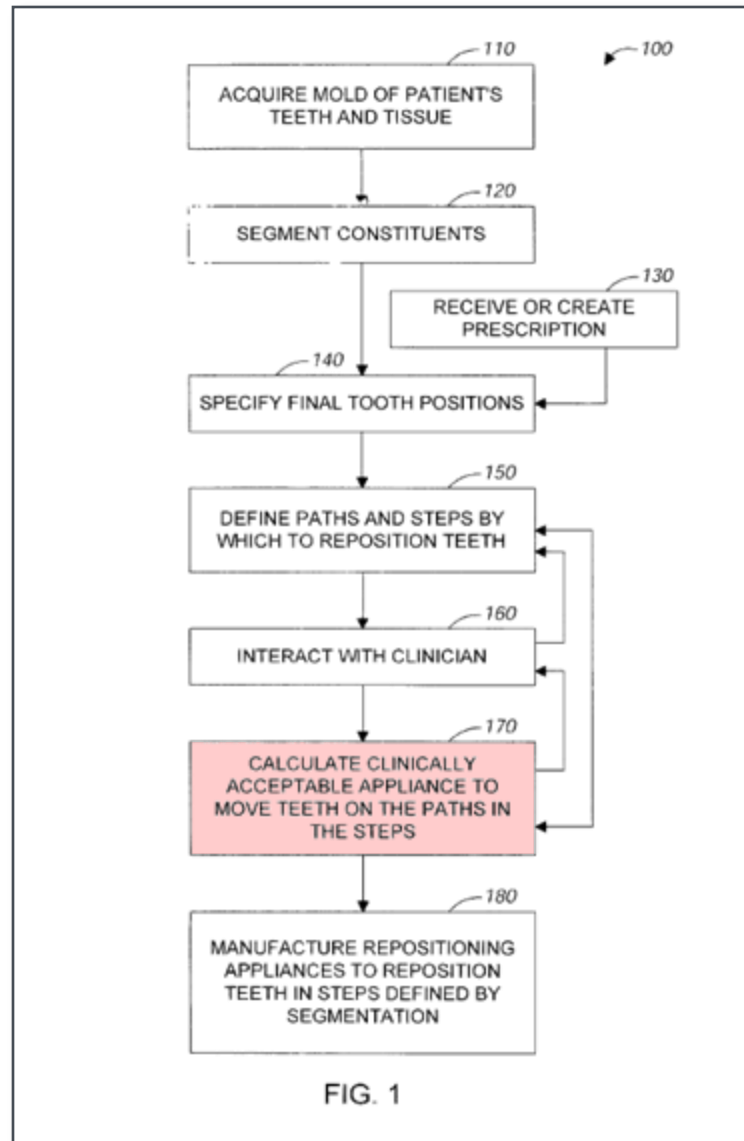
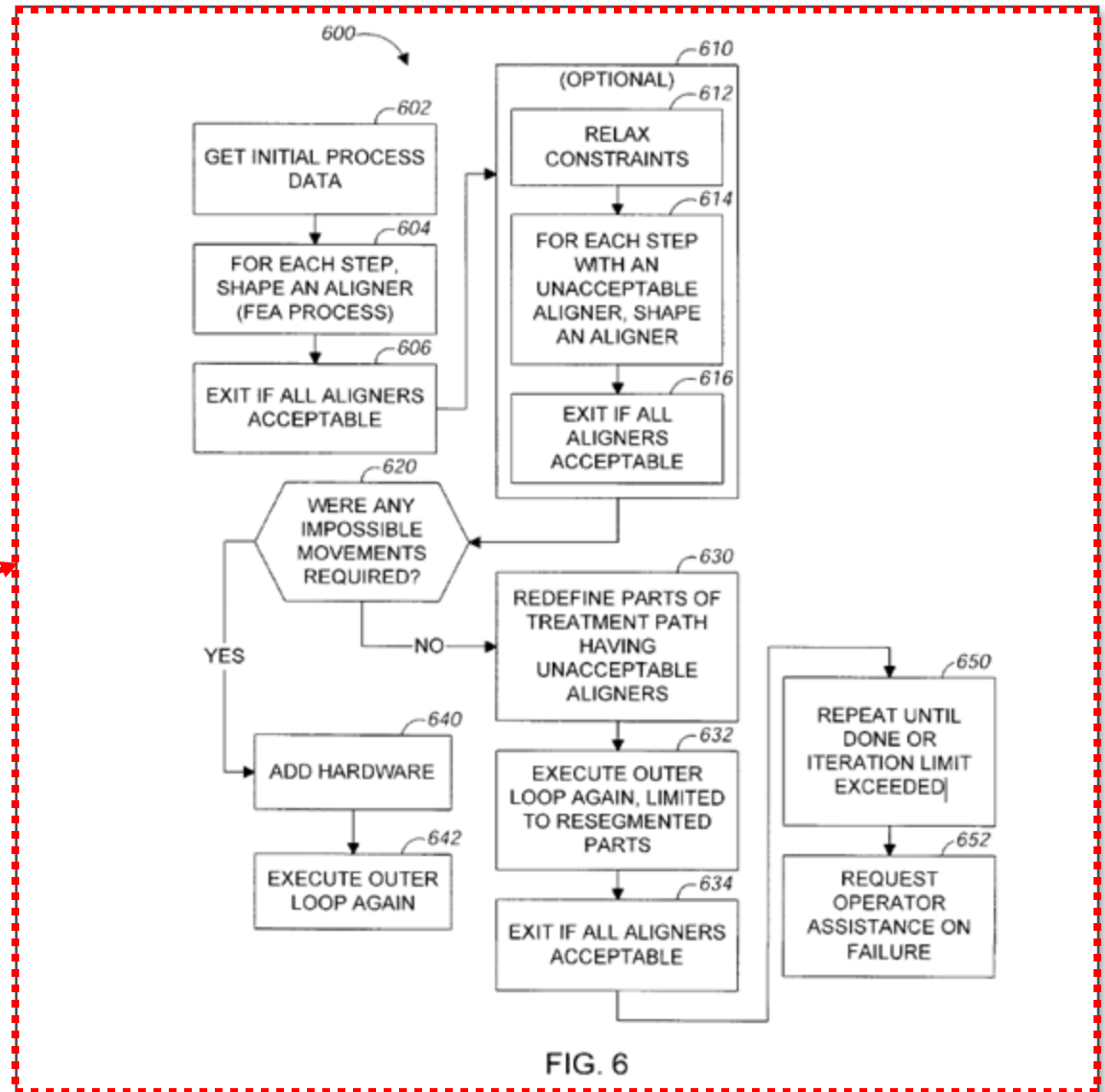
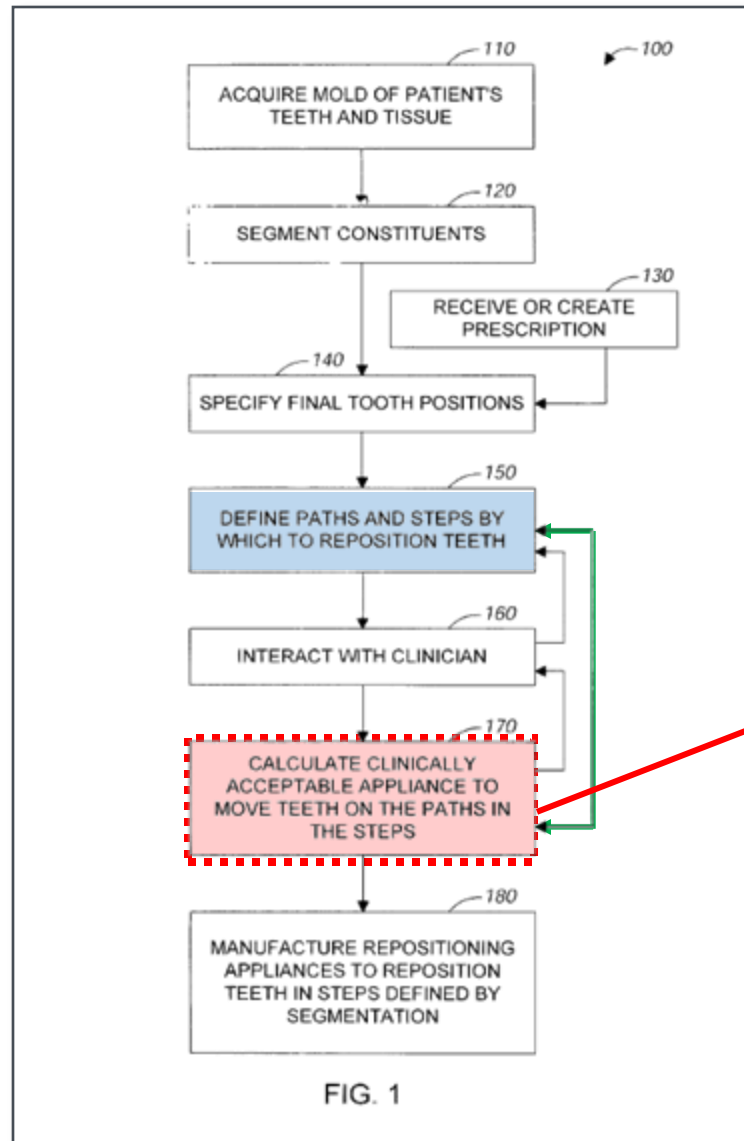


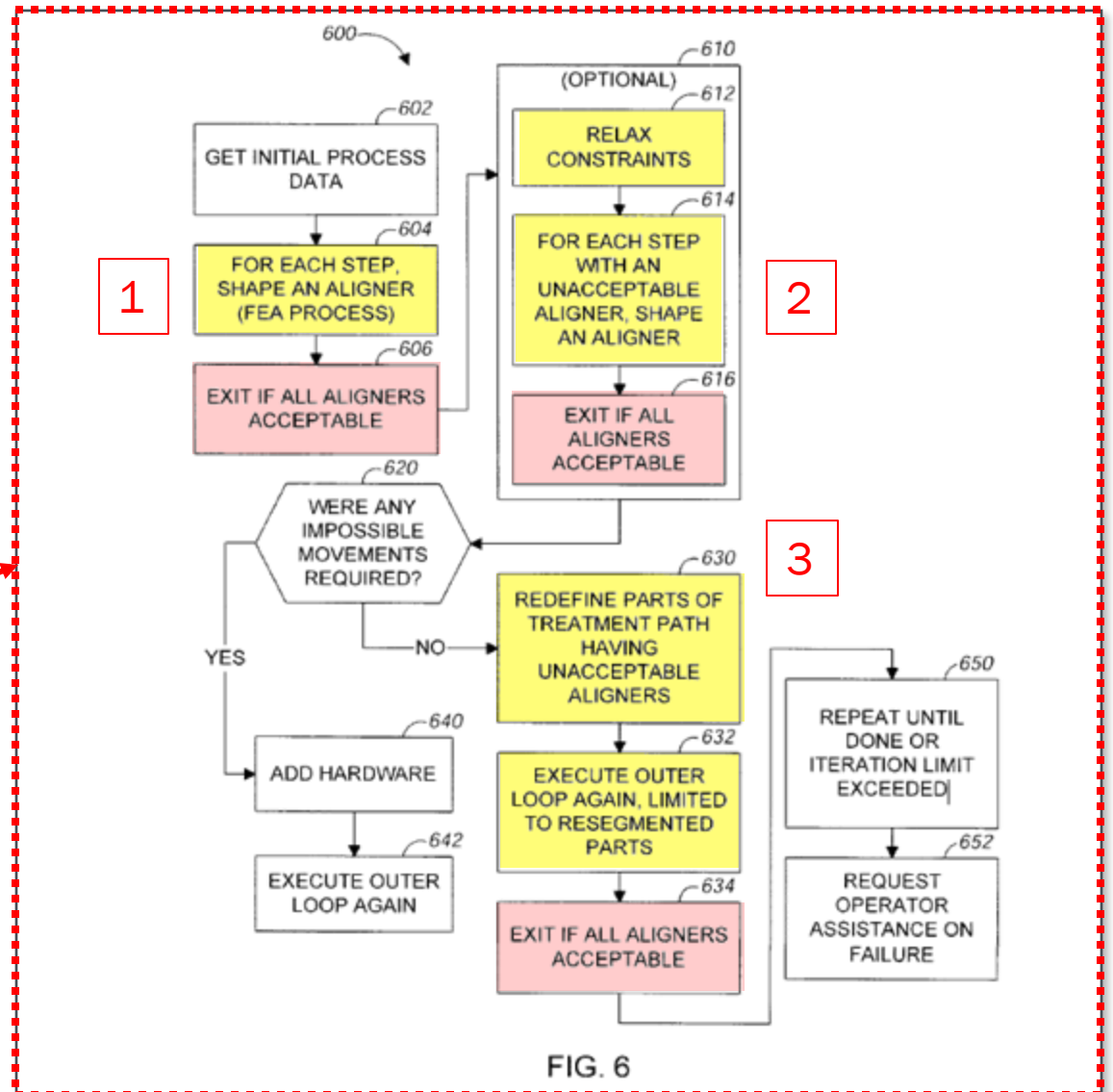
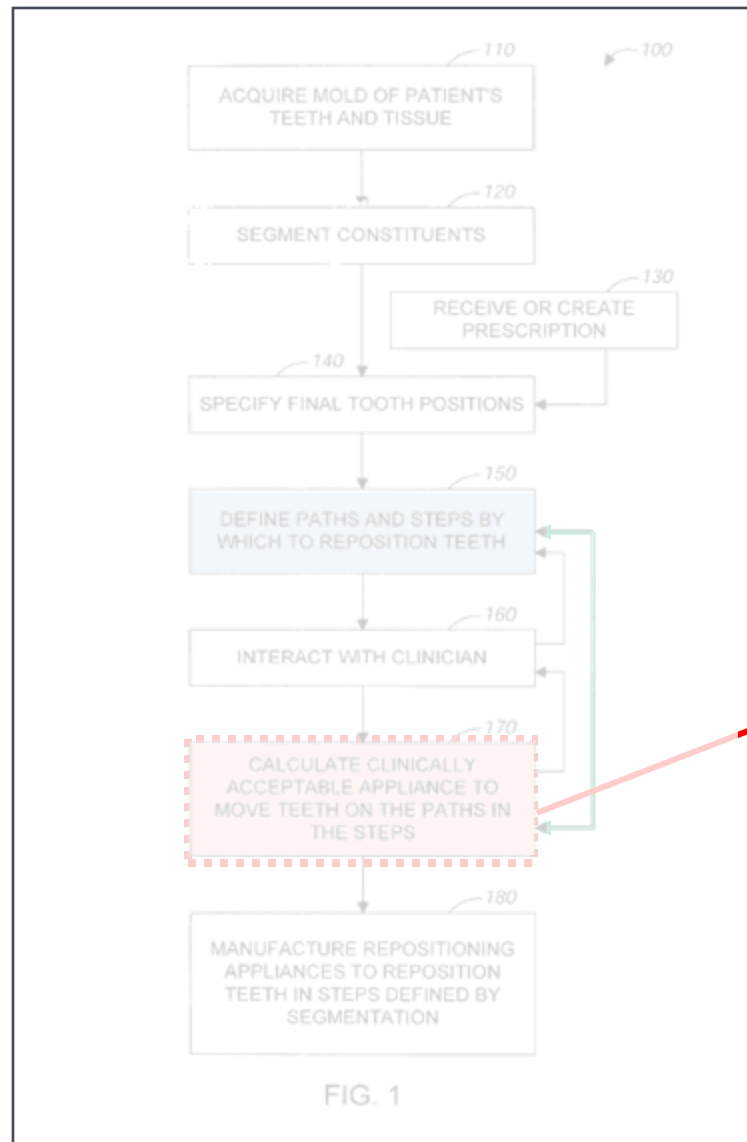
FIG. 2 illustrates a process 200 implementing the appliance-calculation step (FIG. 1, step 170) for polymeric shell aligners of the kind described in above-mentioned patent application Ser. No. 09/169,276. Inputs to the process include an initial aligner shape 202, various control parameters 204, and a desired end configuration for the teeth at the end of the current treatment path segment 206. Other inputs include digital models of the teeth in position in the jaw, models of the jaw tissue, and specifications of an initial aligner shape and of the aligner material. Using the input data, the process creates a finite element model of the aligner, teeth and tissue, with the aligner in place on the teeth (step 210). Next, the process applies a finite element analysis to the composite finite element model of aligner, teeth and tissue (step 220). The analysis runs until an exit condition is

The segmented tooth paths and associated tooth position data are used to calculate clinically acceptable appliance configurations (or successive changes in appliance configuration) that will move the teeth on the defined treatment path in the steps specified by the path segments (step 170). Each appliance configuration represents a step

# Chishti-511 Overview



# Chishti-511 Overview



# Chishti-511's Simulation of Tooth Movement

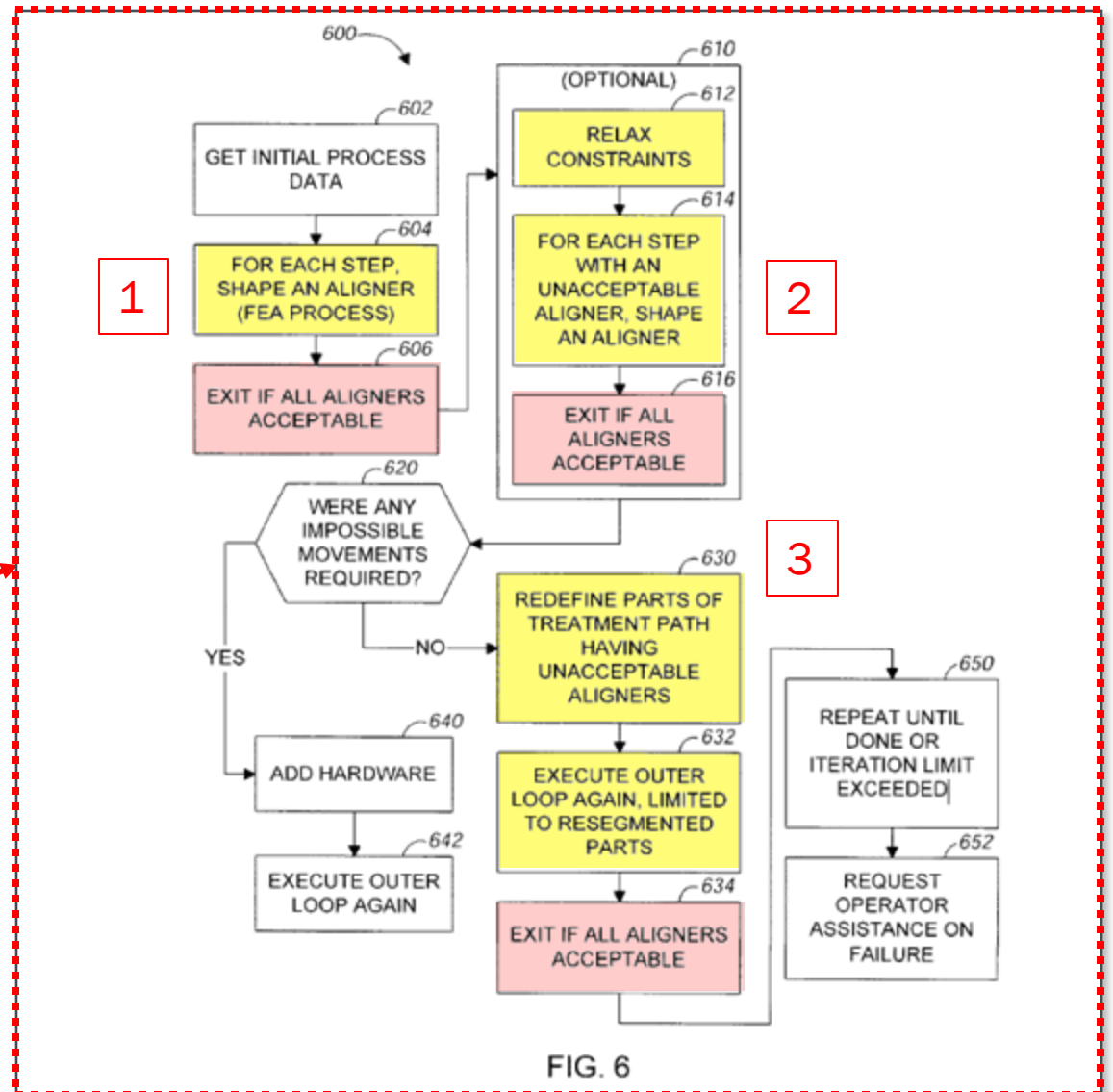
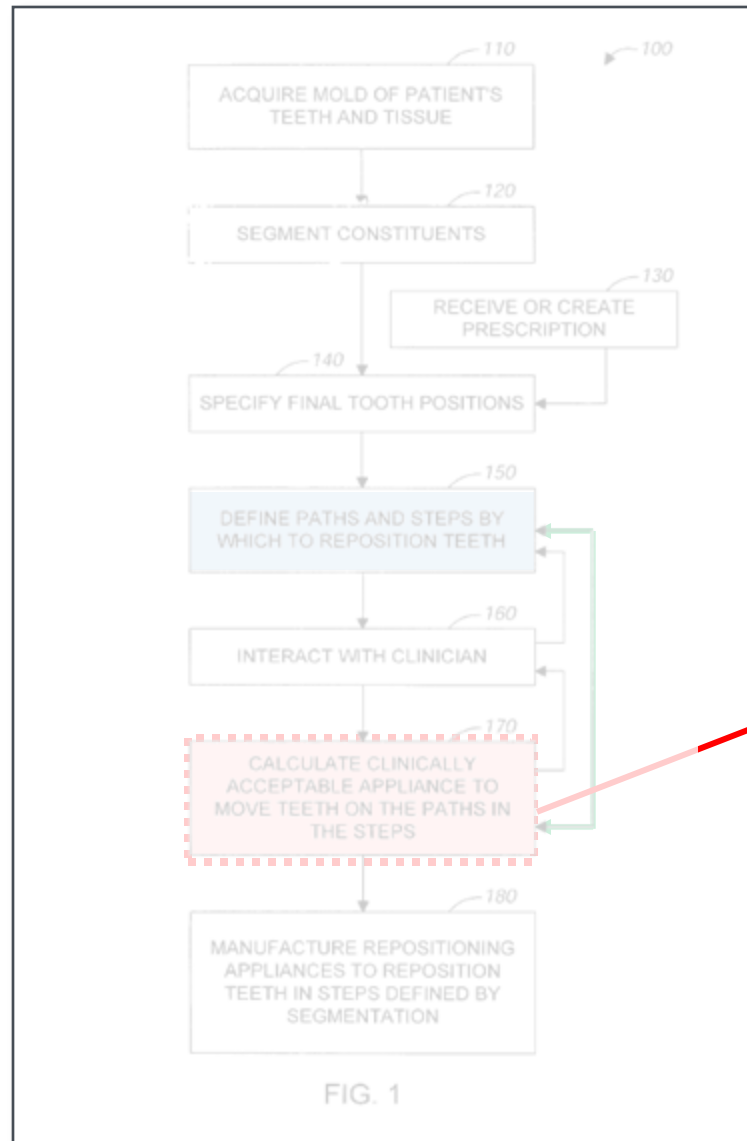
Rules 452 have the conventional two-part form: an if-part defining a condition and a then-part defining a conclusion or action that is asserted if the condition is satisfied. Conditions can be simple or they can be complex conjunctions or disjunctions of multiple assertions. An exemplary set of rules, which defines changes to be made to the aligner, includes the following: if the motion of the tooth is too slow, add driving material to the aligner opposite the desired direction of motion; if the motion of the tooth is too slow, add driving material to overcorrect the position of the tooth; if the tooth is too far short of the desired end position, add material to overcorrect; if the tooth has been moved too far past the desired end position, add material to stiffen the aligner where the tooth moves to meet it; if a maximum amount of driving material has been added, add material to overcorrect the repositioning of the tooth and do not add driving material; if the motion of the tooth is in a direction other than the desired direction, remove and add material so as to redirect the tooth.

When an aligner configuration has been found for each step or segment of the treatment path (step 604), the overall process 600 determines whether all of the aligners are acceptable (step 606). If they are, the process exits and is complete. Otherwise, the process optionally undertakes a set of steps 610 in an attempt to calculate a set of acceptable aligners.

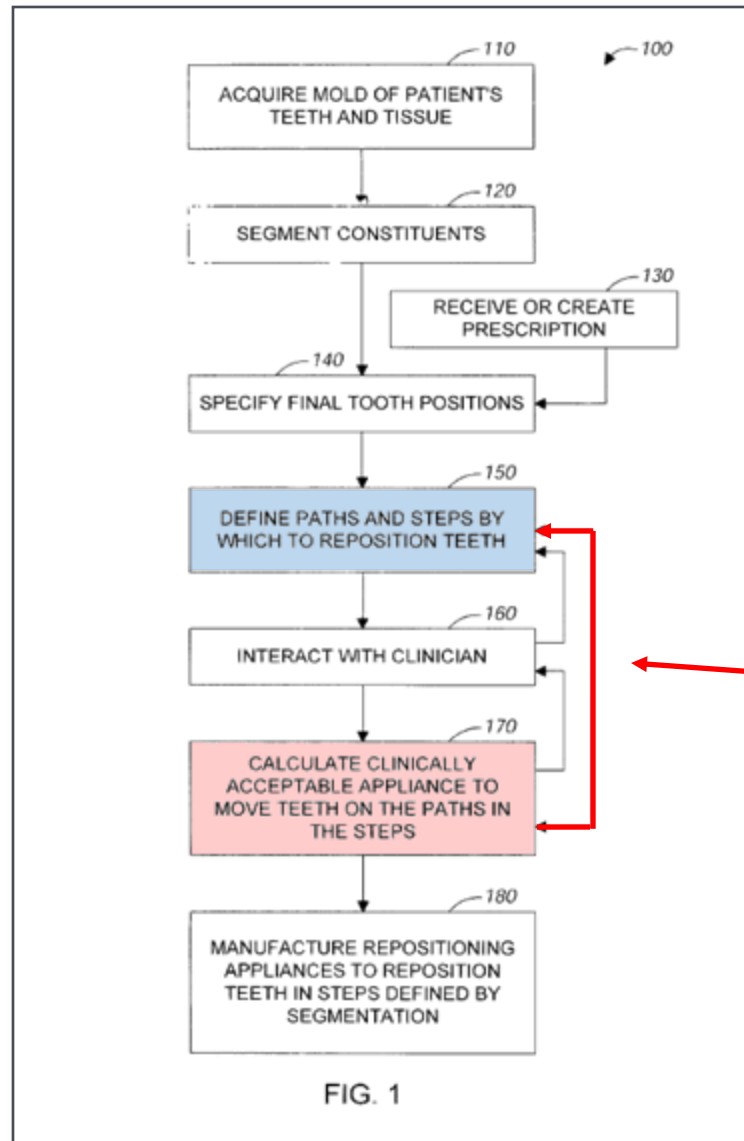
First, one or more of the constraints on the aligners is relaxed (step 612). Then, for each path segment with an unacceptable aligner, the process 200 of shaping an aligner is performed with the new constraints (step 614). If all the aligners are now acceptable, the overall process 600 exits (step 616).

of the unsatisfactory appliance. The clinical constraints can include a maximum rate of displacement of a tooth, a maximum force on a tooth, and a desired end position of a tooth. The maximum force can be a linear force or a torsional force. The maximum rate of displacement can be a linear or an angular rate of displacement. The apparatus of the

# Chishti-511 Overview



# Chishti-511 Redefining Tooth Paths



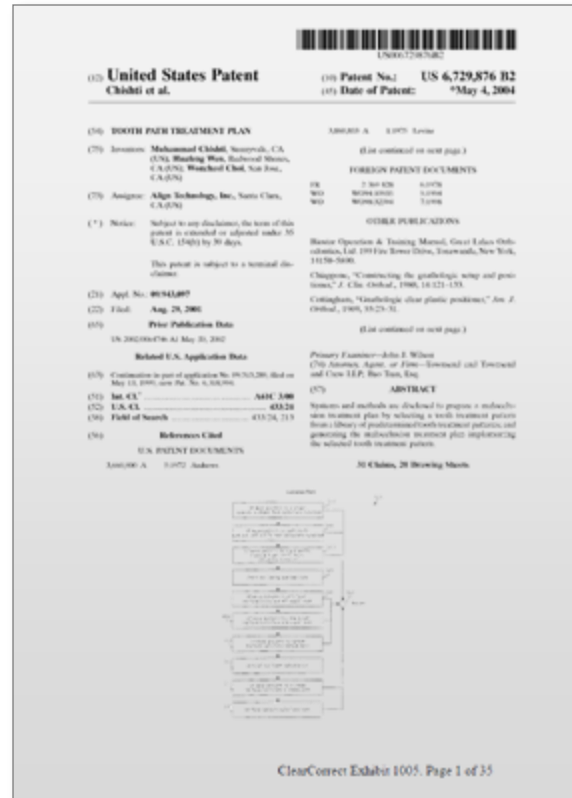
Aligners may be unacceptable for a variety of reasons, some of which are handled by the overall process. For example, if any impossible movements were required (decision step 620), that is, if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available, the process 600 proceeds to execute a module that calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion (step 640). Because adding hardware can have an effect that is more than local, when hardware is added to the model, the outer loop of the overall process 600 is executed again (step 642).

If no impossible movements were required ("no" branch from step 620), the process transfers control to a path definition process (such as step 150, FIG. 1) to redefine those parts of the treatment path having unacceptable aligners (step 630). This step can include both 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. After the treatment path has been redefined, the outer loop of the overall process is executed again (step 632). The recalculation is advanta-

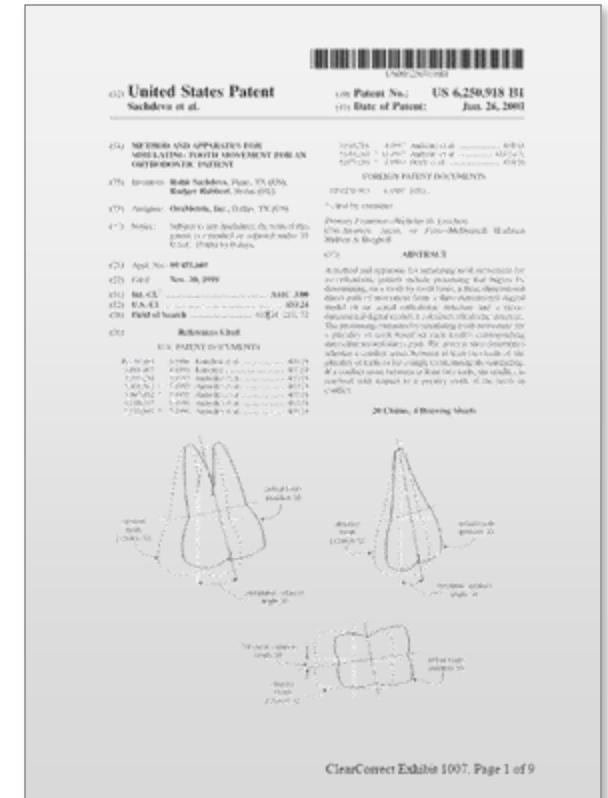
# Chishti-511 + Chishti-876 + Sachdeva



Chishti-511

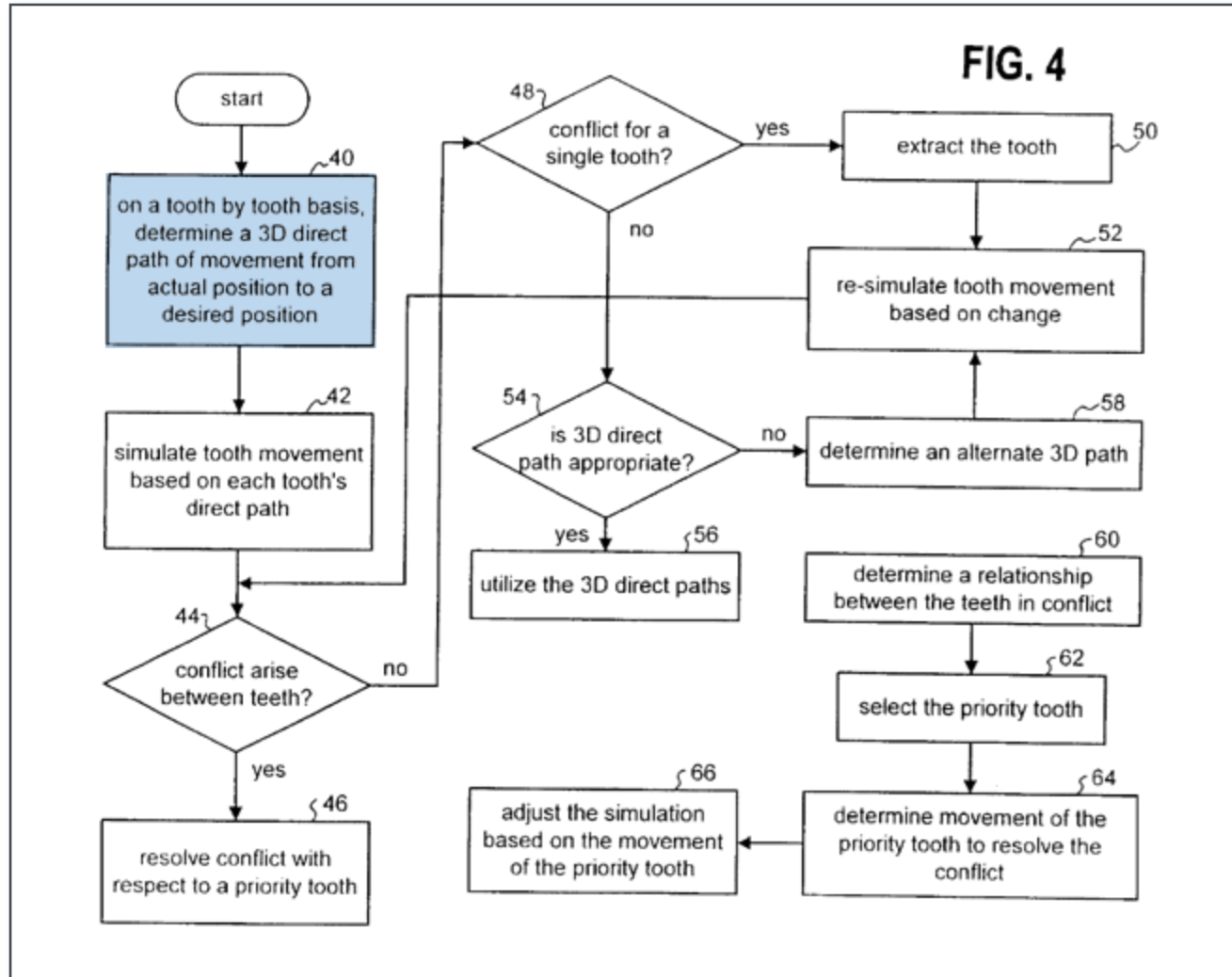


Chishti-876



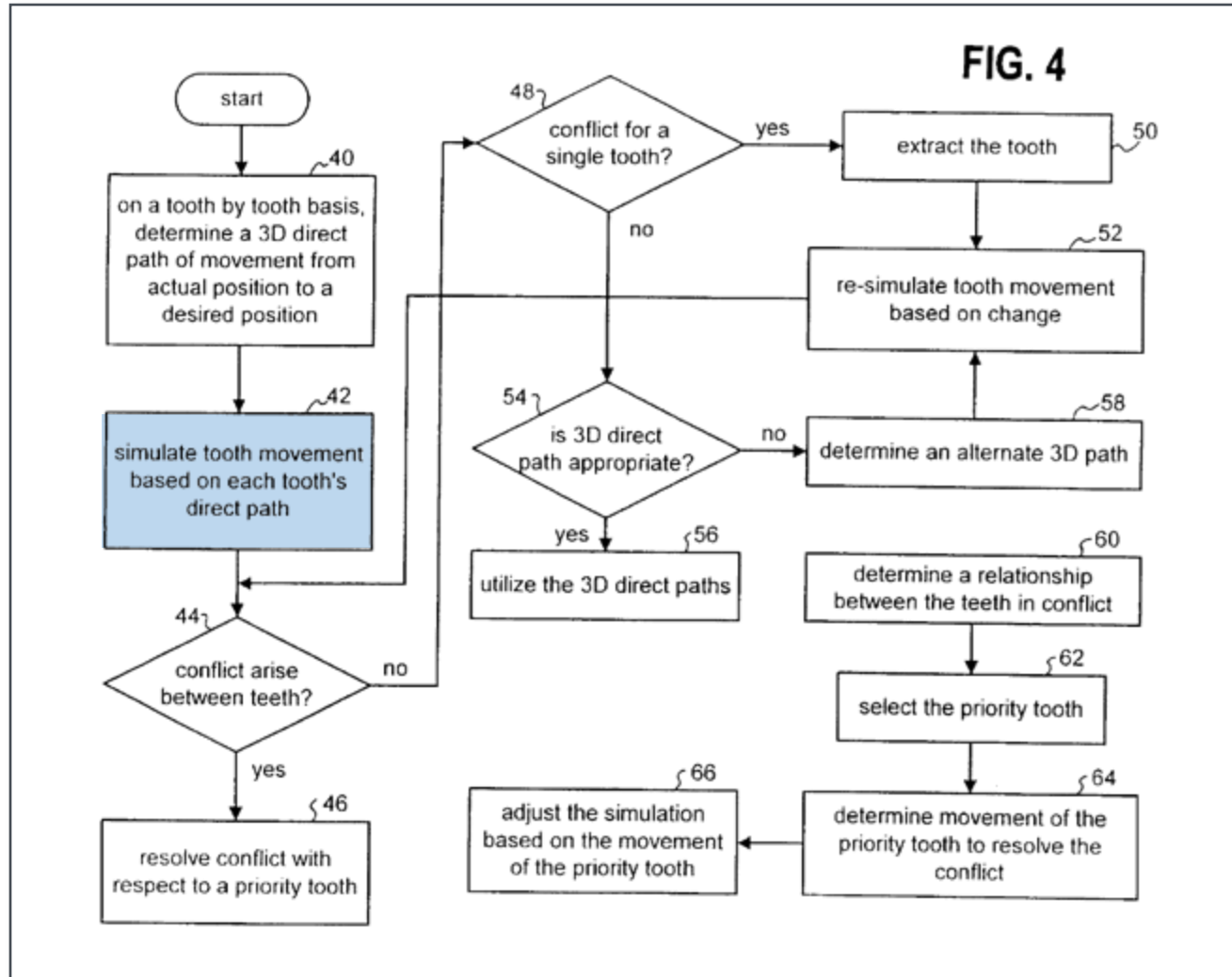
Sachdeva

# Sachdeva Discloses a Treatment Planning System



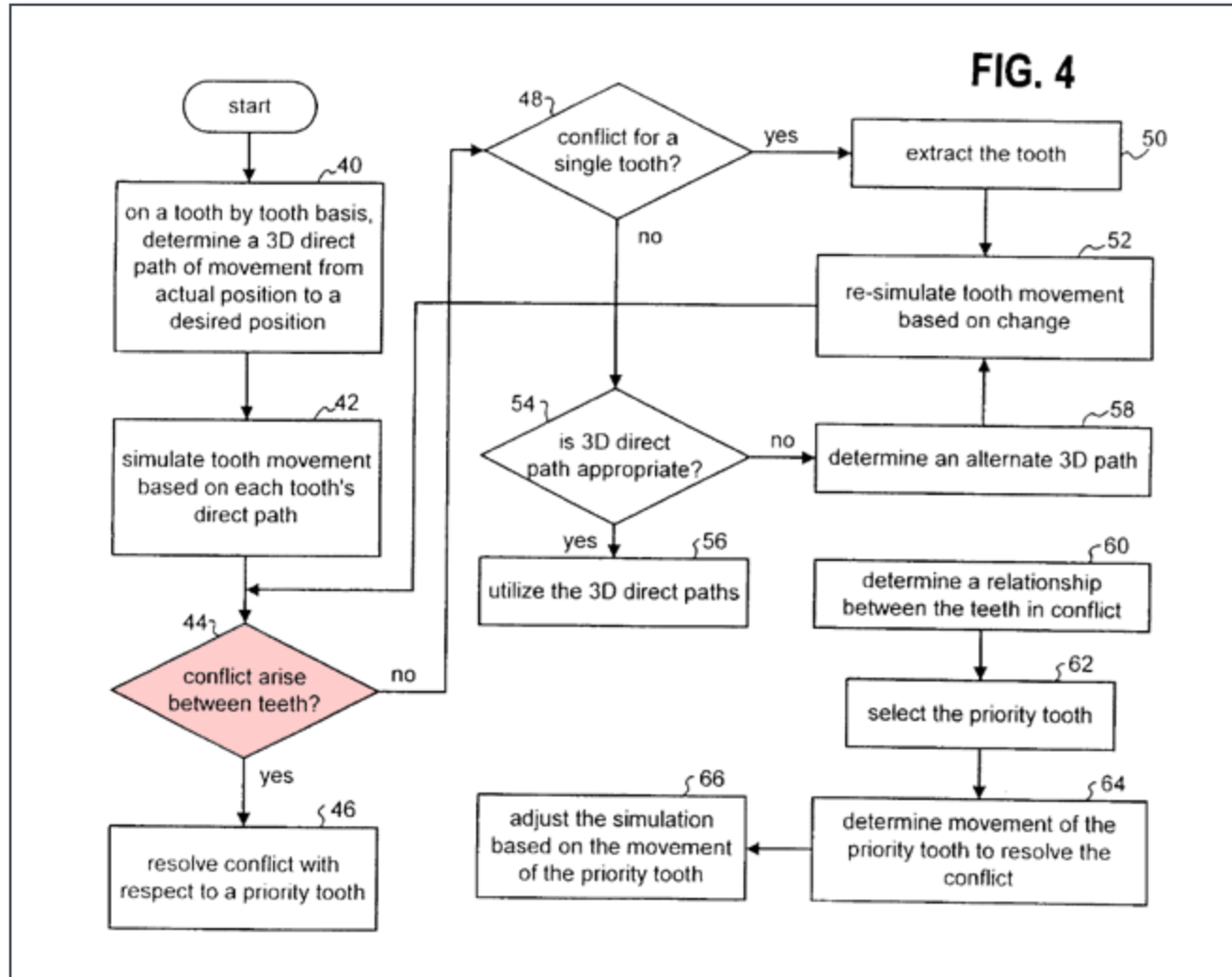
The process begins at step 40 where, on a tooth by tooth basis, a three-dimensional direct path of movement is determined. The three-dimensional direct path is determined from an actual tooth position in relation to a desired tooth position. Such was discussed with reference to FIG. 3. The process then proceeds to step 42 where the tooth movement for a plurality of teeth in the upper arch and lower arch is simulated based on each tooth's direct path. The simulation of the tooth movement will be based on several factors including the number of steps in the treatment, a growth factor if applicable, normalized movement of teeth for a normalized patient, uniformity of force upon each tooth for displacement, and user inputs, such as function, aesthetics, and stability. The normalized patient information will be

# Sachdeva Discloses a Treatment Planning System



The process begins at step 40 where, on a tooth by tooth basis, a three-dimensional direct path of movement is determined. The three-dimensional direct path is determined from an actual tooth position in relation to a desired tooth position. Such was discussed with reference to FIG. 3. The process then proceeds to step 42 where the tooth movement for a plurality of teeth in the upper arch and lower arch is simulated based on each tooth's direct path. The simulation of the tooth movement will be based on several factors including the number of steps in the treatment, a growth factor if applicable, normalized movement of teeth for a normalized patient, uniformity of force upon each tooth for displacement, and user inputs, such as function, aesthetics, and stability. The normalized patient information will be

# Sachdeva Discloses Collision Identification



The process begins at step 40 where, on a tooth by tooth basis, a three-dimensional direct path of movement is determined. The three-dimensional direct path is determined from an actual tooth position in relation to a desired tooth position. Such was discussed with reference to FIG. 3. The process then proceeds to step 42 where the tooth movement for a plurality of teeth in the upper arch and lower arch is simulated based on each tooth's direct path. The simulation

The process then proceeds to step 44 where a determination is made as to whether a conflict in movement arose between at least two teeth during the simulation. A conflict may arise in that the movement of one tooth interferes with the direct path movement of another tooth causing a particular tooth to not be able to obtain its desired position.

# Sachdeva Discloses Collision Identification

What is claimed is:

1. A computer-implemented method comprising:

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;

calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;

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;

performing a first modification of the schedule of movement in response to the identifying, the first modification of the schedule of movement modifying whether or not at least one of the dental objects move during at least one of the treatment stages;

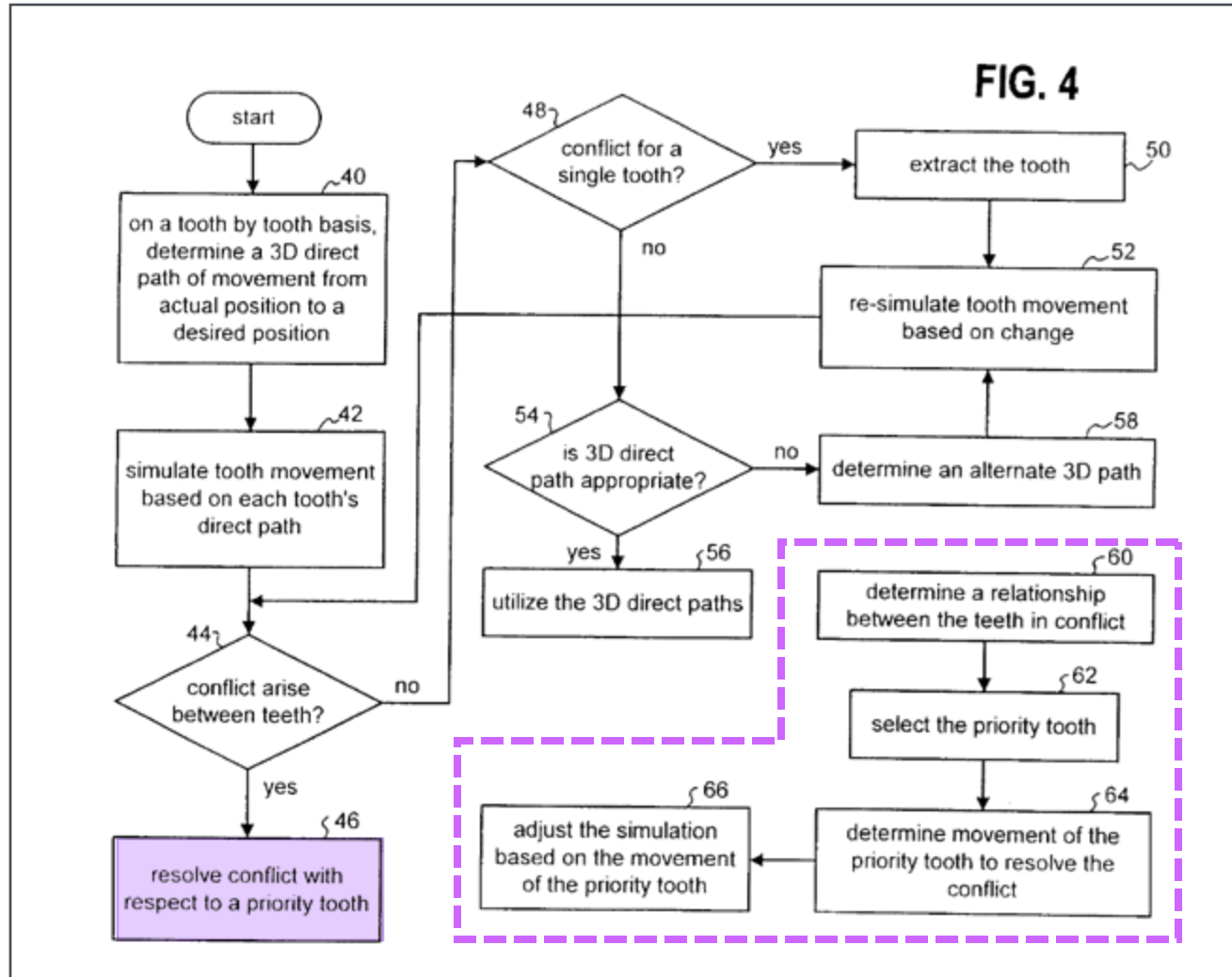
determining that the first modification does not avoid a collision between the first of the dental objects and the second of the dental objects; and

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 during at least one of the treatment stages.

The process begins at step **40** where, on a tooth by tooth basis, a three-dimensional direct path of movement is determined. The three-dimensional direct path is determined from an actual tooth position in relation to a desired tooth position. Such was discussed with reference to FIG. 3. The process then proceeds to step **42** where the tooth movement for a plurality of teeth in the upper arch and lower arch is simulated based on each tooth's direct path. The simulation

The process then proceeds to step **44** where a determination is made as to whether a conflict in movement arose between at least two teeth during the simulation. A conflict may arise in that the movement of one tooth interferes with the direct path movement of another tooth causing a particular tooth to not be able to obtain its desired position.

# Sachdeva Discloses Collision Avoidance



If a conflict arose between two or more teeth, the process proceeds to step 46. At step 46, the conflict is resolved with respect to a priority tooth. The resolution of the conflict is further described with reference to steps 60 through 66. At step 60, a relationship is determined between the teeth and conflict. The process then proceeds to step 62 where a priority tooth is selected between the teeth and conflict. The priority may be established based on whether the tooth is a foundation tooth, whether the conflict results from an inter-arch conflict or an intra-arch conflict, and/or whether the teeth in conflict effect other teeth in movement. For an intra-arch conflict, the actual position of the tooth will dictate whether the upper tooth is priority or the lower tooth is priority. 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.

The resolution of the conflict then proceeds to step 64 where movement of the priority tooth is determined to resolve the conflict. As such, the priority tooth is moved sufficiently to resolve the conflict. The process then proceeds to step 66 where the simulation is adjusted based on the movement of the priority tooth. Note that depending on the priority tooth and the conditions giving rise to the conflict, the movement of the priority tooth may be done independently of other tooth movement or in parallel with other tooth movement.

# Sachdeva Discloses Collision Avoidance

Dr. Yadav

114. In my opinion, a POSITA would have understood that, often, teeth will move at the same time if possible. In the examples provided by Sachdeva, however, two teeth are prevented from initially moving together due to interfering with each other. 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. 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."

If a conflict arose between two or more teeth, the process proceeds to step 46. At step 46, the conflict is resolved with respect to a priority tooth. The resolution of the conflict is further described with reference to steps 60 through 66. At step 60, a relationship is determined between the teeth and conflict. The process then proceeds to step 62 where a priority tooth is selected between the teeth and conflict. The priority may be established based on whether the tooth is a foundation tooth, whether the conflict results from an inter-arch conflict or an intra-arch conflict, and/or whether the teeth in conflict effect other teeth in movement. For an intra-arch conflict, the actual position of the tooth will dictate whether the upper tooth is priority or the lower tooth is priority. 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.

The resolution of the conflict then proceeds to step 64 where movement of the priority tooth is determined to resolve the conflict. As such, the priority tooth is moved sufficiently to resolve the conflict. The process then proceeds to step 66 where the simulation is adjusted based on the movement of the priority tooth. Note that depending on the priority tooth and the conditions giving rise to the conflict, the movement of the priority tooth may be done independently of other tooth movement or in parallel with other tooth movement.

# Sachdeva Discloses Collision Avoidance

What is claimed is:

1. A computer-implemented method comprising:  
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;  
calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;  
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;  
performing a first modification of the schedule of movement in response to the identifying, the first modification of the schedule of movement modifying whether or not at least one of the dental objects move during at least one of the treatment stages;  
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  
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 during at least one of the treatment stages.

If a conflict arose between two or more teeth, the process proceeds to step 46. At step 46, the conflict is resolved with respect to a priority tooth. The resolution of the conflict is further described with reference to steps 60 through 66. At step 60, a relationship is determined between the teeth and conflict. The process then proceeds to step 62 where a priority tooth is selected between the teeth and conflict. The priority may be established based on whether the tooth is a foundation tooth, whether the conflict results from an inter-arch conflict or an intra-arch conflict, and/or whether the teeth in conflict effect other teeth in movement. For an intra-arch conflict, the actual position of the tooth will dictate whether the upper tooth is priority or the lower tooth is priority. 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.

The resolution of the conflict then proceeds to step 64 where movement of the priority tooth is determined to resolve the conflict. As such, the priority tooth is moved sufficiently to resolve the conflict. The process then proceeds to step 66 where the simulation is adjusted based on the movement of the priority tooth. Note that depending on the priority tooth and the conditions giving rise to the conflict, the movement of the priority tooth may be done independently of other tooth movement or in parallel with other tooth movement.

# Chishti-511 Overview

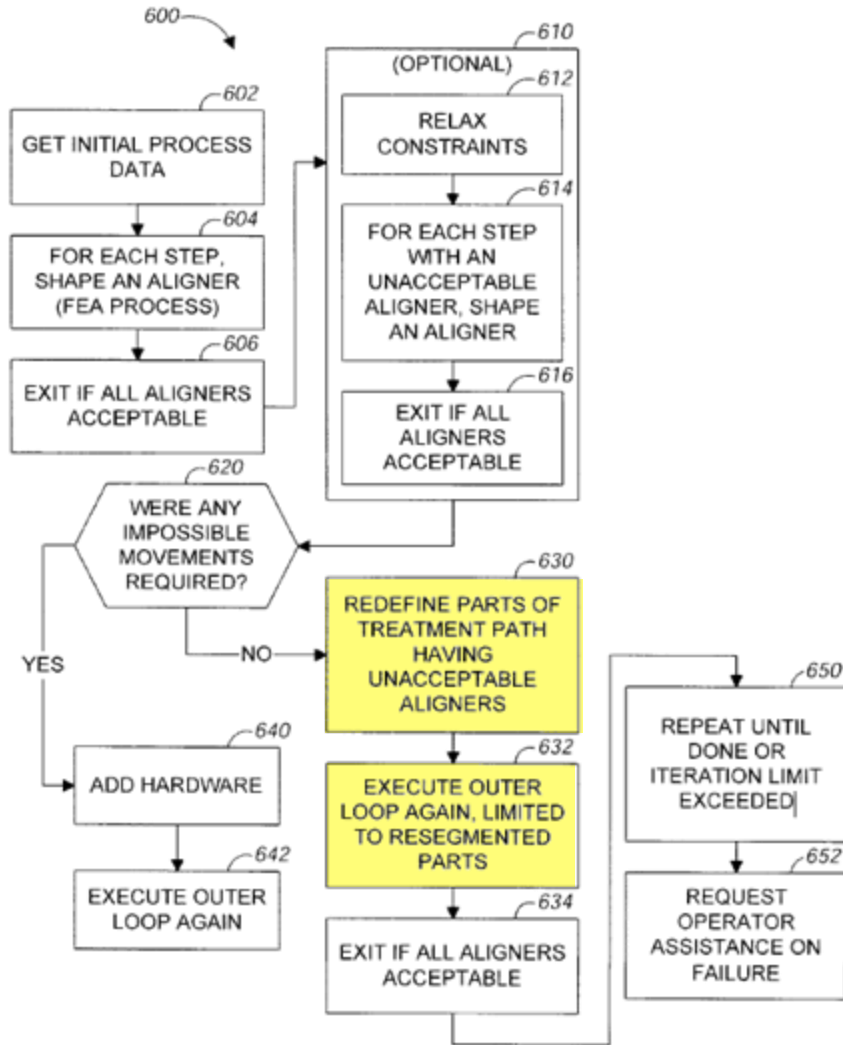
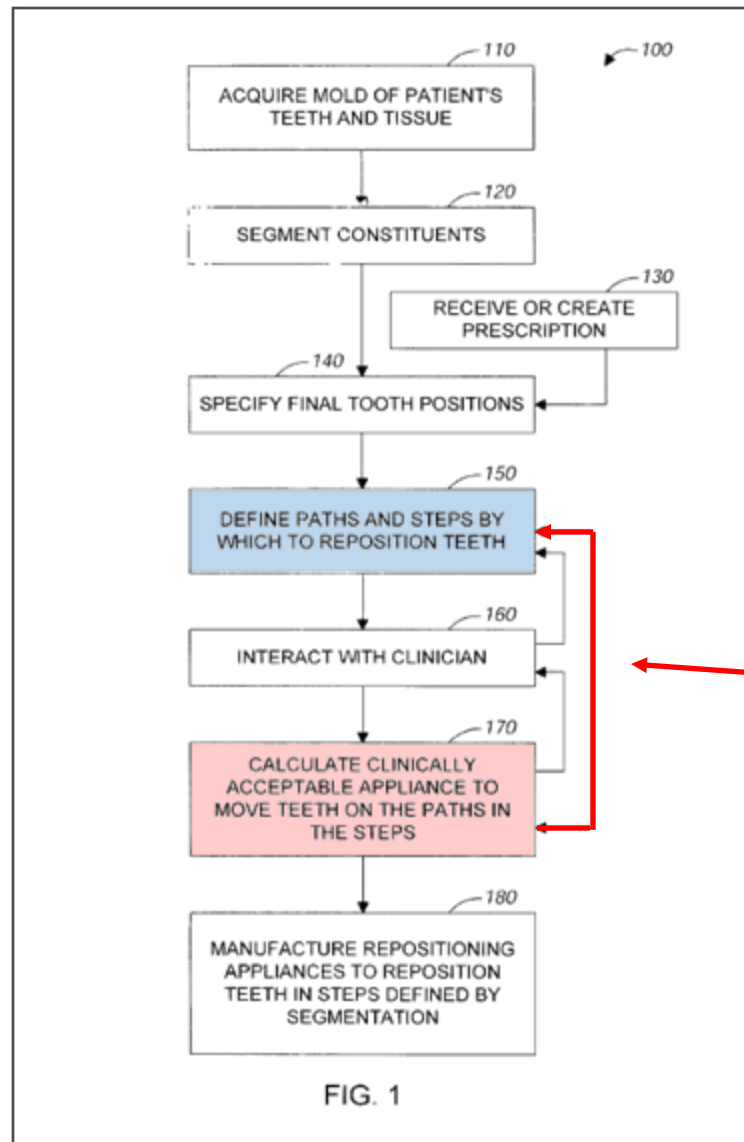


FIG. 6

Aligners may be unacceptable for a variety of reasons, some of which are handled by the overall process. For example, if any impossible movements were required (decision step 620), that is, if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available, the process 600 proceeds to execute a module that calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion (step 640). Because adding hardware can have an effect that is more than local, when hardware is added to the model, the outer loop of the overall process 600 is executed again (step 642).

If no impossible movements were required ("no" branch from step 620), the process transfers control to a path definition process (such as step 150, FIG. 1) to redefine those parts of the treatment path having unacceptable aligners (step 630). This step can include both 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. After the treatment path has been redefined, the outer loop of the overall process is executed again (step 632). The recalculation is advanta-

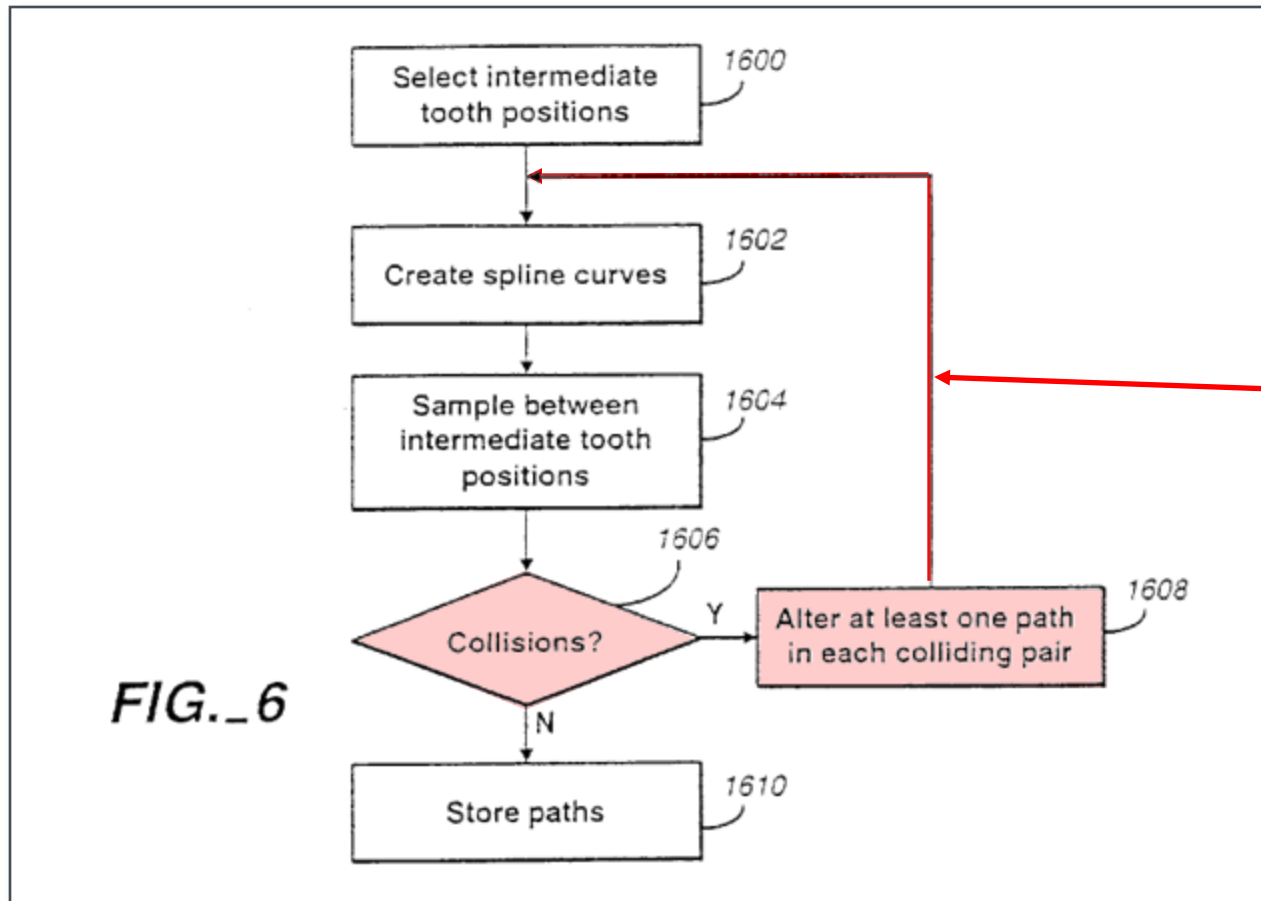
# Chishti-511 Iterates to Calculate a Treatment Plan



Aligners may be unacceptable for a variety of reasons, some of which are handled by the overall process. For example, if any impossible movements were required (decision step 620), that is, if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available, the process 600 proceeds to execute a module that calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion (step 640). Because adding hardware can have an effect that is more than local, when hardware is added to the model, the outer loop of the overall process 600 is executed again (step 642).

If no impossible movements were required ("no" branch from step 620), the process transfers control to a path definition process (such as step 150, FIG. 1) to redefine those parts of the treatment path having unacceptable aligners (step 630). This step can include both 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. After the treatment path has been redefined, the outer loop of the overall process is executed again (step 632). The recalculation is advanta-

# Chishti-876 Iterates to Calculate a Treatment Plan



tion algorithm to the samples (step 1606). If any collisions are detected, the program alters the path of at least one tooth in each colliding pair by selecting a new position for one of the intermediate steps (step 1608) and creating a new spline curve (1602). The program then samples the new path (1604) and again applies the collision detection algorithm (1606). The program continues in this manner until no collisions are detected. The routine then stores the paths,

# Chishti-511 Iterates to Calculate a Treatment Plan

What is claimed is:

1. A computer-implemented method comprising:  
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;  
calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;  
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;  
performing a first modification of the schedule of movement in response to the identifying, the first modification of the schedule of movement modifying whether or not at least one of the dental objects move during at least one of the treatment stages;  
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  
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 during at least one of the treatment stages.

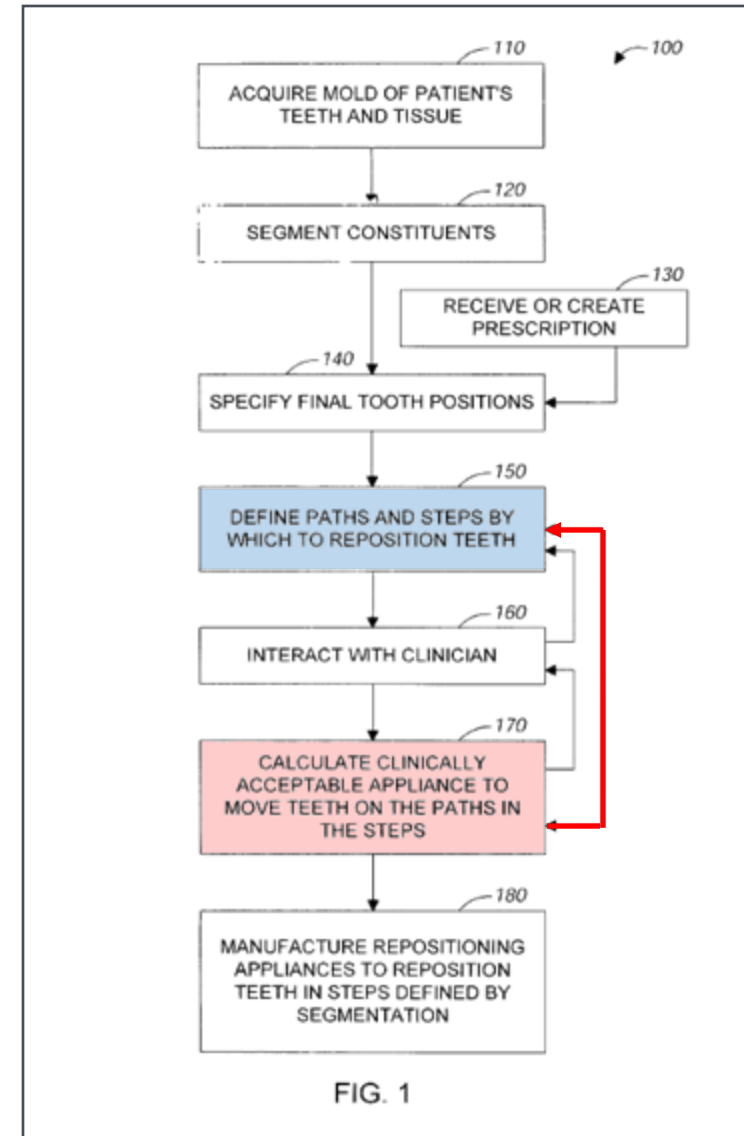
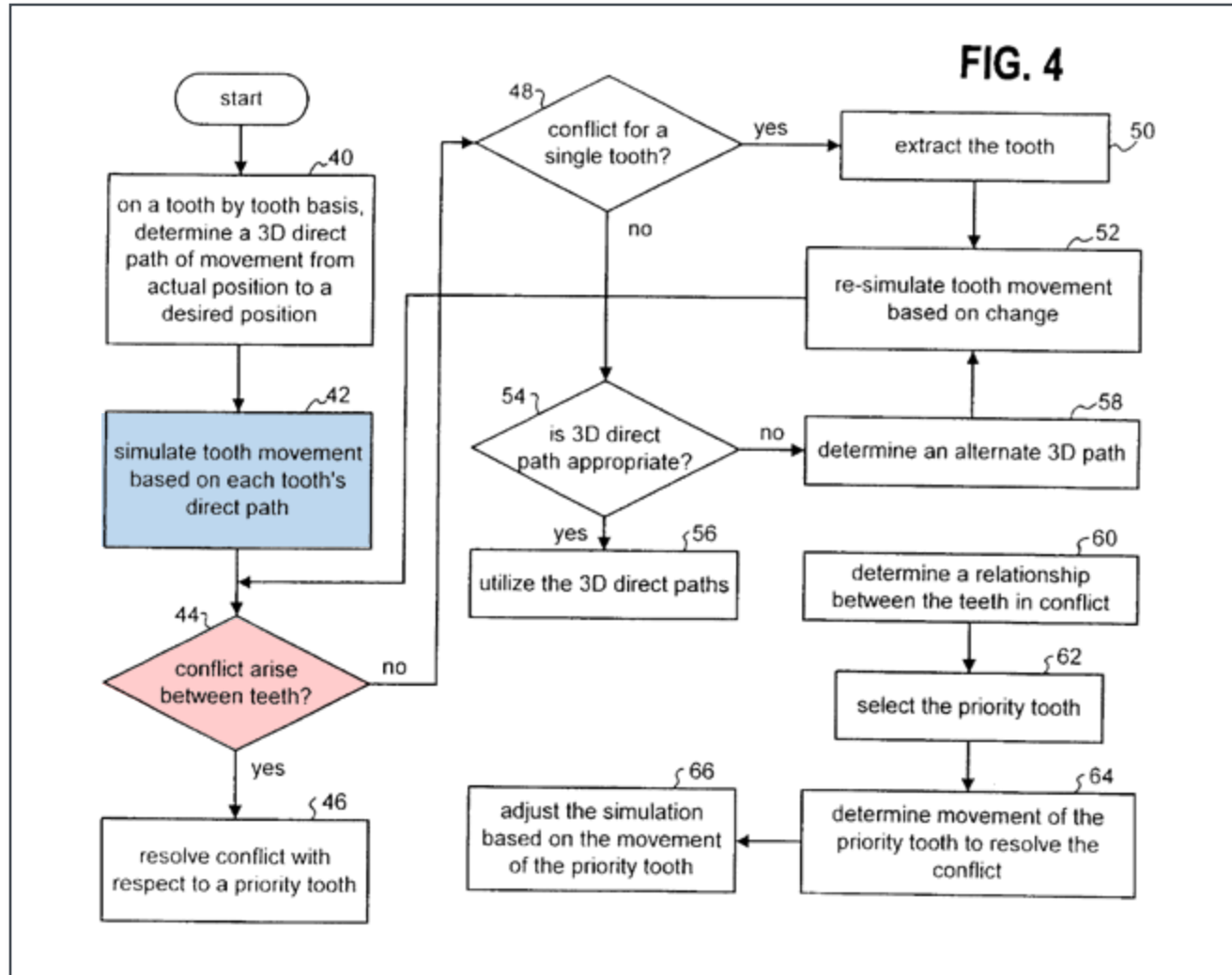


FIG. 1

## Align Argues that a “Conflict” Is Not a “Collision”

Petitioner fails to explain how “a conflict” as described in Sachdeva in which a stationary tooth cannot move because another tooth blocks its path constitutes *a collision* between teeth. Indeed, as Petitioner’s expert, Dr. Yadav,

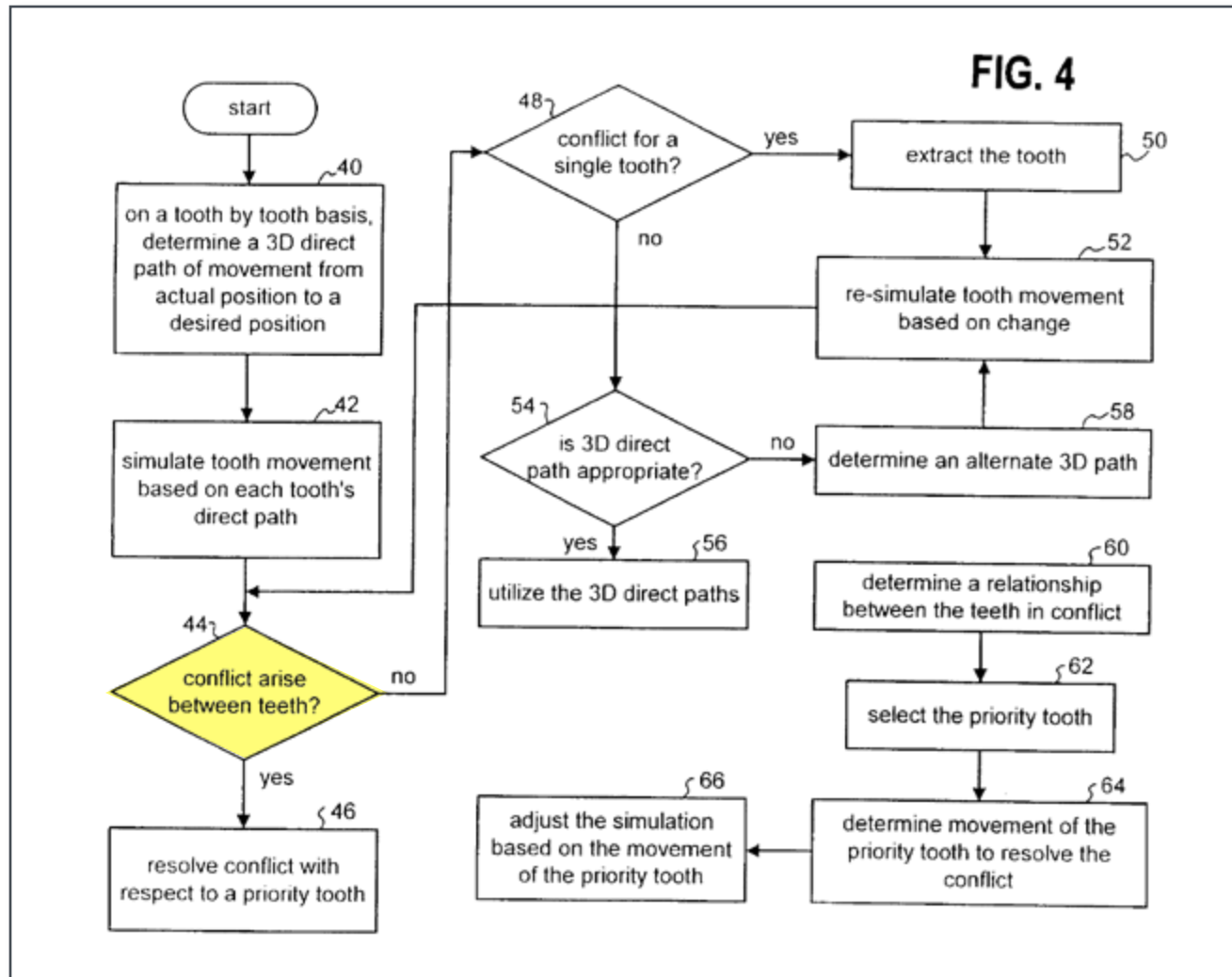
## Sachdeva Simulates Teeth Movement



The process begins at step 40 where, on a tooth by tooth basis, a three-dimensional direct path of movement is determined. The three-dimensional direct path is determined from an actual tooth position in relation to a desired tooth position. Such was discussed with reference to FIG. 3. The process then proceeds to step 42 where the tooth movement for a plurality of teeth in the upper arch and lower arch is simulated based on each tooth's direct path. The simulation of the tooth movement will be based on several factors including the number of steps in the treatment, a growth factor if applicable, normalized movement of teeth for a normalized patient, uniformity of force upon each tooth for displacement, and user inputs, such as function, aesthetics, and stability. The normalized patient information will be

The process then proceeds to step 44 where a determination is made as to whether a conflict in movement arose between at least two teeth during the simulation. A conflict may arise in that the movement of one tooth interferes with the direct path movement of another tooth causing a particular tooth to not be able to obtain its desired position.

# Sachdeva Discloses Collision Identification and Avoidance



The process then proceeds to step 44 where a determination is made as to whether a conflict in movement arose between at least two teeth during the simulation. A conflict may arise in that the movement of one tooth interferes with the direct path movement of another tooth causing a particular tooth to not be able to obtain its desired position.

If a conflict arose between two or more teeth, the process proceeds to step 46. At step 46, the conflict is resolved with respect to a priority tooth. The resolution of the conflict is further described with reference to steps 60 through 66. At step 60, a relationship is determined between the teeth and conflict. The process then proceeds to step 62 where a priority tooth is selected between the teeth and conflict. The priority may be established based on whether the tooth is a foundation tooth, whether the conflict results from an inter-arch conflict or an intra-arch conflict, and/or whether the teeth in conflict effect other teeth in movement. For an intra-arch conflict, the actual position of the tooth will dictate whether the upper tooth is priority or the lower tooth is priority. 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.

# Contemporaneous Evidence Refers to Sachdeva as Detecting Collisions

| (12) United States Patent                                                                                                                                                                                                                                                                       |  | (10) Patent No.: US 6,632,089 B2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Rubbert et al.                                                                                                                                                                                                                                                                                  |  | (45) Date of Patent: Oct. 14, 2003                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| <b>(50) ORTHODONTIC TREATMENT PLANNING WITH USER-SPECIFIED SIMULATION OF TOOTH MOVEMENT</b>                                                                                                                                                                                                     |  | 5,975,803 A 11/29/98 Chiba et al. 433:24<br>6,227,879 B1 5/2000 Chiba et al. 433:24<br>6,227,879 B1 5/2000 Chiba et al. 433:24<br>6,296,680 B1 9/2000 Pao et al. 433:24<br>6,380,994 B1 11/2000 Chiba et al. 433:24<br>6,384,853 B1 1/2002 Kogut et al. 433:24<br>6,371,261 B1 4/2002 Cheng et al. 433:24<br>6,386,678 B1 5/2002 Perlovskiy et al. 433:24<br>2002/062900 A1 2/2002 Chappard et al. 433:24<br>2002/062901 A1 2/2002 Chappard et al. 433:24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <b>(73) Inventors:</b> Rudger Rubbert, Berlin (DE); Thomas Weber, Berlin (DE); Rolf Sachdeva, Plano, TX (US); Hans Ingrened, Berlin (DE); Peter Spierbert, Berlin (DE); Marie Lechner, München (DE); (DE); Jens Freytag, Berlin (DE); Diering Kowalski, Berlin (DE); Stephan Maier, Berlin (DE) |  | <b>FOREIGN PATENT DOCUMENTS</b><br>JP 2001-000000 A 1/2001<br>* cited by examiner                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| <b>(71) Assignee:</b> Orthometrix, Inc., Dallas, TX (US)                                                                                                                                                                                                                                        |  | <b>Primary Examiner:</b> Todd E. Marston<br>(74) Attorney, Agent, or Firm: McDonnell Boehnen Hulbert & Berghoff                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(*) Notice:</b> Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 187 days.                                                                                                                                                               |  | <b>(57) ABSTRACT</b><br>An interactive, software-based treatment planning method to correct a malocclusion is described. The method can be performed on an orthodontic workstation in a clinic or at a remote location such as a lab or provision appliance manufacturing center. The workstation stores a virtual three-dimensional model of the dentition of a patient and patient records. The virtual model is manipulated by the user to define a target situation for the patient, including a target occlusion and individual tooth positions in the arches. Parameters for an orthodontic appliance, such as the location of orthodontic brackets and resulting shape of an orthodontic archwire, are obtained from the simulation of tooth movement to the target situation and the placement position of virtual brackets. The treatment planning can also be executed remotely by a provider appliance server, after having access to the virtual model of the dentition in the target situation. The proposed treatment plan is sent to the clinic for review and modification or approval by the orthodontist. The method is suitable for other orthodontic appliance systems, including removable appliances such as transparent aligning trays. |  |
| <b>(21) Appl. No.:</b> 09/034,412                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(22) Filed:</b> Apr. 13, 2000                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(10) Prior Publication Data</b><br>US 2002/000000 A1 Jan. 24, 2002                                                                                                                                                                                                                           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>Related U.S. Application Data</b>                                                                                                                                                                                                                                                            |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(67) Continuation-in-part of application No. 09/034,412, filed on Apr. 13, 2000, which is a continuation-in-part of application No. 09/034,412, filed on Nov. 20, 1999, now U.S. Pat. No. 6,250,918.</b>                                                                                     |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(51) Int. Cl.:</b> A61C 3/00                                                                                                                                                                                                                                                                 |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(52) U.S. Cl.:</b> 433/24                                                                                                                                                                                                                                                                    |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(53) Field of Search:</b> 433/24, 25, 72, 433/213, 700/98                                                                                                                                                                                                                                    |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>(50) References Cited</b>                                                                                                                                                                                                                                                                    |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>U.S. PATENT DOCUMENTS</b>                                                                                                                                                                                                                                                                    |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| 5,975,803 A 4/2001 London 433:24<br>5,376,398 A 5/1994 Wu et al. 433:24<br>5,447,432 A 7/1995 Sachdeva et al. 433:24<br>5,670,358 A 5/1999 Doyle et al. 433:24                                                                                                                                  |  | 45 Claims, 28 Drawing Sheets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |

ClearCorrect Exhibit 1043, Page 1 of 46  
ClearCorrect v. Align • IPR2025-00816

Because the teeth are represented as complete three-dimensional virtual objects, it is possible to detect the collision between teeth or between teeth and brackets in the simulation of movement of teeth from the current to the target situation. The point cloud representing tooth objects defines a surface, when surfaces come in contact during the tooth movement a collision is simulated. This collision is detected by suitable collision detection algorithms. When the collisions are detected, the user can be notified of the collision and resolve the conflict between teeth, for example by selecting one tooth as a primary tooth and moving that tooth first in an initial stage of treatment, and then moving the other tooth in a secondary stage of treatment. These features are described in further detail in U.S. Pat. No. 6,250,918 to Sachdeva et al., the contents of which are incorporated by reference herein.

# The '456 Patent Claims Sachdeva's Approach

8. A computer-implemented method comprising:  
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;  
calculating a respective treatment path for each of the dental objects between their respective initial position and respective final position;  
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;  
performing a first modification of the schedule of movement in response to the identifying, wherein the first modification comprises delaying initial movement of the first of the dental objects;  
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  
performing a second modification of the schedule of movement after the determining that the first modification does not avoid a collision.

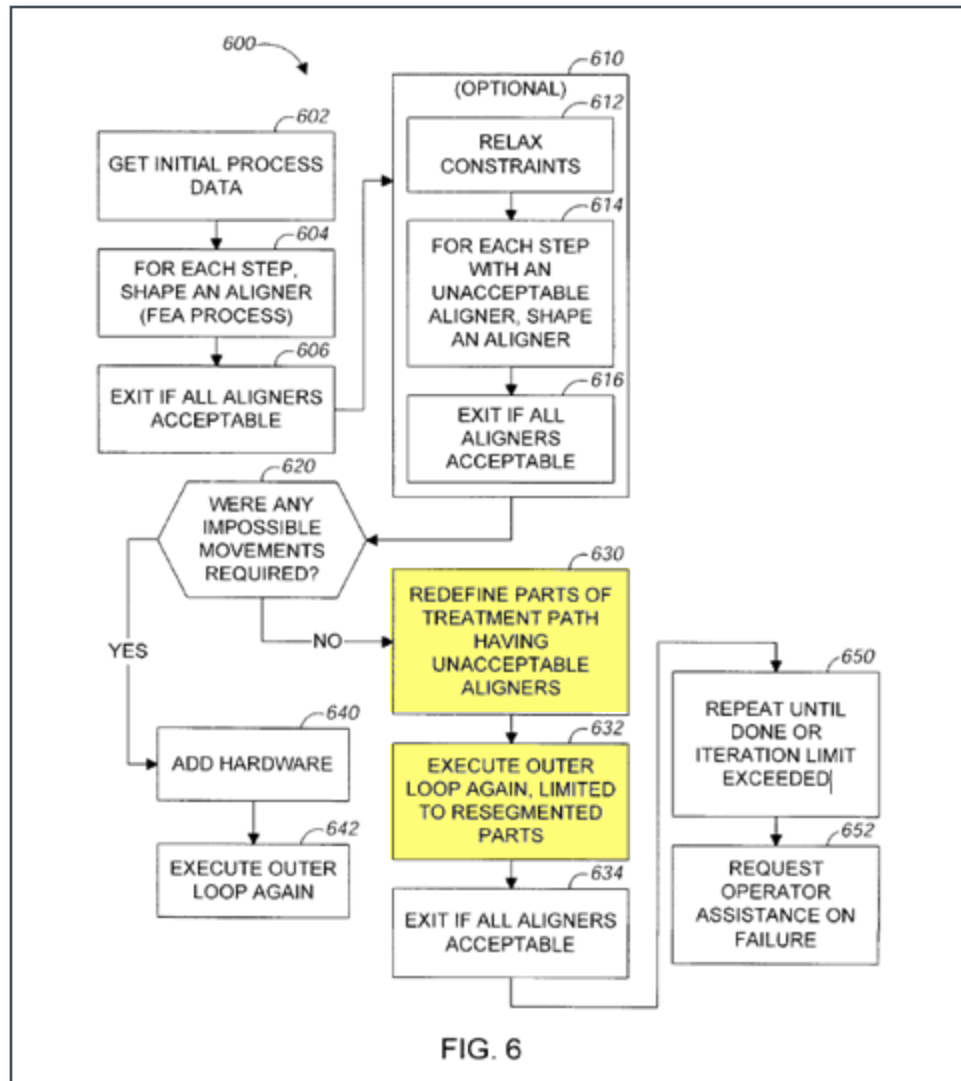
If a conflict arose between two or more teeth, the process proceeds to step 46. At step 46, the conflict is resolved with respect to a priority tooth. The resolution of the conflict is further described with reference to steps 60 through 66. At step 60, a relationship is determined between the teeth and conflict. The process then proceeds to step 62 where a priority tooth is selected between the teeth and conflict. The priority may be established based on whether the tooth is a foundation tooth, whether the conflict results from an inter-arch conflict or an intra-arch conflict, and/or whether the teeth in conflict effect other teeth in movement. For an intra-arch conflict, the actual position of the tooth will dictate whether the upper tooth is priority or the lower tooth is priority. 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.

The resolution of the conflict then proceeds to step 64 where movement of the priority tooth is determined to resolve the conflict. As such, the priority tooth is moved sufficiently to resolve the conflict. The process then proceeds to step 66 where the simulation is adjusted based on the movement of the priority tooth. Note that depending on the priority tooth and the conditions giving rise to the conflict, the movement of the priority tooth may be done independently of other tooth movement or in parallel with other tooth movement.

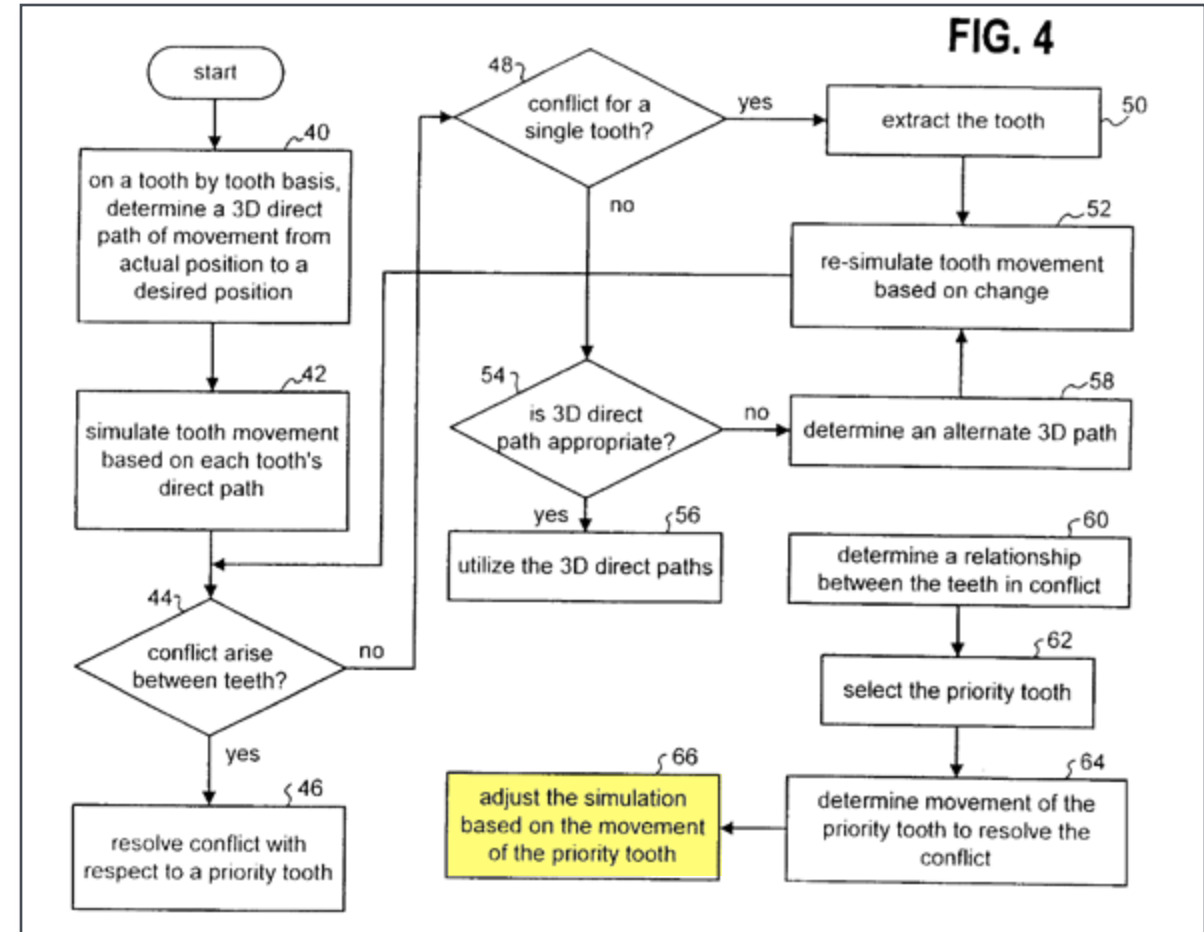
'456 Patent, Claim 8

Sachdeva

# Chishti-511 in view of Sachdeva Renders Obvious an Iterative Loop

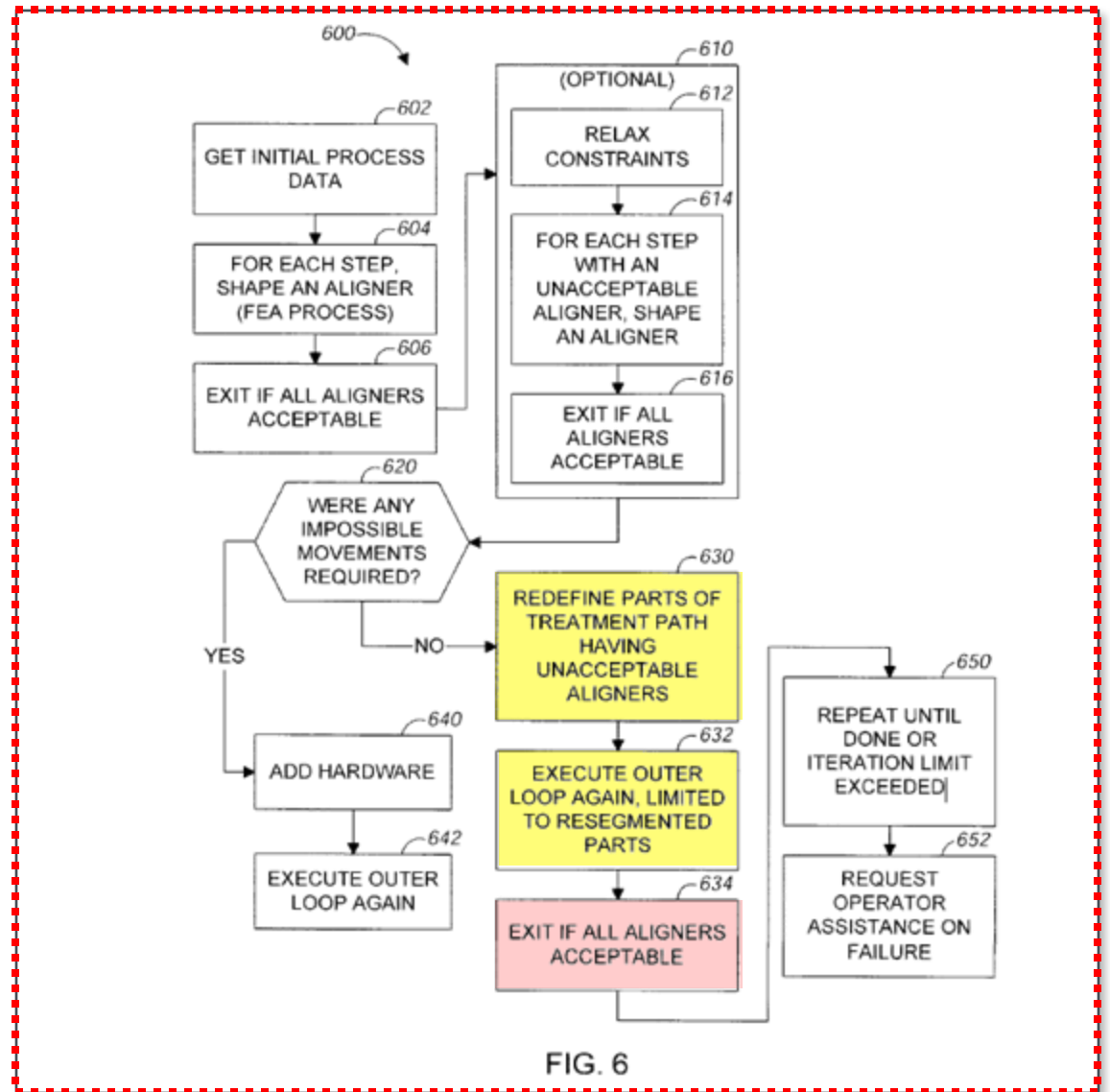


Chishti-511



Sachdeva

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



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

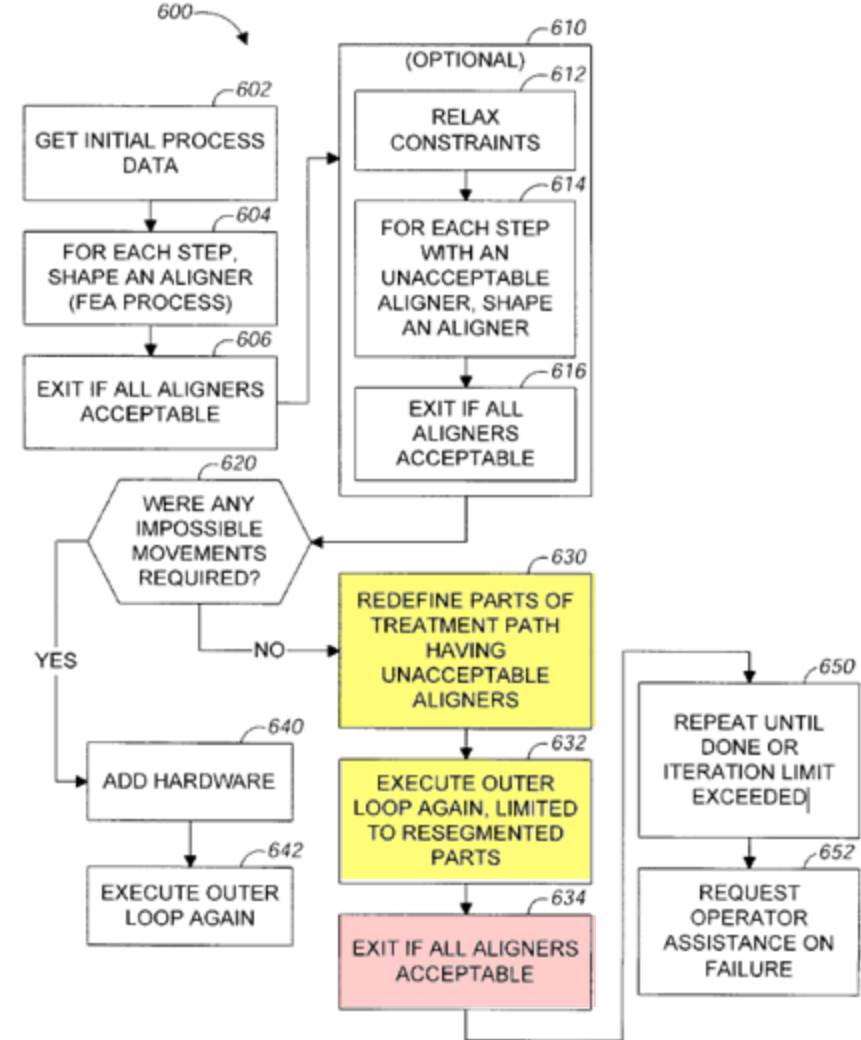
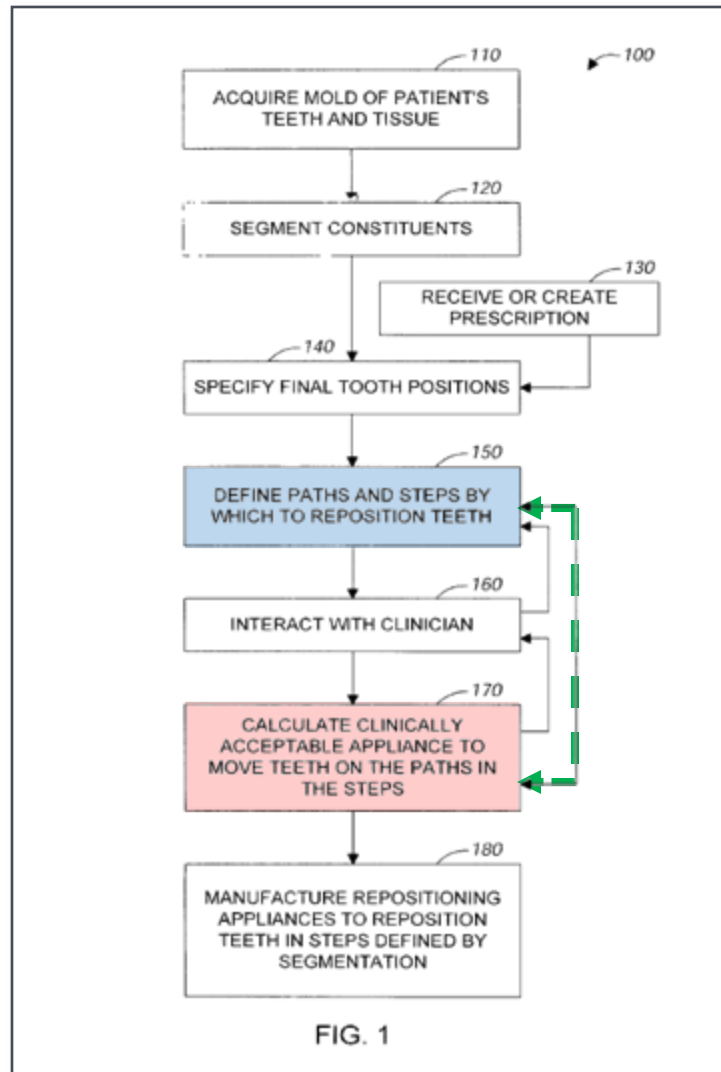


FIG. 6

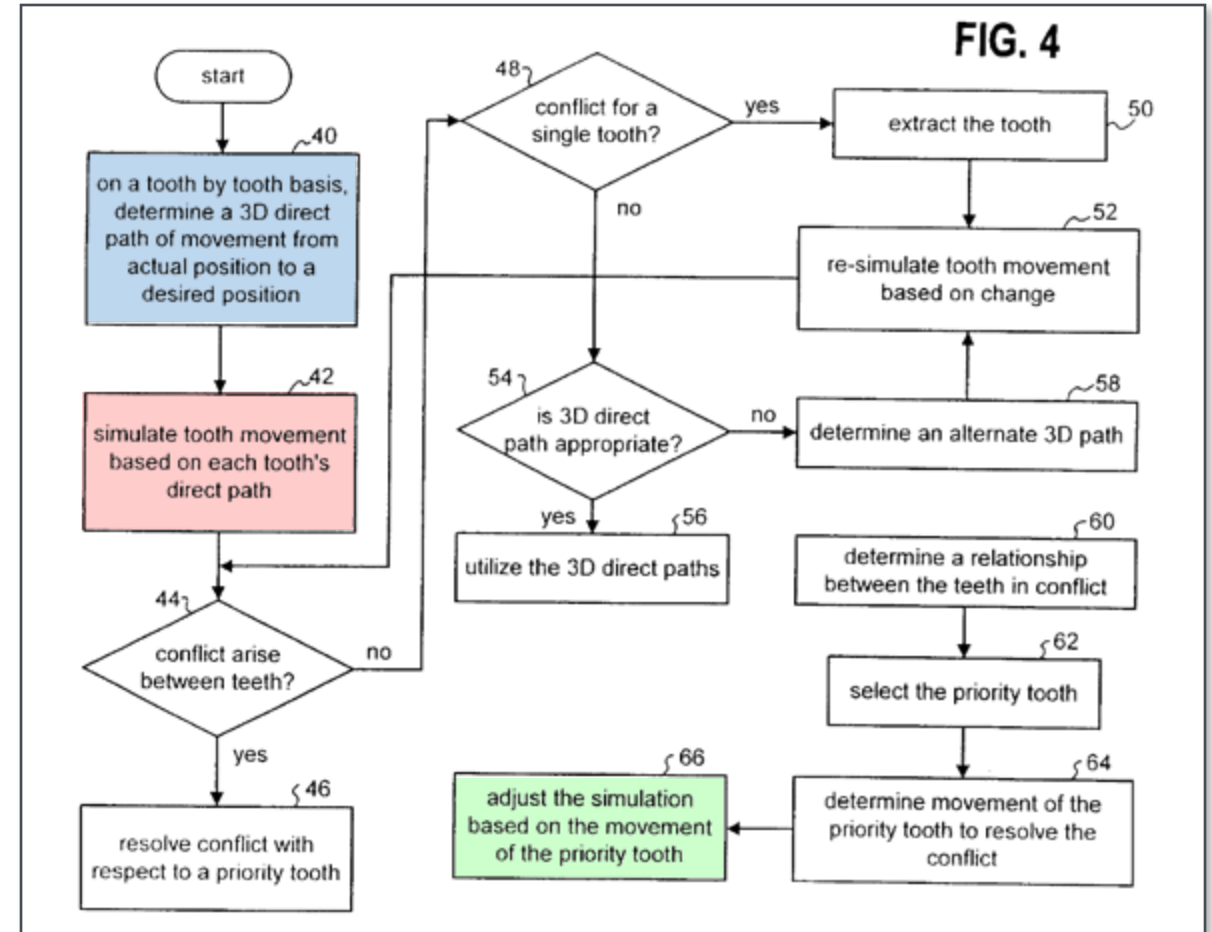
57. If any unacceptable aligners remain, the process determines if “any impossible movements were required” (step 620 above)—that is, “if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available.” *Id.*, 8:43-47. For example, exemplary rules for defining changes to be made to the aligner in certain events include: “if the motion of the tooth is too slow,” then driving material can be added to the aligner; “if the tooth is too far short of the desired end position,” then material may be added to overcorrect; “if the tooth has been moved too far past the desired end position,” then material to stiffen the aligner can be added; or “if the motion of the tooth is in a direction other than the desired direction,” then material may be removed and added so as to redirect the tooth. *Id.*, 7:22-51.

- **Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva**
  - Identifying a collision and performing a modification in response
  - **Motivation to Combine**
- **Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker**
  - Indirect movement
  - The prior art does not teach away
  - Applicability to clear aligners
- **Level of Ordinary Skill in the Art**

# Chishti-511 in view of Sachdeva



Chishti-511



Sachdeva

# Chishti-511 in view of Sachdeva

(12) **United States Patent**  
Sachdeva et al.

(10) Patent No.: US 6,250,918 B1  
(45) Date of Patent: Jun. 26, 2001

(57)

## ABSTRACT

A method and apparatus for simulating tooth movement for an orthodontic patient include processing that begins by determining, on a tooth by tooth basis, a three-dimensional direct path of movement from a three-dimensional digital model of an actual orthodontic structure and a three-dimensional digital model of a desired orthodontic structure. The processing continues by simulating tooth movement for a plurality of teeth based on each tooth's corresponding three-dimensional direct path. The process then determines whether a conflict arises between at least two teeth of the plurality of teeth, or for a single tooth, during the simulating. If a conflict arose between at least two teeth, the conflict is resolved with respect to a priority tooth of the teeth in conflict.

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

The appliance that is manufactured in accordance with the treatment planned for the patient can vary within the scope of the invention and will depend on the application, including the type of appliance desired by the orthodontist and the patient. Obviously, the treatment planning and simulation features described above can be used in wide variety of treatment regimes, including flat wires and brackets, finishing wires, retainers, Herbst devices, expansion devices, and removable, transparent aligning devices such as those furnished by Align Technologies. For example, the movement of the teeth from the current or observed stage to the target or treatment stage can be broken into a series of movement steps. For each step in the process, the position of the teeth in that stage is known by virtue of the manipulation of the individual tooth models in the treatment planning software. These tooth positions can be used to manufacture the aligning devices.

Ex-1043

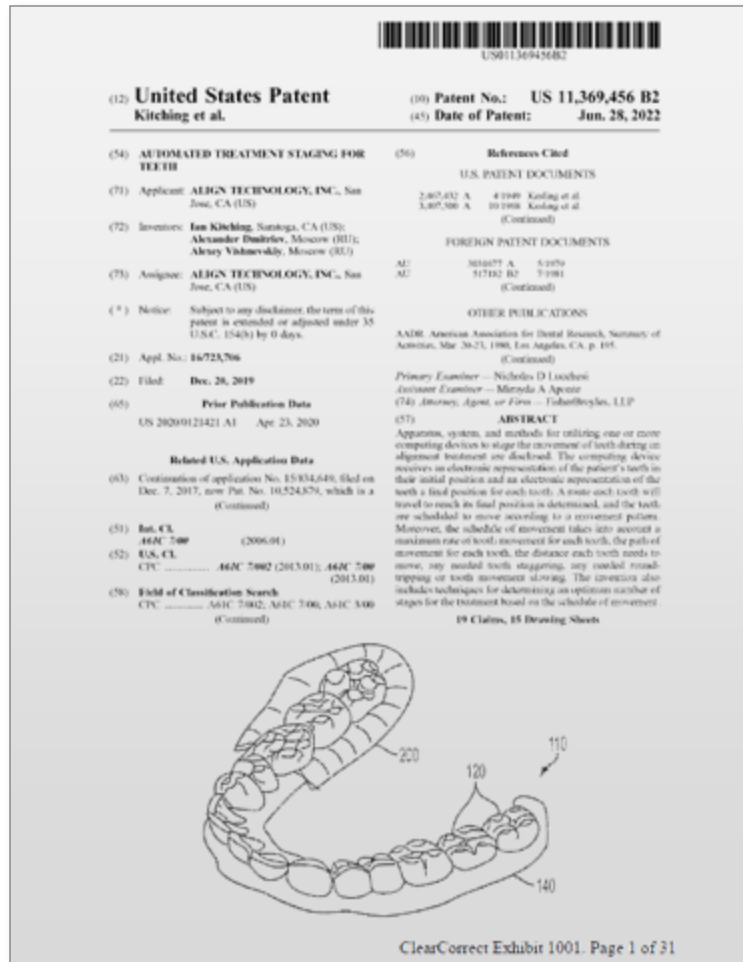
In general, in one aspect, the invention provides methods and corresponding apparatus for segmenting an orthodontic treatment path into clinically appropriate substeps for repositioning the teeth of a patient. The methods include providing a digital finite element model of the shape and material of each of a sequence of appliances to be applied to a patient; providing a digital finite element model of the teeth and related mouth tissue of the patient; computing the actual effect of the appliances on the teeth by analyzing the finite elements models computationally; and evaluating the effect against clinical constraints. Advantageous implementations can include one or more of the following features. The appliances can be braces, including brackets and archwires, polymeric shells, including shells manufactured by stereo lithography, retainers, or other forms of orthodontic appliance. Implementations can include comparing the

Chishti-511



- Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva
  - Identifying a collision and performing a modification in response
  - Motivation to Combine
- **Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker**
  - **Indirect movement**
  - The prior art does not teach away
  - Applicability to clear aligners
- Level of Ordinary Skill in the Art

# Ground 2 – Claims 10, 12, 18, and 19



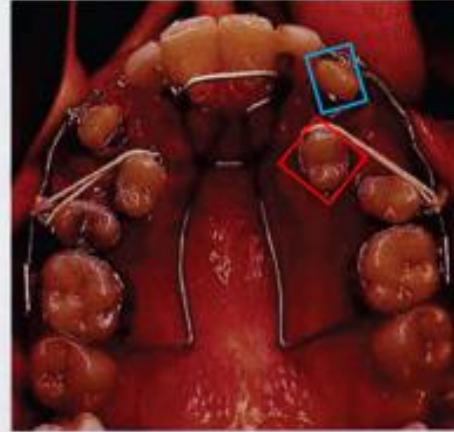
10. The method of claim 9, further comprising:  
performing, after determining that the second modification does not avoid a collision, a modification of the schedule of movement of the dental objects, the modification comprising:  
moving the first of the dental objects away from the respective route of the second of the dental objects; and  
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.

'456 Patent

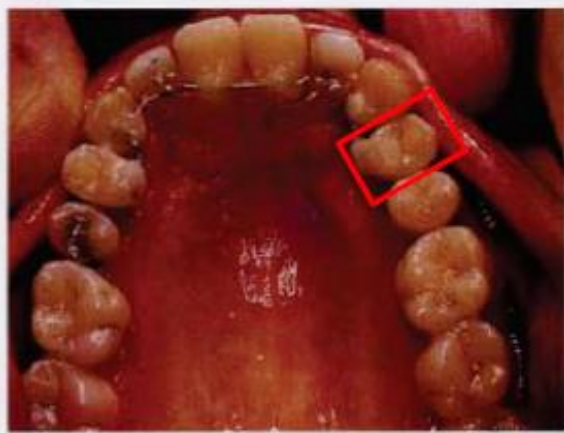
# Becker Overview



(k)



(l)



(m)

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.

- Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva
  - Identifying a collision and performing a modification in response
  - Motivation to Combine
- **Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker**
  - Indirect movement
  - **The prior art does not teach away**
  - Applicability to clear aligners
- Level of Ordinary Skill in the Art

# Indirect Movement Is Sometimes Necessary

- While *preferable* to avoid indirect movement, it is sometimes ***necessary***.

Rarely, one or more of the impacted teeth is also transposed. For the most part, it is preferable to align the teeth in their transposed positions, rather than to try to retranspose them to their ideal positions, for reasons already discussed in Chapter 6. Nevertheless, there are situations in which this may be the preferred line of treatment.

Becker

motion of each tooth. The tooth paths are optimized in the aggregate so that the teeth are moved in the quickest fashion with the least amount of round-tripping to bring the teeth from their initial positions to their desired final positions. (Round-tripping is any motion of a tooth in any direction other than directly toward the desired final position. Round-tripping is sometimes necessary to allow teeth to move past each other.) The tooth paths are segmented. The segments

Chishti-511

the initial position to the final position. The path scheduling algorithm determines the treatment path while avoiding “round-tripping,” i.e., while avoiding moving a tooth along a distance greater than absolutely necessary to straighten the teeth. Such motion is highly undesirable, and has potential negative effects on the patient.

Chishti-876

# Indirect Movement Is Sometimes Necessary

combination, and in any order. In an exemplary embodiment, the computer program first attempts staggering of the teeth movement, followed by slowing-down/interim key frames if the staggering does not avoid collisions, and then followed by round-tripping as a last resort. In addition, each of staggering, slowing down and round-tripping techniques can be applied to any of the patterns discussed above, or any other movement patterns hereinafter developed in the field of orthodontics.

'456 Patent

Federal Circuit:



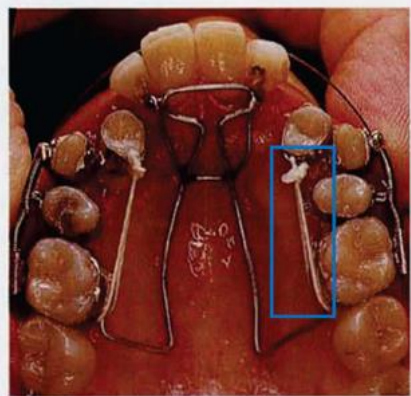
“[A] reference does not teach away if a skilled artisan, upon reading the reference, would not be ‘discouraged from following the path set out in the reference,’ and **would not be ‘led in a direction divergent from the path that was taken by the applicant.’**”

*Adapt Pharma Operations Ltd. v. Teva Pharms. USA, Inc.*,  
25 F.4th 1354, 1370 (Fed. Cir. 2022) (second emphasis added)

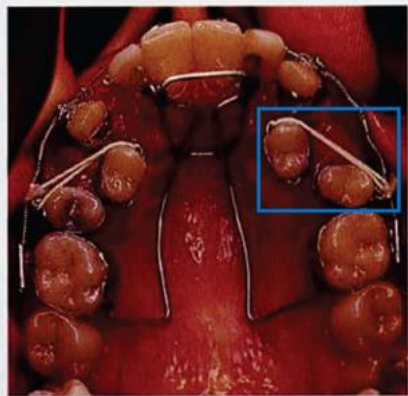
- Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva
  - Identifying a collision and performing a modification in response
  - Motivation to Combine
- **Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker**
  - Indirect movement
  - The prior art does not teach away
  - **Applicability to clear aligners**
- Level of Ordinary Skill in the Art

# Compatibility with Aligner Systems

Becker



(k)



(l)

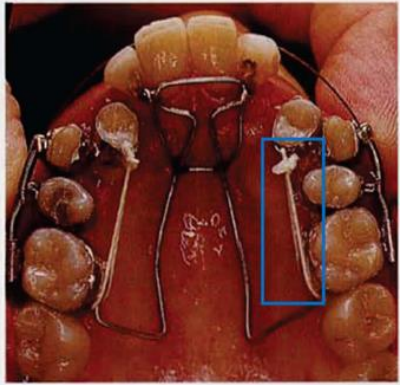
Chisthi-511

Aligners may be unacceptable for a variety of reasons, some of which are handled by the overall process. For example, if any impossible movements were required (decision step 620), that is, if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available, the process 600 proceeds to execute a module that calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion (step 640). Because adding hardware can have an effect that is more than local, when hardware is added to the model, the outer loop of the overall process 600 is executed again (step 642).

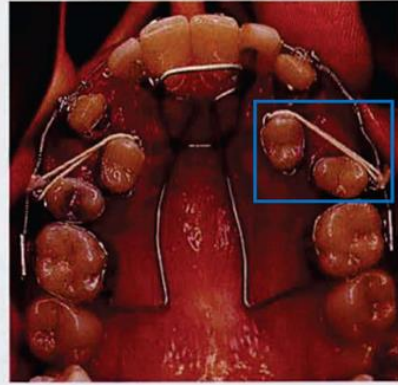
## Dr. Yadav's Testimony

the desired movement. A POSITA would have understood that using such attachments was well known. 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 (“process 600 proceeds to execute a module that 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 (discussing that its 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-1016, 26, 30-38; Ex-1016, 34, 35 (Fig. 2-24c); Ex-1018, Abstract, 11:45-65; Ex-1019, Abstract, 3:21-48. Thus, in my opinion, a POSITA would have understood that, depending on the type of malocclusion, aligners may be used either alone or with attachments to achieve the type of round-tripping disclosed in Becker.

# Attachments with Aligners Were Well Known



(k)



(l)



a



b



FIG 2-23 (a to c) A tab is cut into the Essix appliance for attachment of an elastic band.



FIG 2-24a The initial heated plier thermoforms a cylinder into the appliance.



FIG 2-24b The second heated plier crimps the base of the cylinder to form an elastic attachment.

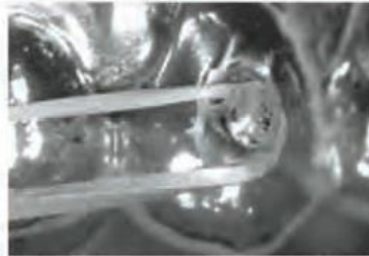


FIG 2-24c An elastic can be attached to the thermoformed button.

FIG 2-27 (right) The bonded molar attachment is the base for the Class II elastic. The molar is encapsulated in the Essix appliance and is therefore resistant to displacement.

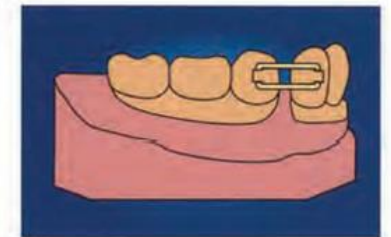
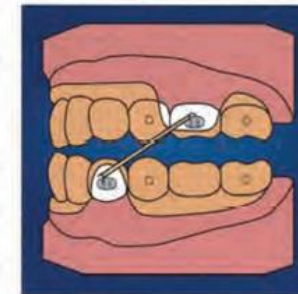


FIG 2-28 (far right) A stretched elastic between the sections of the Essix appliance creates the force necessary to close the buccal section space. A stretched elastic between the sections of an anterior Essix appliance induces enough force to close the midline diastema.

# Attachments with Aligners Were Well Known

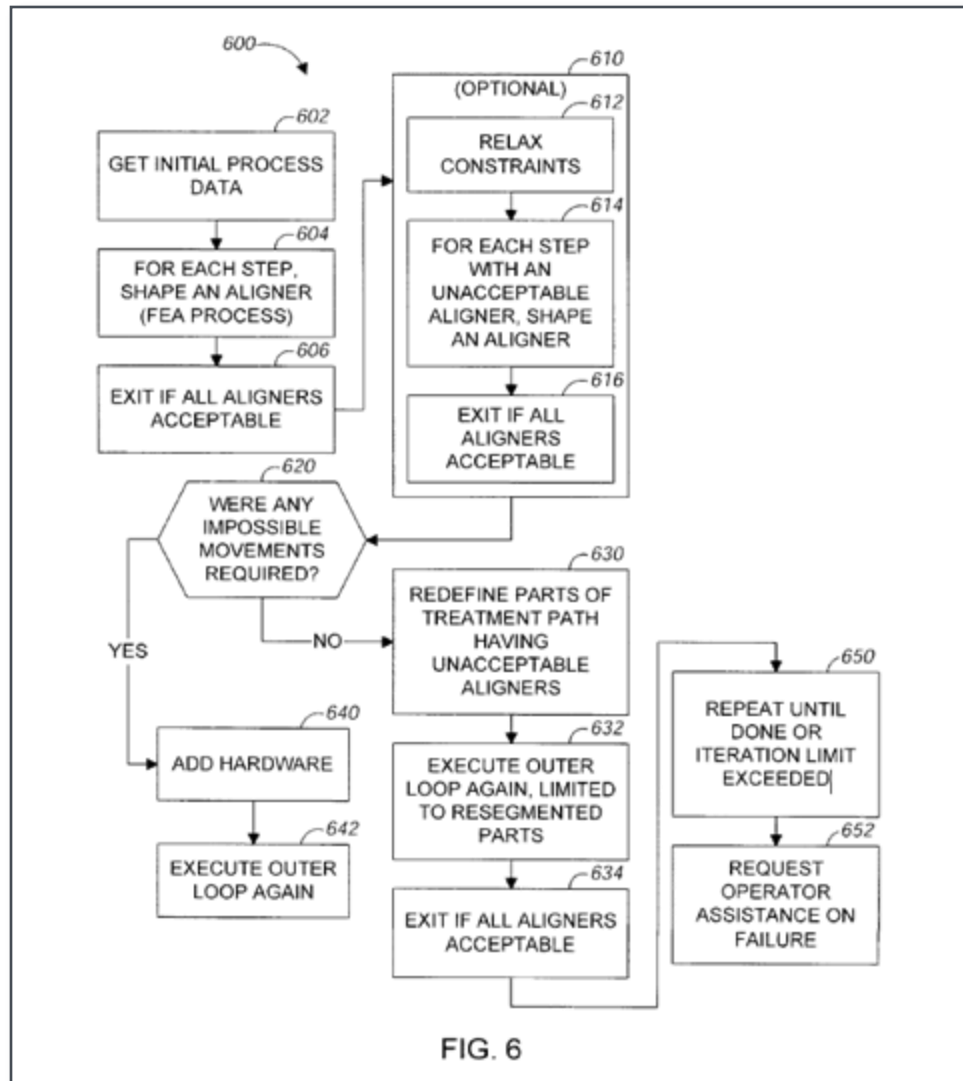
acting alone. Further, through the availability of a system of progressive lengths or progressive elasticities, such couple-based progressive therapeutic forces can be part of a patient-activated modality between appointments. In treatment, combinations of orthodontic aligner auxiliaries can generate various types of therapeutic forces that can be directed to individual mal-positioned teeth in a manner where rotational correction can be accomplished with a mesially-directed or lingually-directed emphasis or bias, thus providing the practitioner with a comprehensive means of differentially repositioning the teeth. For example, the mesial labial device described in the example of couple-type forces may be a “short”; whereas the lingual distal device may be a “long”. In this manner, the practitioner may be able to emphasize the labial repositioning of a tooth, while simultaneously accomplishing aggressive rotational correction through coupled labial-lingual forces. In this manner, specific and aggressive repositioning of the worst positioned teeth can be accomplished while overall, the removable aligner 20 is generally correcting the positions of the rest of the moderately mal-positioned teeth.

EX-1018

The use of attachment devices in combination with removable dental positioning appliances provides the patient with the benefits of removable appliances while retaining the ability to extrude, rotate, and otherwise manipulate teeth as with conventional braces. Like conventional braces, attachment devices may be bonded to the surface of the teeth in order to provide physical features which facilitate the application of controlled force. The attachment devices of the present invention may have a very simple construction, in some instances being only a bump, bead, wedge, or other body or structure which can be fixedly attached to the surface of a tooth or other dental feature in order to transmit force generated by the dental positioning appliance to the dental feature and/or to anchor the positioning appliance to teeth in order to permit the appliance to apply forces elsewhere in the patient's teeth. In such instances, the attachment device acts simply as a handle or lever to assist in the transmission of force between the teeth and the dental positioning appliance. In other instances, the attachment device may feature a hook, similar in design to those used for mounting elastic bands. The hook may be engaged with a number of ligatures, bands, filaments, coils or other connecting members to effect repositioning of the teeth, usually in combination with the dental positioning appliance. The hook may serve as an anchor in the repositioning of other teeth, or it may serve as a point of purchase to apply directed force to the surface of the tooth to which it is bonded.

EX-1019

# Chishti-511 Discloses the Use of Attachments



Chishti-511

Aligners may be unacceptable for a variety of reasons, some of which are handled by the overall process. For example, if any impossible movements were required (decision step 620), that is, if the shape calculation process 200 was required to effect a motion for which no rule or adjustment was available, the process 600 proceeds to execute a module that calculates the configuration of a hardware attachment to the subject tooth to which forces can be applied to effect the required motion (step 640). Because adding hardware can have an effect that is more than local, when hardware is added to the model, the outer loop of the overall process 600 is executed again (step 642).

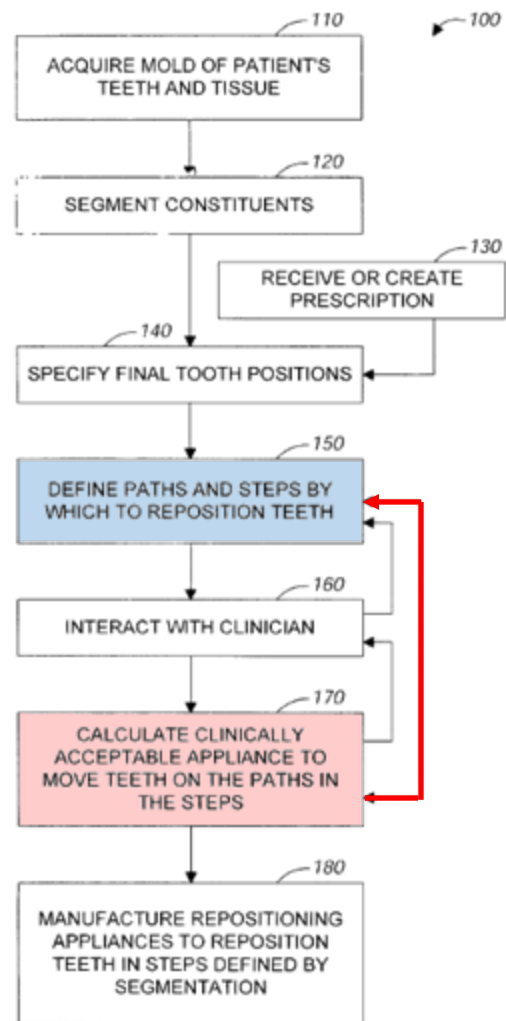


FIG. 1

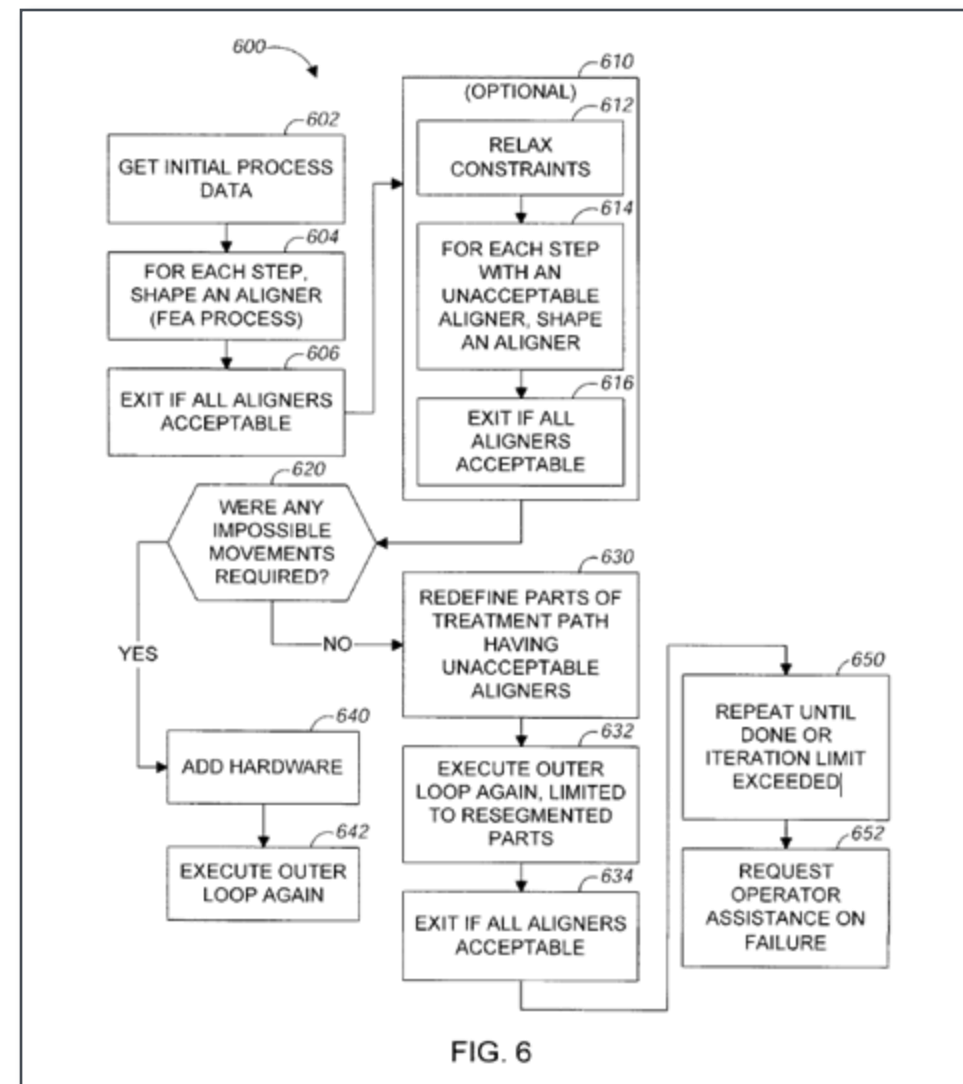


FIG. 6

- Ground 1 - Chishti-511 in view of Chishti-876 and Sachdeva
  - Identifying a collision and performing a modification in response
  - Motivation to Combine
- Ground 2 - Chishti-511 in view of Chishti-876, Sachdeva, and Becker
  - Indirect movement
  - The prior art does not teach away
  - Applicability to clear aligners
- **Level of Ordinary Skill in the Art**

## ClearCorrect's Definition:

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.

## Align's Alternative Definition:

N/A

## ClearCorrect's Definition:

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.

## Dr. Yadav:

- ✓ Advanced Dental Degree
- ✓ Orthodontic Experience
- ✓ Experience with Clear Aligners

## Not Required:

- ✓ Understanding of and Experience with Digital Platforms

# Clear Aligner Experience

Q So what are the -- yeah, what are the different kinds of clear aligners that you used in 2006 or earlier?

A So if I were to define clear aligner as being an appliance made of a clear polymer material used in the field of orthodontics, then as of 2006 I used the Invisalign brand. I used the Essix brand. And then I used -- I performed techniques with clear aligners using other polymer company materials.

Dr. Valley

4. I understand Dr. Valley opined that Essix-type clear aligners were not used to move teeth “over multiple stages.” I disagree with Dr. Valley. In my opinion, a POSITA would have understood that Essix-type clear aligners were regularly used for multi-stage treatments for tooth movement. This is consistent with my experience using Essix-type clear aligners between 2003-2006, which includes instances where I used Essix-type clear aligners for tooth alignment in a treatment involving as many as 6 stages.

Dr. Yadav

**CERTIFICATE OF SERVICE**

The undersigned certifies that a copy of the foregoing **PETITIONER'S DEMONSTRATIVES** was served on July 28, 2026, via email directed to counsel of record for the Patent Owner at the following:

Michael T. Rosato  
Patrick M. Medley  
Wilson Sonsini Goodrich & Rosati  
701 Fifth Avenue, Suite 5100  
Seattle, WA 98104-7036  
Email: mrosato@wsgr.com  
Email: pmedley@wsgr.com

Matthew A. Argenti  
Wilson Sonsini Goodrich & Rosati  
650 Page Mill Road  
Palo Alto, CA 94304  
Email: margenti@wsgr.com

Tasha M. Thomas  
Wilson Sonsini Goodrich & Rosati  
1700 K Street, NW, Fifth Floor  
Washington, DC, 20006  
Email: tthomas@wsgr.com

Dated: July 28, 2026

By: / William Esper /  
William Esper  
Senior Litigation Paralegal  
Finnegan, Henderson, Farabow,  
Garrett & Dunner, LLP