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December 10, 2024

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APPLICATION NUMBER: ***15/834,608***
FILING DATE: ***December 07, 2017***
PATENT NUMBER: ***10456217***
ISSUE DATE: ***October 29, 2019***

Certified by

Katherine Kelly Vidal

Performing the Functions and Duties of the
Under Secretary of Commerce
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PTO/AIA/15 (03-13)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	22773-774.304
First Named Inventor	Ian Kitching
Title	AUTOMATED TREATMENT STAGING FOR TEETH
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✓] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 29] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✓] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 15]
6. **Inventor's Oath or Declaration** [*Total Pages* 5] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✓] A copy from a prior application (37 CFR 1.63(d))
7. [✓] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

ADDRESS TO:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
    Name of Assignee _____
11. [✓] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✓] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [ ] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [✓] **Other:** Certification and Request for Prioritized Examination Under 37 CFR 1.102(e)

Note*: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[✓] The address associated with Customer Number: 107046 **OR** [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Charles Hagadorn, III/	Date	2017-12-07
Name (Print/Type)	Charles Hagadorn, III	Registration No. (Attorney/Agent)	62367

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/17 (03-13)
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FEE TRANSMITTAL

Complete if known	
Application Number	
Filing Date	concurrently herewith
First Named Inventor	Ian Kitching
Examiner Name	
Art Unit	
Practitioner Docket No.	22773-774.304

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

TOTAL AMOUNT OF PAYMENT ($) 6960

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☑ Deposit Account Deposit Account Number: 23-2415 Deposit Account Name: Wilson Sonsini Goodrich & Rosati

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☑ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☑ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayment of fee(s)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES (U = undiscounted fee; S = small entity fee; M = micro entity fee)

	FILING FEES			SEARCH FEES			EXAMINATION FEES			
Application Type	**U ($)**	**S ($)**	**M ($)**	**U ($)**	**S ($)**	**M ($)**	**U ($)**	**S ($)**	**M ($)**	**Fees Paid ($)**
Utility	280	140*	70	600	300	150	720	360	180	$1600
Design	180	90	45	120	60	30	460	230	115	
Plant	180	90	45	380	190	95	580	290	145	
Reissue	280	140	70	600	300	150	2,160	1,080	540	
Provisional	260	130	65	0	0	0	0	0	0	

* The $140 small entity status filing fee for a utility application is further reduced to $70 for a small entity status applicant who files the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	**Undiscounted Fee ($)**	**Small Entity Fee ($)**	**Micro Entity Fee ($)**
Each claim over 20 (including Reissues)	80	40	20
Each independent claim over 3 (including Reissues)	420	210	105
Multiple dependent claims	780	390	195

Total Claims		**Extra Claims**		**Fee ($)**		**Fee Paid ($)**
30	-20 or HP =	10	x	80	=	800

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		**Extra Claims**		**Fee ($)**		**Fee Paid ($)**
4	-3 or HP =	1	x		=	420

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	**Fee ($)**	**Fee Paid ($)**

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $400 ($200 for small entity) ($100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		**Extra Sheets**		**Number of each additional 50 or fraction thereof**		**Fee ($)**		**Fee Paid ($)**
44	- 100 =		/ 50 =	(round **up** to a whole number)	x		=	

4. OTHER FEE(S)

	Fees Paid ($)
Non-English specification, $130 fee (no small or micro entity discount)	
Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, $400 fee ($200 small or micro entity)	
Other (e.g., late filing surcharge): prioritized examination fee ($4000); processing fee ($140)	$4140

SUBMITTED BY

Signature	/Charles Hagadorn, III/	Registration No. (Attorney/Agent) 62,367	Telephone
Name (Print/Type)	Charles Hagadorn, III		Date 2017-12-07

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT APPLICATION

AUTOMATED TREATMENT STAGING FOR TEETH

Inventors: Ian KITCHING,
Citizen of UK, Residing in
Saratoga, CA

Alexander DMITRIEV,
Citizen of RU, Residing in
Moscow, RU

Alexey VISHNEVSKIY,
Citizen of RU, Residing in
Moscow, RU

Assignee: ALIGN TECHNOLOGY, INC.
2820 Orchard Parkway
San Jose, CA 95134

a Delaware Corporation

Entity: Large business concern

WSGR

Wilson Sonsini Goodrich & Rosati
PROFESSIONAL CORPORATION

650 Page Mill Road
Palo Alto, CA 94304
(650) 493-9300 (Main)
(650) 493-6811 (Facsimile)

Filed Electronically on: December 7, 2017

AUTOMATED TREATMENT STAGING FOR TEETH

CROSS-REFERENCE

[0001] This application is a continuation of U.S. Patent Application No. 15/086,491, filed March 31, 2016, which is a continuation of U.S. Patent Application No. 13/209,276, filed August 12, 2011, now U.S. Patent No. 9,326,830, issued May 3, 2016, which is a continuation of U.S. Patent Application No. 11/848,172, filed August 30, 2007, now U.S. Patent No. 8,038,444, issued October 18, 2011, which claims the benefit of U.S. Provisional Patent Application No. 60/824,022, filed August 30, 2006, and U.S. Provisional Patent Application No. 60/824,024, filed August 30, 2006, the entire contents of which are hereby incorporated by reference.

BACKGROUND

FIELD OF THE INVENTION

[0002] 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.

RELATED ART

[0003] One objective of orthodontics is to move a patient's teeth to positions where the teeth function optimally and aesthetically. Conventionally, braces are applied to the teeth of a patient by an orthodontist. The braces exert continual force on the teeth and gradually urge the teeth to their respective ideal position. The orthodontist does this by adjusting the braces over time to move the teeth toward their final destination.

[0004] 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 initial positions of the teeth and their desired ending positions are then planned. These corrective paths generally include a plurality of intermediate positions between the initial and ending positions of the teeth. Multiple clear, removable aligners formed to move the teeth, to the various positions along the corrective path are then manufactured. One system for providing such aligners formed to move the teeth to the various positions along the corrective path is the Invisalign® System from Align Technologies, Inc. of Santa Clara, California.

ClearCorrect Exhibit 1002, Page 7 of 391

[0005] In currently available systems for providing clear, removable tooth aligners, it is often necessary to manually manipulate digital and/or physical models of a patient's teeth to plan movements of the teeth through their various treatment stages, and, thus, to manufacture the corresponding stages of aligners. Although some aspects of the planning and manufacturing processes have been automated, one continuing technical challenge has been to further automate these processes. This challenge is difficult to overcome, primarily because every patient's teeth are unique and their movements during treatment are also unique. In a tooth moving treatment involving multiple clear, removable aligners, every aligner made is different from every other aligner, not only for one patient but, of course, from patient to patient as well. Therefore, automating treatment planning and aligner manufacturing is extremely challenging. At the same time, manually planning each stage of treatment is quite labor and time intensive and requires extensive training.

[0006] 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.

SUMMARY

[0007] Embodiments of the present invention provide apparatus, systems, and methods for automated staging of teeth, from an initial position to a final, corrected position. Depending upon the pm1icular needs of the patient, the patient's teeth are scheduled to move according to various movement patterns, routes, rates, and/or distances; and the need for utilizing tooth staggering, round-tripping, and/or slowing techniques. Furthermore, the invention provides techniques for minimizing the treatment period of the patient based upon the pattern, route, rate, and/or distance selected for the patient's individual needs, as well as the need for any tooth staggering, round-tripping and/or slowing technique(s).

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the drawing Figures, where like reference numbers refer to similar elements throughout the Figures, and:

[0009] FIG. 1A is a diagram showing the arrangement of a patient's teeth at an initial stage of orthodontic treatment. FIG. 1B is a diagram showing the arrangement of a patient's teeth at an intermediate stage of orthodontic treatment. FIG. 1C is a diagram showing the arrangement of a patient's teeth at a final stage of orthodontic treatment;

[0010] FIG. lD is a diagram showing teeth numbering according to the standard system of tooth numbering;

[0011] FIG. 2A is a diagram illustrating a partial model of a patient's dentition, including a model of gingival tissue;

[0012] FIG. 2B is a flow diagram illustrating a plurality of patterns and options available to a computing device for optimizing the movement of a patient's teeth during treatment;

[0013] FIG. 3 is a diagram of an exemplary embodiment of an "all-equal" pattern for moving the teeth of a patient during an orthodontic treatment;

[0014] FIG. 4 is a diagram of one exemplary embodiment of an "A-shaped" pattern for moving the gapped teeth of a patient during an orthodontic treatment;

[0015] FIG. 5 is a diagram of an exemplary embodiment of a "V-shaped" pattern for moving the crowded teeth of a patient during an orthodontic treatment;

[0016] FIG. 6A is a diagram of one exemplary embodiment of a "Mid-Line Shift" pattern for moving the skewed teeth of a patient during an o1ihodontic treatment;

[0017] FIG. 6B is a diagram of an exemplary embodiment of another "Mid-Line Shift" pattern for moving the skewed teeth of a patient during an orthodontic treatment;

[0018] FIG. 7 is a diagram of one exemplary embodiment of an "M-shaped" pattern for moving the gapped teeth of a patient during an orthodontic treatment;

[0019] FIG. 8 is a diagram of the exemplary embodiment of FIG. 4 utilizing a staggering technique to avoid collisions with and/or obstructions between teeth during the orthodontic treatment;

[0020] FIG. 9 is a diagram of the exemplary embodiment of FIG. 4 utilizing a round-tripping technique to avoid collisions with and/or obstructions between teeth during the orthodontic treatment;

[0021] FIG. 10A is a diagram of the exemplary embodiment of FIG. 5 utilizing interim keyframes to avoid collisions with and/or obstructions between teeth during the orthodontic treatment;

[0022] FIG. 10B is a diagram of the exemplary embodiment of FIG. 5 utilizing different rates of movement to avoid collisions with and/or obstructions between teeth during the orthodontic treatment; and

[0023] FIG. 11 is flow diagram of a method for scheduling the movement of teeth during an orthodontic treatment.

DETAILED DESCRIPTION OF THE INVENTION

[0024] United States Patent Application Serial Nos. 09/169,276, now abandoned; 09/264,547; and 09/311,716, now United States Patent No. 6,514,074 describe techniques for generating 3-dimensional digital data sets containing models of individual components of a patient's dentition. These data sets include digital models of individual teeth and the gingival tissue surrounding the teeth. Furthermore, these applications also describe computer-implemented techniques for using the digital models in designing and simulating an orthodontic treatment plan for the patient. For example, one such technique involves receiving an initial data set that represents the patient's teeth before treatment, specifying a desired arrangement of the patient's teeth after treatment, and calculating transformations that will move the teeth from the initial to the final positions over desired treatment paths. United States Patent Application Serial No. 09/169,276 also describes the creation of data sets representing the tooth positions at various treatment stages and the use of these data sets to produce orthodontic appliances that implement the treatment plan. One technique for producing an orthodontic appliance involves creating a positive mold of the patient's dentition at one of the treatment stages and using a conventional pressure molding technique to form the appliance around the positive mold. A design of orthodontic appliances from the digital dentition models is, for example, described in U.S. Patent Application Serial No. 09/169,034.

[0025] FIGS. 1A, 1B, and 1C show a patient's dentition at three stages during a course of treatment. FIG. 1A illustrates the initial positions of the patient's teeth before treatment begins. A digital model of the teeth at these initial positions is captured in an initial digital data set (IDDS). The digital model contained in the IDDS also includes portions representing gingival tissue surrounding the patient's teeth. A computer program segments the IDDS into digital models of individual teeth and the gingival tissue.

[0026] FIG. 1B illustrates an example of how the patient's teeth may be oriented at an intermediate stage in the treatment process, and FIG. 1C illustrates an example of how the patient's teeth may be oriented at their final positions. A human operator and/or a computer program manipulate the digital models of the patient's teeth to achieve the final tooth positions. The program then calculates one or more of the intermediate positions, taking into account any constraints imposed on the movement of the teeth by the human operator or by the natural characteristics of the teeth themselves. The program also accounts for any collisions that might occur between teeth as the teeth move from one treatment stage to the next. Selecting the final and intermediate tooth positions and the treatment paths along which the teeth move is described in more detail in one or more of the Patent

Applications discussed above, which are all hereby incorporated by reference, in their respective entireties.

[0027] FIG. 1D is a diagram of a set of teeth showing the standard system of numbering teeth. Reference is made to this standard system of numbering throughout the discussion below.

[0028] FIG. 2A is a diagram illustrating a portion of a typical digital dentition model 110 derived from the IDDS. Dentition model 110 includes models of individual teeth 120 and a model of the patient's gums 140. Various techniques for creating models of gum tissue and individual teeth from the IDDS are described in, for example, U.S. Patent Application Serial Nos. 09/264,547 and 09/311,941.

[0029] Furthermore, FIG. 2A shows a portion of another gingival model 200 (a "secondary" gingival model), which is constructed to overlie gingival model 140 derived from the IDDS (the "primary" gingival model). The program uses the secondary gingival model 200 to model the deformation of the gingival tissue around the patient's teeth as the teeth move from their initial positions to their final positions. This ensures that orthodontic appliances made from positive molds of the patient's dentition fit comfortably around the patient's gums at all treatment stages. The secondary gingival model 200 also adds thickness to the gum model, which ensures that the orthodontic appliances do not press too tightly against the patient's gums.

[0030] Reference will now be made to various exemplary embodiments of the invention, which are illustrated in the accompanying figures. While these exemplary embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, it should be understood that other embodiments may be realized and that logical and/or mechanical changes may be made without departing from the spirit and scope of the invention. Thus, the various embodiments herein are presented for purposes of illustration and not by way of limitation. For example, the steps recited in any of the method or process descriptions may be executed in any order and are not limited to the order presented. Moreover, any of the functions or steps may be outsourced to or performed by one or more third parties.

[0031] For the sake of brevity, conventional data networking, application development, and other functional aspects of the systems (and components of the individual operating components of the systems) may not be described in detail herein. Furthermore, the connecting lines shown in the various figures contained herein are intended to represent exemplary functional relationships and/or physical connections between the various elements. It should be noted that many alternative and/or additional functional relationships or physical connections may be present in a practical system.

[0032] Various embodiments of the present invention include one or more computing devices having programs stored therein for staging the movement of a patient's teeth. The computing device(s) or various components of any computing device discussed herein may include one or more of the following: a host server or other computing systems including a processor for processing digital data; a memory coupled to the processor for storing digital data; an input digitizer coupled to the processor for inputting digital data; an application program stored in the memory and accessible by the processor for directing processing of digital data by the processor; a display device coupled to the processor and memory for displaying information derived from digital data processed by the processor; and a plurality of databases. Various file indexes and/or databases used herein may include: client data; merchant data; and/or other similar useful data.

[0033] As those skilled in the art will appreciate, any computing device utilized by a user may include an operating system (e.g., Windows NT, 95/98/2000, OS2, UNIX, Linux, Solaris, MacOS, etc.) as well as various conventional support software and drivers typically associated with computers. As will be appreciated by one of ordinary skill in the art, each computing device may be embodied as a customization of an existing system, an add-on product, upgraded software, a stand alone system, a distributed system, a method, a data processing system, a device for data processing, and/or a computer program product. Accordingly, any program stored therein may take the form of an entirely software embodiment, an entirely hardware embodiment, or an embodiment combining aspects of both software and hardware. Furthermore, any program may take the form of a computer program product on a computer-readable storage medium having computer-readable program code means embodied in the storage medium. Any suitable computer-readable storage medium may be utilized, including hard disks, CD-ROM, optical storage devices, magnetic storage devices, and/or the like.

[0034] In accordance with one exemplary embodiment, a computing device is configured to receive an electronic representation of the patient's teeth in an initial position taken by, for example, an intra-oral scanner (i.e., a CT scanner) based on an impression or partial impression of the patient's teeth. In addition, the computing device is configured to receive or generate an electronic representation of a desired final position for each of the patient's teeth. The program stored within the computing device is configured to analyze the initial and final positions, and automatically create a route for each tooth to move from its initial position to its final position. A set of aligners to move the teeth along the route in various stages is manufactured. In doing such, the program is configured to coordinate the movement of the teeth such that the simplest method of moving teeth is utilized based

upon several factors (e.g., complexity of movement required, obstructions from other teeth, and the like).

[0035] FIG. 2B is a flow diagram illustrating a plurality of patterns and options available to a system user and a computing device for optimizing the movement of a patient's teeth during treatment. After the computing device generates the electronic representation of the patient's teeth with respect to the desired final position, in accordance with an exemplary embodiment, the system user can decide which pattern, or combination of patterns thereof, to suitably utilize for moving the patient's teeth to achieve the desired final position, for example, by determining whether the patient's teeth does not require complex movements, and/or has gaps, crowding or are otherwise skewed. The computer program then calculates the planned stages in between the current and desired final position. If the patient does not require complex movements, an "all-equal" pattern 300 (discussed below) of teeth movement can be selected by the system user and utilized by the program. For patients having too much space between teeth (i.e., gaps between teeth), the system user can enable the program to be configured to utilize an "A-shaped" pattern 400 (discussed below) to coordinate the movement of the patient's teeth. For the opposite case (i.e., crowded teeth), the system user can enable the program to be configured to utilize a "V-shaped" pattern 500 (discussed below) to coordinate the movement of the patient's teeth. If a patient's teeth are skewed to the left or right of the patient's mid-line, a "Mid-Line Shift" pattern 600 (discussed below) for small shifts or a Mid-Line Shift pattern 600' (discussed below) can be selected by the system user to enable the program to coordinate the staged movement of the patient's teeth. For a set of teeth having gaps between both posterior and anterior teeth, the system user can enable the program to be configured to utilize an "M-shaped" pattern 700 (discussed below) to coordinate teeth movement. In addition, any other treatment patterns can be suitably selected from other orthodontic treatment patterns for treating space closure, reproximation, dental expansion, flaring, distalization, and/or lower incisor extraction, such as those patterns disclosed in U.S. Patent No. 6,729,876, entitled "Tooth Path Treatment Plan" issued on May 4, 2004 and assigned to Align Technology, Inc.

[0036] Selection of a pattern, e.g., patterns for addressing all equal, gapped, crowded or skewed teeth, can be suitably determined by the system user through use of one or more command or input screens of a computing device. For example, in accordance with an exemplary embodiment, a computing device can be configured to allow the system user to assess the initial and desired final positions of a patient's teeth and then suitably select from such command screens appropriate movement patterns, as well as the extent or degree of stages within any pattern and/or the severity of the teeth misalignment, the speed of movement during treatment for each of the teeth and other

treatment criteria. Such a configuration can include various known orthodontic treatment protocols, or any devised hereinafter.

[0037] While an exemplary embodiment may be configured to have a system user select a suitably pattern for treatment, in accordance with another exemplary embodiment, the computer program can be suitably configured to determine and select such a pattern. For example, by measuring distances of movement needed and/or otherwise analyzing the electronic representation of the patient's teeth in initial and final positions, and then based on algorithms to determine whether the teeth need approximately all-equal movement, or whether the teeth are gapped, crowded or skewed, or some combination thereof, the computer program can select a suitable pattern for treatment planning.

[0038] 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. Patent No. 6,729,876, entitled "Tooth Path Treatment Plan" issued on May 4, 2004 and assigned to Align Technology, Inc.

[0039] In one embodiment, the program is configured to "stagger", "round trip" and/or slow the movement (each of which is discussed below, respectively) of one or more teeth if the patient's teeth cannot be moved without colliding with and/or obstructing another tooth/teeth. Based on that assessment, the program determines the most efficient path to take through some combination of patterns and accommodation of movement thereof.

[0040] As discussed above, for patients that do not require complex tooth movement coordination between multiple teeth or for teeth needing relatively simple correction, the program is configured to utilize an "all-equal" pattern in staging a set of aligners to correct the teeth. In accordance with one exemplary embodiment of the invention, the "all-equal" pattern provides that all of a patient's teeth move in parallel with one another. In other words, all of the patient's teeth that need to move begin moving at the same stage, and finish moving at the same stage.

[0041] Since each tooth begins and ends at the same stage, and the distance each tooth needs to travel may differ, the rate at which each tooth will move will generally vary. Specifically, the rate at which any one tooth will move generally depends upon how many total stages are needed to treat the patient, wherein the total number of stages needed for the treatment is the number of stages needed to place all of the teeth in their respective final positions. As such, the total number of stages needed for treatment is the number of stages needed for the tooth requiring the greatest number of stages for

it to reach its final position. For example, if a first tooth needs five stages (at its maximum rate) of to reach its final position, a second tooth needs nine stages (at its maximum rate) to reach its final position, and a third tooth needs seven stages (at its maximum rate) to reach its final position, the total number of stages needed for treatment is nine stages. Moreover, the rate of the first and third teeth will generally be reduced, respectively, to accommodate the increased number of stages. As such, the first tooth will move at a rate of approximately five-ninths (5/9) its maximum rate, and the third tooth will move at a rate of seven-ninths (7/9) its maximum rate. Thus, each of these teeth will reach their final position at the same stage (i.e., stage 9).

[0042] The system user and/or program can suitably select a rate of tooth movement for each stage, such as by system user input on a command screen, or by computer algorithm. In accordance with one exemplary embodiment, the maximum rate at which a tooth can move is approximately 0.25 millimeters per stage (mm/stage), based in part upon physical limitations of movement of the certain teeth, such as the incisors. However, this maximum rate is capable of being higher or lower depending upon the patient's comfort level and/or tolerance for pain. In other words, the maximum rate at which the teeth move should be such that it does not cause significant discomfort or pain to the patient, but allows fast, efficient movement. The minimum rate can be any rate greater than zero, with the understanding that slower rates mean more stages and longer treatment times.

[0043] FIG. 3 is a diagram representing one example of an "all-equal" pattern 300 for moving the teeth of a patient in accordance with one exemplary embodiment of the invention. Column 310 depicts the number of stages for this particular treatment (i.e., stage 0 through stage 8), wherein stage 0 represents the patient's current teeth positioning, and stage 8 represents the final teeth positioning (or a final desired position for each respective tooth). The remaining columns depict the tooth number 320 according to the standard tooth numbering system, and the position number 330 (i.e., the relative position of each tooth on the patient's jaw arch). Notably, for illustration purposes it is assumed that the patient is not missing any teeth.

[0044] Recall, each tooth in an "all-equal" pattern is configured to be moved at the same time and for the same number of stages. Tooth movement is represented by the solid line connecting the teeth from their initial position (i.e., stage 0) to their final position (i.e., stage 8). Thus, FIG. 3 depicts each of teeth 18 through 31 moving at the same time through stages through 7 until they reach their desired final position at stage 8.

[0045] For a set of teeth having gaps between at least two posterior teeth, the program is configured to utilize an "A-shaped" pattern in staging a set of aligners to correct the teeth. In accordance with one exemplary embodiment of the invention, the "A-shaped" pattern provides that 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. Moreover, the "A-shaped" pattern begins by moving the most anterior-positioned teeth (e.g., the incisors, or teeth in positions 1 and/or 2) then sequentially moving the next posterior-positioned teeth until all of the teeth reach their final position. In accordance with an exemplary embodiment, the next posterior-positioned teeth are not scheduled to begin moving until at least approximately the half-way stage of its respective anterior-positioned teeth. For this and any of the other treatment patterns below, allowing movement of numerous teeth significantly earlier than half-way can result in undesirable pain, particularly in larger teeth, and attempting to move teeth too fast can cause the teeth to lose anchorage as well. On the other hand, allowing movement significantly later than approximately half-way delays treatment by increasing the total number of stages, and thus aligners needed. In accordance with an aspect of one exemplary embodiment, no more than two posterior teeth on one side of the arch may move simultaneously. In the event it is determined that the teeth may collide, such as the incisors if they move at the same time, then the movement of the incisors may be "staggered", "round-tripped", and/or include slower rates of movement (discussed below) to prevent them from colliding with and/or obstructing one another.

[0046] For example, a set of incisors may need six stages to move from their starting position to their final position. This means that the patient's pair of canines will not begin moving until at least approximately the incisors' stage 3. Furthermore, the patient's bicuspids are not scheduled to begin moving until the canines' stage 2 since the canines need 3 stages to move. This staging process continues until all of the patient's teeth reach their final position.

[0047] In accordance with one exemplary embodiment, the maximum rate at which the incisors may be configured to move is approximately 0.25 mm/stage, and the maximum rate at which the remaining teeth may be configured to move is approximately 0.33 mm/stage. However, similar to above, these maximum and/or selected rates are capable of being higher and/or lower depending upon the patient's comfort level and/or tolerance for pain.

[0048] FIG. 4 is a diagram illustrating an example of an "A-shaped" pattern 400 in accordance with one exemplary embodiment of the invention. Similar to above, Column 410 illustrates the number of stages needed to correct the patient's teeth. In this example, the patient requires 18 stages of treatment before the patient's teeth reach their final position in stage 19. Moreover, similar to FIG. 3, FIG. 4 uses the standard teeth numbering system 420 to identify each of the teeth and a position 430 to illustrate the respective positioning of the teeth on the patient's arch.

[0049] Pattern 400 initiates by moving teeth 7, 8, 9, and 10 (i.e., the incisors) in stage 1. These teeth move in stages 1 through 8 to reach their final position in stage 9, but are not moved in stages 9 through 19. The solid lines represent the movement of teeth 7, 8, 9, and 10 in stages 1 through 8, and the lack of such solid lines in stages 9 through 19 represent the non-movement of teeth 7, 8, 9, and 10. Notably, the black boxes represent initial or final tooth positions, wherein no tooth movement occurs.

[0050] Next, the teeth in position 3 (i.e., teeth 6 and 11) are moved in stages 5 through 8, but are not moved in stages 1 through 4 or in stages 9 through 19. Teeth 6 and 11 are not scheduled to move until at least approximately the middle stage (i.e., stage 4) of the previous tooth movement. In other words, teeth 7 through 11 move a total of 8 stages and teeth 6 and 11 are not scheduled to move prior to stage 4 of those 8 stages.

[0051] After the teeth in position 3 have moved at least half way (i.e., 2 stages), the teeth in position 4 (i.e., teeth 5 and 12) are scheduled to begin moving. Teeth 5 and 12 are scheduled to begin moving no sooner than in stage 7 and continue moving until their final position in stage 11. In one embodiment, teeth 5 and 12 do not move in stages 1 through 7, or in stages 11 through 19.

[0052] The teeth in position 5 (i.e., teeth 4 and 13) are the next teeth scheduled to move in pattern 400, but no sooner than the middle stage (i.e., stage 9) for the teeth in position 4. Teeth 4 and I3 are scheduled to begin moving in stage 10 and continue to move until reaching their final position in stage 15. In one embodiment, teeth 4 and 13 do not move in stages 1 through 9, or in stages 15 through 19.

[0053] Next, the teeth in position 6 (i.e., teeth 3 and 14) are schedule to move, but no sooner than the half way point (i.e. stage 12 or later) of the teeth in position 5. Teeth 3 and 14 are scheduled to begin moving in stage 13 and continue to move until reaching their final position in stage 16. Furthermore, similar to above, teeth 3 and 14 do not move in stages 1 through 12, or in stages 16 through 19.

[0054] Final teeth movement in pattern 400 is scheduled to begin no earlier than in stage 14 for teeth in position 7 (i.e., teeth 2 and 15). Teeth 2 and 15 are scheduled to begin movement in stage 16 and continue to move until reaching their final position in stage 19. Moreover, teeth 2 and 15 do not move in stages 1 through 15.

[0055] For a set of teeth lacking space in between at least two teeth (i.e., over-crowding), the program is configured to utilize a "V-shaped" pattern in staging a set of aligners to correct the teeth. In accordance with one exemplary embodiment of the invention, the "V-shaped" pattern provides that 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. Moreover, the "V-shaped"

pattern begins by moving the most posterior-positioned teeth (e.g., the molars, or teeth in position 7 and/or 8) then sequentially moving the next anterior-positioned teeth until all of the teeth reach their final position. The next anterior-positioned teeth are not scheduled to begin moving until at least approximately the half-way stage of its respective posterior-positioned tooth. In accordance with an aspect of one exemplary embodiment, no more than two posterior teeth on one side of the arch may move simultaneously, but all of the incisors move simultaneously during the final stages of the treatment. In one embodiment, if the teeth, e.g., incisors, will collide if they move at the same time, then the teeth may be "staggered", "round-tripped", and/or slowed (discussed below) to prevent them from colliding with one another.

[0056] In accordance with one exemplary embodiment, the maximum rate at which the incisors move may be configured to be approximately 0.25 mm/stage, and the maximum rate at which the remaining teeth move may be configured to be approximately 0.33 mm/stage. However, similar to above, these maximum and/or selected rates are capable of being higher or lower depending upon the patient's comfort level and/or tolerance for pain.

[0057] FIG. 5 is a diagram illustrating an example of a "V-shaped" pattern 500 in accordance with one exemplary embodiment of the invention. Similar to above, column 510 illustrates the number of stages needed to correct the patient's teeth. In this example, the patient requires 20 stages of treatment before the patient's teeth reach their final position in stage 21. Moreover, similar to FIGS. 3 and 4, FIG. 5 uses the standard teeth numbering system 520 to identify each of the teeth and a position 530 to illustrate the respective positioning of the teeth on the patient's arch.

[0058] Pattern 500 initiates by moving teeth in position 7 (i.e., the molars numbered as teeth 2 and 15) in stage 1. These teeth continue to move in stages 1 through 6 to reach their final position in stage 7, but are not moved in stages 8 through 21. Next, the teeth in position 6 (i.e., teeth 3 and 14) are moved in stages 4 through 10, but are not moved in stages 1 through 3 or in stages 10 through 21. In one embodiment, teeth 3 and 14 are not scheduled to move until at least approximately the middle stage (i.e., stage 3) of the previous tooth movement. In other words, teeth 2 through 15 move a total of 6 stages, and teeth 3 and 14 are not scheduled to begin moving their seven stages prior to stage 3 of teeth 2 and 15's 6 stages.

[0059] In this example, the patient does not need the teeth in position 5 (i.e., teeth 4 and 13) to move. Thus, after the teeth in position 6 have moved half way (i.e., 4 stages), the teeth in position 4 (i.e., teeth 5 and 12) are scheduled to begin moving. Teeth 5 and 12 are scheduled to begin moving no sooner than in stage 7 and continue moving until their final position in stage 12. In one embodiment, teeth 5 and 12 do not move in stages 1 through 7, or in stages 13 through 21.

[0060] The teeth in position 3 (i.e., teeth 6 and 11) are the next teeth scheduled to move in pattern 500, but no sooner than the middle stage (i.e., stage 10) for the teeth in position 4. Teeth 6 and 11 begin moving in stage 11 and continue to move until reaching their final position in stage 19. In one embodiment, teeth 6 and 11 do not move in stages 1 through 10, or in stages 19 through 21.

[0061] Final teeth movement in pattern 500 is scheduled to begin no earlier than in stage 14 for teeth in positions 2 and 1 (i.e., the incisors numbered as teeth 7, 8, 9, and 10). Teeth 7 through 10 are scheduled to begin movement in stage 15 and continue to move until reaching their final position in stage 21. Similar to above, teeth 7 through 10 do not move in stages 1 through 14.

[0062] For a set of teeth that is off-centered (i.e., skewed to one side), the program is configured to utilize a "mid-line shift" pattern in staging a set of aligners to correct the teeth. In accordance with one exemplary embodiment of the invention, the mid-line shift pattern provides that tooth movement begins on one side of the patient's arch to center the teeth with respective to the mid-line of the patient's mouth. The next tooth/teeth to move is/are not scheduled to begin moving until at least approximately the half way stage of its respective previously-scheduled tooth/teeth. For example, if the patient's teeth are skewed to the left, tooth movement begins by moving the most-posterior tooth on the right side of the patient's arch to the right, and then progressively shifting the teeth towards the right filling in the space vacated by the previously-moved tooth. The opposite is true for teeth skewed to the right.

[0063] For situations where the patient's teeth need to shift less than about 1.0 mm, in one embodiment of the invention, the incisors move simultaneously during an intermediate stage of the treatment. In one embodiment, if the incisors will collide and/or obstruct one another if they move at the same time, then the incisors may be "staggered", "round-tripped", and/or slowed (discussed below) to prevent them from doing such. In another embodiment of the invention, when the patient's mid-line needs to shift greater than about 1.0 mm, each of the incisors is scheduled to move independent of the other incisors. In yet another exemplary embodiment of the invention, no more than two posterior teeth on one side of the arch may move simultaneously regardless of the amount of shift required.

[0064] In accordance with one exemplary embodiment of the invention, the maximum rate at which the incisors move may be configured to be approximately 0.25 mm/stage, and the maximum rate at which the remaining teeth move may be configured to be approximately 0.33 mm/stage. However, similar to above, these maximum and/or selected rates are capable of being higher or lower depending upon the patient's comfort level and/or tolerance for pain.

[0065] FIG. 6A is a diagram illustrating an example of a "mid-line shift" pattern 600 for teeth skewed (to the patient's left) less than about 1.0 mm in accordance with one exemplary embodiment of the invention. Similar to above, column 610 illustrates the number of stages needed to correct the patient's teeth. In this exan1ple, the patient requires 26 stages of treatment before the patient's teeth reach their final position in stage 27. Moreover, similar to FIGS. 3-5, FIG. 6A uses the standard teeth numbering system 620 to identify each of the teeth and a position 630 to illustrate the respective positioning of the teeth on the patient's arch.

[0066] Pattern 600 initiates by moving tooth 2 to the right in stage 1. Next, tooth 3 is moved to the right for 2 stages, followed by tooth 4 moving to the right for 2 stages. Tooth 5 moves next for 3 stages, followed by tooth 6 for 4 stages. The incisors (i.e., teeth 7 through 10) are scheduled to move next beginning in stage 11 (although they could have been scheduled as early as stage 10). As noted above, since the patient needs a mid-line shift less than about 1.0 mm, the incisors move together. The remaining teeth continue shifting sequentially to the right until all the teeth arrive in their respective final position in stage 27.

[0067] In one embodiment, the teeth are not scheduled to move after they have reached their respective final positions. Furthermore, the next tooth/teeth scheduled to move are not scheduled to move prior to at least approximately the half-way stage of the previously-scheduled tooth/teeth.

[0068] FIG. 6B is a diagram illustrating an example of an "mid-line shift" pattern 600' for teeth skewed (to the patient's right) more than about 1.0 mm in accordance with one exemplary embodiment of the invention. Similar to above, column 610 illustrates the number of stages needed to correct the patient's teeth. In this example, the patient requires 29 stages of treatment before the patient's teeth reach their final position in stage 30. Moreover, similar to FIG. 6A, FIG. 6B uses the stand teeth numbering system 620 to identify each of the teeth and a position 630 to illustrate the respective positioning of the teeth on the patient's arch.

[0069] Pattern 600 initiates by moving tooth 15 to the left 3 stages beginning in stage 1. Next, tooth 14 is moved to the left for 3 stages, followed by tooth 13 moving to the left for 3 stages. The remaining teeth continue shifting sequentially to the left until all the teeth arrive in their respective final position in stage 30. As noted above, since the patient needs a mid-line shift greater than about 1.0 mm, the incisors do not move together, but instead move individually. In one embodiment, the teeth are not scheduled to move after they have reached their respective final positions. Furthermore, the next tooth scheduled to move is not scheduled to move prior to at least approximately the halfway stage of the previously-scheduled tooth.

[0070] For a set of teeth having gaps between posterior teeth and anterior teeth, the program is configured to utilize an "M-shaped" pattern in creating a set of aligners to correct the teeth. In accordance with one exemplary embodiment of the invention, the "M-shaped" pattern provides that 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. Moreover, the "M-shaped" pattern begins by moving teeth between the anterior teeth and the posterior teeth (e.g., the bicuspids, or teeth in positions 4 and/or 5) then sequentially moving both the adjacent anterior and/or adjacent posterior teeth until all of the teeth reach their final position. Furthermore, the teeth, e.g., incisors, move simultaneously unless they will collide with or obstruct one another, wherein the incisors may be "staggered", "round-tripped", and/or slowed (discussed below) to prevent them from colliding with one another. In addition, similar to embodiments discussed above, subsequently scheduled teeth are not scheduled to begin moving until at least approximately the half-way stage of its respective precedent tooth. Moreover, the corresponding positions on each side of the patient's arch move during the same stage. In accordance with an aspect of one exemplary embodiment, no more than two posterior teeth on one side of the arch may move simultaneously.

[0071] In accordance with one exemplary embodiment, the maximum rate at which the incisors move may be configured to be approximately 0.25 mm/stage, and the maximum rate at which the remaining teeth move may be configured to be approximately 0.33 mm/stage. However, similar to above, these maximum and/or selected rates are capable of being higher or lower depending upon the patient's comfort level and/or tolerance for pain.

[0072] FIG. 7 is a diagram illustrating an example of an "M-shaped" pattern 700 in accordance with one exemplary embodiment of the invention. Similar to above, column 710 illustrates the number of stages needed to correct the patient's teeth, wherein, in this example, the patient requires 16 stages of treatment before the patient's teeth reach their final position in stage 17. Moreover, similar to FIGS. 3-6B, FIG. 7 uses the standard teeth numbering system 720 to identify each of the teeth and a position 730 to illustrate the respective positioning of the teeth on the patient's arch.

[0073] Pattern 700 initiates by moving teeth in positions 5 and 6 (i.e., the bicuspids) in stage 1. These teeth continue to move until they reach their final position, which, for example includes teeth 5 and 12 moving in stages I through 6, and teeth 4 and 13 moving in stages 1 through 8. Notably, these teeth need different numbers of stages to reach their final positions. As such, their respective adjacent teeth are scheduled to begin moving during different stages.

[0074] In the example illustrated in FIG. 7, teeth 5 and 12 need five stages of treatment, thus, teeth 6 and 11 are scheduled to begin moving at the mid-point (i.e., stage 3) of teeth 5 and 12's treatment.

Similarly, teeth 4 and 13 need seven stages, thus, teeth 3 and 14 are not scheduled to begin movement until stage 4 of teeth 4 and 13's treatment. Subsequently, the next adjacent teeth are scheduled to move proximate the mid-point of stages of its respective adjacent tooth.

[0075] In accordance with one exemplary embodiment, the maximum rate at which the incisors move may be configured to be approximately 0.25 mm/stage, and the maximum rate at which the remaining teeth move may be configured to be approximately 0.33 mm/stage. However, similar to above, these maximum and/or selected rates are capable of being higher or lower depending upon the patient's comfort level and/or tolerance for pain.

[0076] As referenced above, in cases where teeth may collide with or obstruct one another during movement, the program is configured to suitably stagger, slow down and/or plan-round-tripping for the teeth movement. "Staggering" is the process of delaying one or more teeth from moving one or more stages where it would otherwise move in order to prevent another tooth from colliding with and/or obstructing the path of the delayed tooth. "Slowing down" is the process of having one or more teeth scheduled to move at a rate less than the rate of other teeth, or even stopping using interim key frames, so that collisions and/or obstructions do not occur. "Round-tripping" is the technique of moving a first tooth out of the path of a second tooth, and once the second tooth has moved sufficiently, moving the first tooth back to its previous position before proceeding to a desired final position of that first tooth. Such staggering, slowing down and/or round-tripping can be suitably applied alone or in 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.

[0077] FIG. 8 illustrates an example of the incisors of an "A-shaped" pattern 800 similar to the example of FIG. 4 with the teeth in position 1 (i.e., teeth 8 and 9) being staggered such that they do not collide with the teeth in position 2 (i.e., teeth 7 and 10). In this example, teeth 7 and 10 are scheduled to begin movement in stage 1. In a typical "A-shaped" pattern, teeth 8 and 9 would also begin movement in stage 1. However, if this were performed for the patient of this example, tooth 8 would collide with tooth 7 and/or tooth 9. Likewise, tooth 9 would collide with tooth 8 and/or tooth 10. Thus, tooth 8 is not scheduled to begin moving until a later stage, e.g., stage 2, to prevent such a collision. Furthermore, tooth 9 is likewise not scheduled to begin movement until a later stage, e.g., stage 3, to prevent a collision with tooth 8 and/or tooth 10. By staggering the tooth movement, any

tooth/teeth that may collide with another tooth is moved out of the path of other teeth to prevent any undesired collisions.

[0078] Notably, although the above example of staggering refers to the incisors, staggering techniques may be used to delay the movement of any tooth and/or teeth in order to prevent one or more teeth from colliding. Moreover, the remaining schedule for the other teeth in pattern 800 would be similar to the discussion above with respect to FIG. 4. Furthermore, the above staggering example is with reference to an "A-shaped" pattern, however, the above discussion is equally applicable to an "all-equal" pattern, a "V-shaped" pattern, a "Mid-Line Shift" pattern, and an "M-shaped" pattern.

[0079] In addition to staggering tooth movement, the program also includes the ability to avoid teeth from colliding with and/or obstructing one another utilizing round-tripping techniques, wherein a tooth is positioned of the path of another tooth, and then repositioned or otherwise redirected until a desired final position. In accordance with an exemplary embodiment, the round-tripping process can also include the use of interim key frames that comprise "just-in-time" stops of movement of a selected tooth or teeth for one or more stages.

[0080] FIG. 9 illustrates an example of the incisors of an "A-shaped" pattern 900 similar to the example of FIG. 4 with the teeth in position 2 (i.e., teeth 7 and 10) being moved out of the way of tooth 8 and tooth 9, respectively. Recall in FIG. 4, tooth 7 is scheduled to move 8 stages. In this example, tooth 7 is moved out of the way of tooth 8 for 3 stages (i.e., stages 1 through 3), tooth 8 takes 4 stages to pass through tooth 7's previous position (i.e., stages 4 through 7), tooth 7 is moved back 3 stages to return to its previous position (i.e., stages 8 through 10), and then tooth 7 is moved its originally scheduled 8 stages (i.e., stages 11 through 18) to reach its final position in stage 19.

[0081] Similarly, recall in FIG. 4 that tooth 9 is also scheduled to move 8 stages. In the example of FIG. 9, tooth 10 is moved out of the way of tooth 9 for 2 stages (i.e., stages 1 and 2), tooth 10 takes 4 stages to pass through tooth 10's previous position (i.e., stages 3 through 6), tooth 10 is moved back 2 stages to return to its previous position (i.e., stages 7 and 8), and then tooth 10 is moved its originally scheduled 8 stages (i.e., stages 9 through 16) to reach its final position in stage 17.

[0082] Notably, although the above example of round-tripping refers to the incisors, round-tripping techniques may be used to delay the movement of any tooth and/or teeth in order to prevent one or more teeth from colliding with and/or obstructing one another. Moreover, the remaining schedule for the other teeth in pattern 900 would be similar to the discussion above with respect to FIG. 4. Furthermore, the above round-tripping example is with reference to an "A-shaped" pattern, however, the above discussion is equally applicable to an all-equal pattern, a "V-shaped" pattern, a "Mid-Line Shift" pattern, and an "M-shaped" pattern.

[0083] Another technique utilized to avoid teeth from colliding with and/or obstructing one another is to slow the rate of movement of one or more teeth. As discussed above, the teeth ideally move at a maximum rate for each stage to reduce the overall number of stages of the treatment. When it is appropriate, one or more teeth can be scheduled to move at a rate less than the maximum rate, while other teeth can move at a constant and/or increased rate, so that collisions and/or obstructions do not occur. In addition to decreasing the rate of movement, the slow down process can also include the use of interim key frames that comprise "just-in-time" stops of movement of a selected tooth or teeth for one or more stages.

[0084] For example, FIGs. 10A and 10B shows an example of varying rates of movement for the teeth, such as for the over-crowding of teeth using a V-shaped pattern as illustrated in FIG. 5. In this example, tooth 7 initially moves at a rate of0.23mm for each of stages 12 through 21, and then is slowed down to a rate of 0.16 mm for each of stages 22 through 27, then further slowed down to 0.15 mm for each of stages 28 through 31. Furthermore, the rate of movement for tooth 8 initially moves at a rate of 0.22mm for 12 and 13, then sped up to a rate of 0.23 for each of stages 14 through 23, and then is further sped up to 0.24 mm for stages 24-31, before being slowed to 0.21 mm for each of stages 32 and 33. Thus, tooth 7 is slowed to a rate in which it will not collide and/or obstruct the movement of tooth 8 and/or other teeth during the tooth movement treatment.

[0085] Similarly, tooth 9 is scheduled to move at its maximum rate of 0.09 mm per stages for each of stages 12 and 13, then slightly sped up to 0.10 mm per stage for each of stages 14 through 27. Next, an interim key frame is applied through stages 28-31 of tooth 9 to stop all movement of tooth 9, before being increased back to a speed of 0.12 mm per stages for each of stages 32 and 33. Thus, tooth 9 is slowed to a rate in which it will not collide and/or obstruct the movement of tooth 8 and/or other teeth during the tooth movement treatment.

[0086] In this example, certain of the teeth, e.g., teeth 3, 4, 5, 6, 8, 10 and 11 can be configured to move proximate their maximum rate per stage for each of their respective stages of movement, with very slight increases and/or decreases in speed along the way since these teeth will not collide or obstruct one another during tooth movement. One the other hand, the rates of movement of teeth 7, 10 and 8 (using an interim key frame) are slowed to avoid such collisions.

[0087] FIG. 11 is a flow diagram of one exemplary embodiment of a method 1100 to stage the movement of one or more teeth in accordance with one exemplary embodiment of the invention. Method 1100, in one embodiment, initiates by receiving an electronic representation of a patient's teeth in their initial positions (step 1110). Furthermore, method 1100 includes the step of receiving an electronic representation of the· patient's teeth in a desired final position (step 1120).

[0088] In one exemplary embodiment of the invention, method 1100 includes the step of determining a schedule in which each tooth will move (step 1130). In accordance with an aspect of an exemplary embodiment, step 1130 includes the step of determining a route for each of the patient's teeth (step 1140). In another aspect of the invention, step 1130 includes the step of determining a rate each tooth will move (step 1150). Step 1130, in yet another aspect of the invention, includes the step of determining a distance each tooth will need to travel to reach its final position (step 1160).

[0089] Method 1100, in another exemplary embodiment of the invention, includes determining the optimum number of stages for a patient's treatment (step 1170). The optimum number of stages, in one embodiment, is determined based upon the determinations of step 1130 through step 1170. Furthermore, step 1170 includes factoring any staggering, slowing down/interim key framing, and/or round-tripping needed to place the patient's teeth in their desired final position. For example, in FIGS 3-9 the optimum number of stages needed for these respective examples factored in the type of pattern needed, the rate, the path, the distance, staggering, slowing down/interim key framing, and/or round-tripping in determining the optimum number of stages for treating the patient's teeth. As one skilled in the art will recognize, the optimum number of stages will likely differ from patient to patient.

[0090] In one exemplary embodiment, determining the optimum number of stages includes determining the minimum number of stages needed for each respective tooth to be placed in its final, desired position. In another exemplary embodiment, the optimum number of stages is the largest number of the minimum stages needed to place the patient's teeth in their final, desired position. For example, a patient has three teeth that need to be moved during treatment, wherein the first tooth needs 4 stages to move to its final position, the second tooth needs 9 stages to move to its final position, and the third tooth needs 6 stages to move to its final position. Assuming each of these teeth is scheduled to begin moving at the same stage, the optimum number of stages is 9 since this is the minimum number of stages needed to place all of the teeth in their final position.

[0091] Benefits, other advantages, and solutions to problems have been described herein with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as critical, required, or essential features or elements of any or all the claims or the invention. The scope of the present invention is accordingly to be limited by nothing other than the appended claims, in which reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." All structural, chemical, and

functional equivalents to the elements of the above-described exemplary embodiments that are known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the present claims.

ClearCorrect Exhibit 1002, Page 26 of 391

CLAIMS

WHAT IS CLAIMED IS:

1. A method comprising:

selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

2. The method of claim 1, wherein the movement pattern is selected by a user.

3. The method of claim 1, wherein the selecting comprises analyzing, by a computer processor, the dental objects in their respective initial and final positions.

4. The method of claim 3, wherein the analyzing comprises determining, by a computer processor, a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

5. The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping movement of the

first dental object during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved.

6. The method of claim 5, further comprising:

determining, by a computer processor, that the second modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object.

7. The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

8. The method of claim 1, wherein the round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

9. The method of claim 1, wherein the round-tripping comprises:

moving the first dental object away from the respective path of the second dental object; and

moving the first dental object toward its previous position.

10. 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.

11. The method of claim 10, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

12. A non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial an final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

13. The medium of claim 12, wherein the movement pattern is selected by a user.

14. The medium of claim 12, wherein the selecting comprises analyzing the dental objects in their respective initial and final positions.

15. The medium of claim 14, wherein the analyzing comprises determining a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

16. The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping the movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved.

17. The medium of claim 16, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object moved.

18. The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

19. The medium of claim 12, wherein round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

20. The medium of claim 12, wherein round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its previous position.

21. The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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.

22. The medium of claim 21, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

23. A method comprising:

selecting a movement pattern from a plurality of movement patterns for moving the patient's teeth from the initial arrangement toward the final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths;

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object; and

recalculating, by a computer processor after the performing, the respective treatment path for at least one of the dental objects.

24. The method of claim 23, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising:

slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

25. The method of claim 23, 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.

26. The method of claim 25, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

27. A non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving the patient's teeth from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial and final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths;

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object; and

recalculate, after the performing, the respective treatment path for at least one of the dental objects.

28. The medium of claim 27, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising:

slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

29. The medium of claim 27, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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.

30. The medium of claim 29, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

ABSTRACT OF THE DISCLOSURE

Apparatus, system, and methods for utilizing one or more computing devices to stage the movement of teeth during an alignment treatment are disclosed. The computing device receives an electronic representation of the patient's teeth in their initial position and an electronic representation of the teeth a final position for each tooth. A route each tooth will travel to reach its final position is determined, and the teeth are scheduled to move according to a movement pattern. Moreover, the schedule of movement takes into account a maximum rate of tooth movement for each tooth, the path of movement for each tooth, the distance each tooth needs to move, any needed tooth staggering, any needed round-tripping or tooth movement slowing. The invention also includes techniques for determining an optimum number of stages for the treatment based on the schedule of movement.

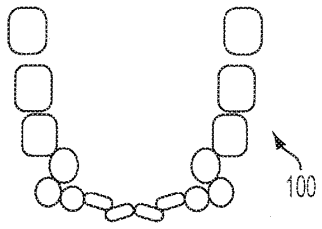


FIG. 1A

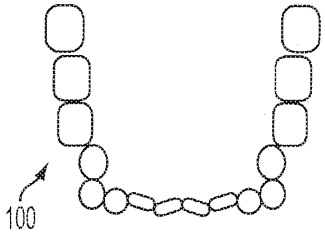


FIG. 1B

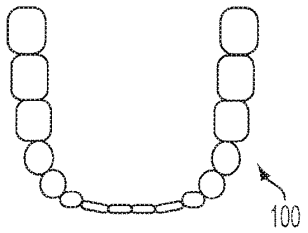


FIG. 1C

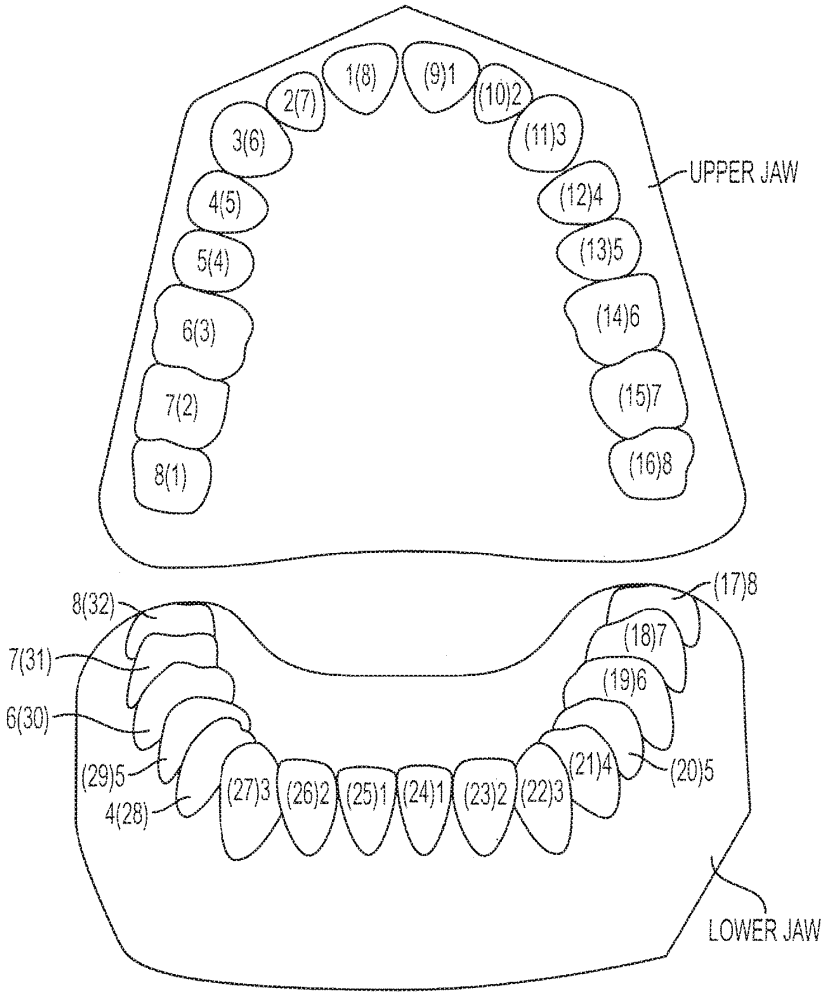

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(15)7
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UPPER JAW
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(18)7
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4(28)
LOWER JAW

FIG. 1D

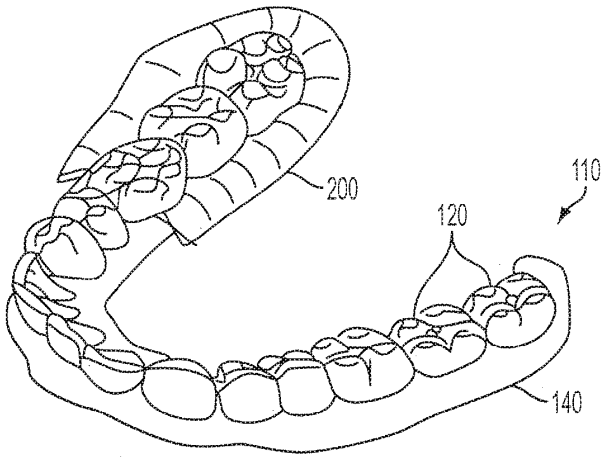


FIG. 2A

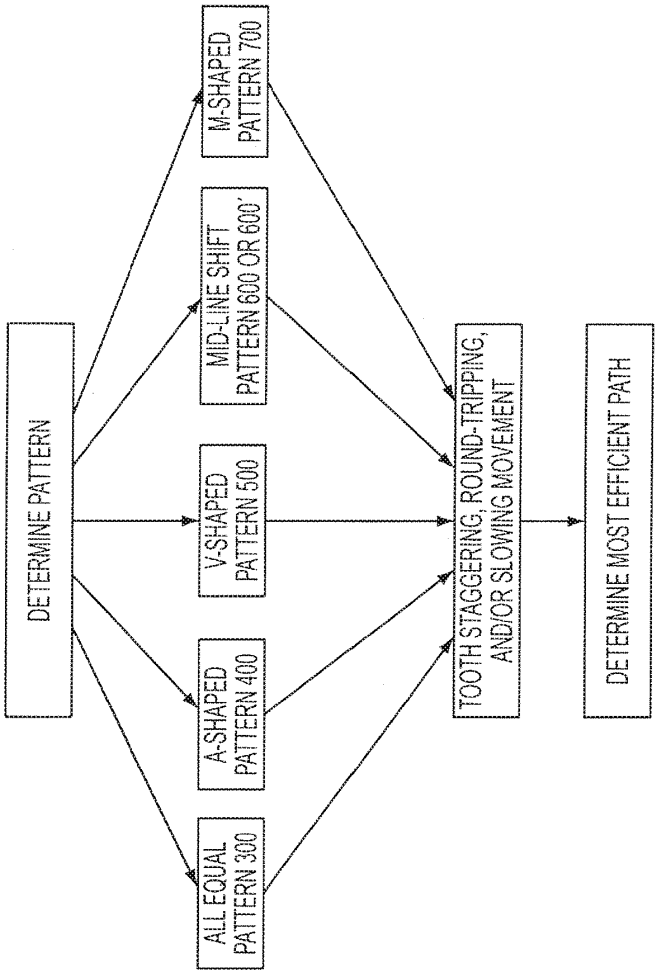

DETERMINE PATTERN
ALL EQUAL PATTERN 300
A-SHAPED PATTERN 400
V-SHAPED PATTERN 500
MID-LINE SHIFT PATTERN 600 OR 600'
M-SHAPED PATTERN 700
TOOTH STAGGERING, ROUND-TRIPPING, AND/OR SLOWING MOVEMENT
DETERMINE MOST EFFICIENT PATH

FIG. 2B

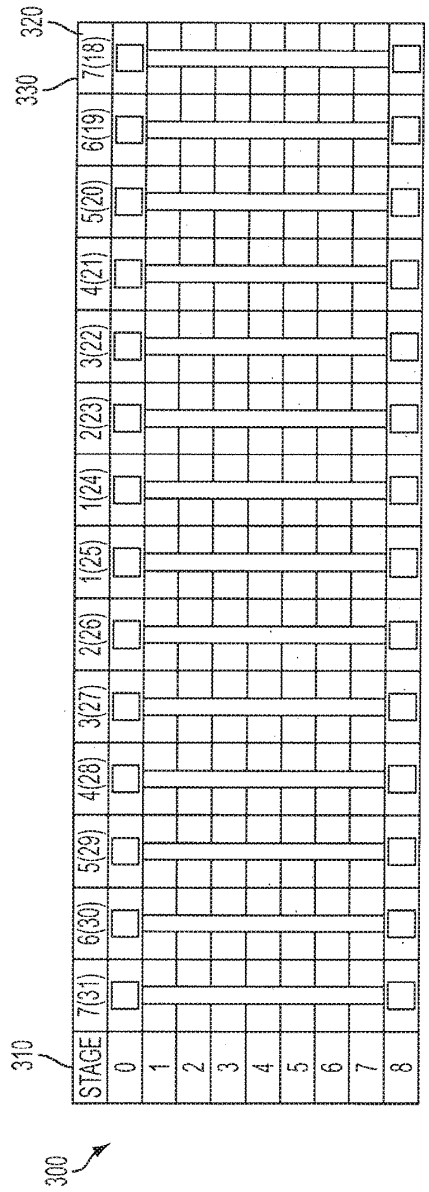

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FIG. 3

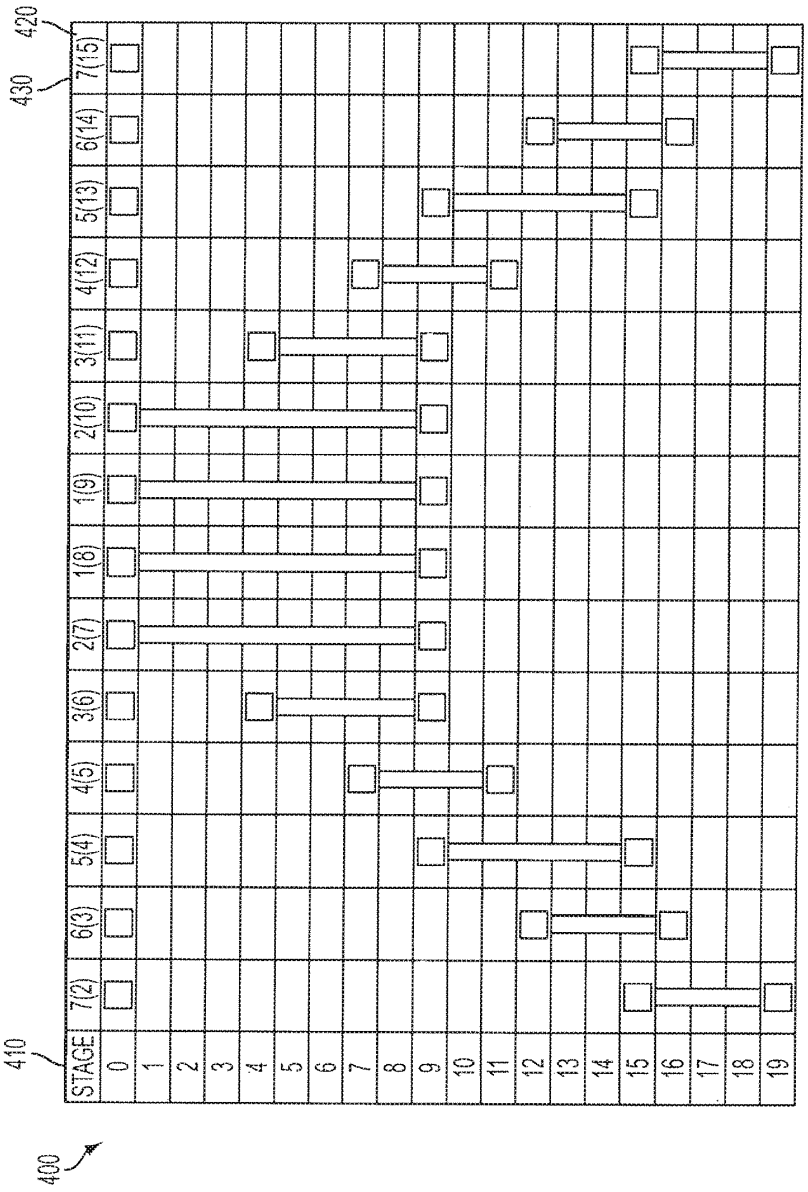

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FIG. 4

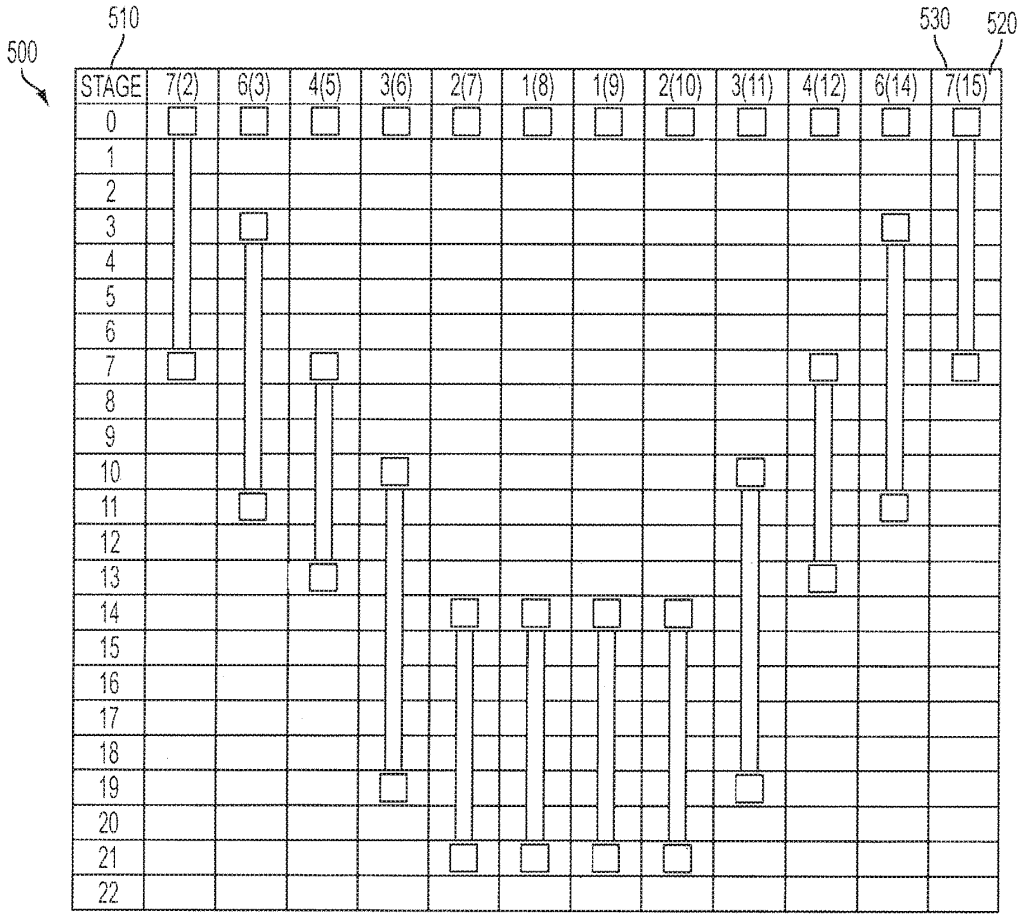

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FIG. 5

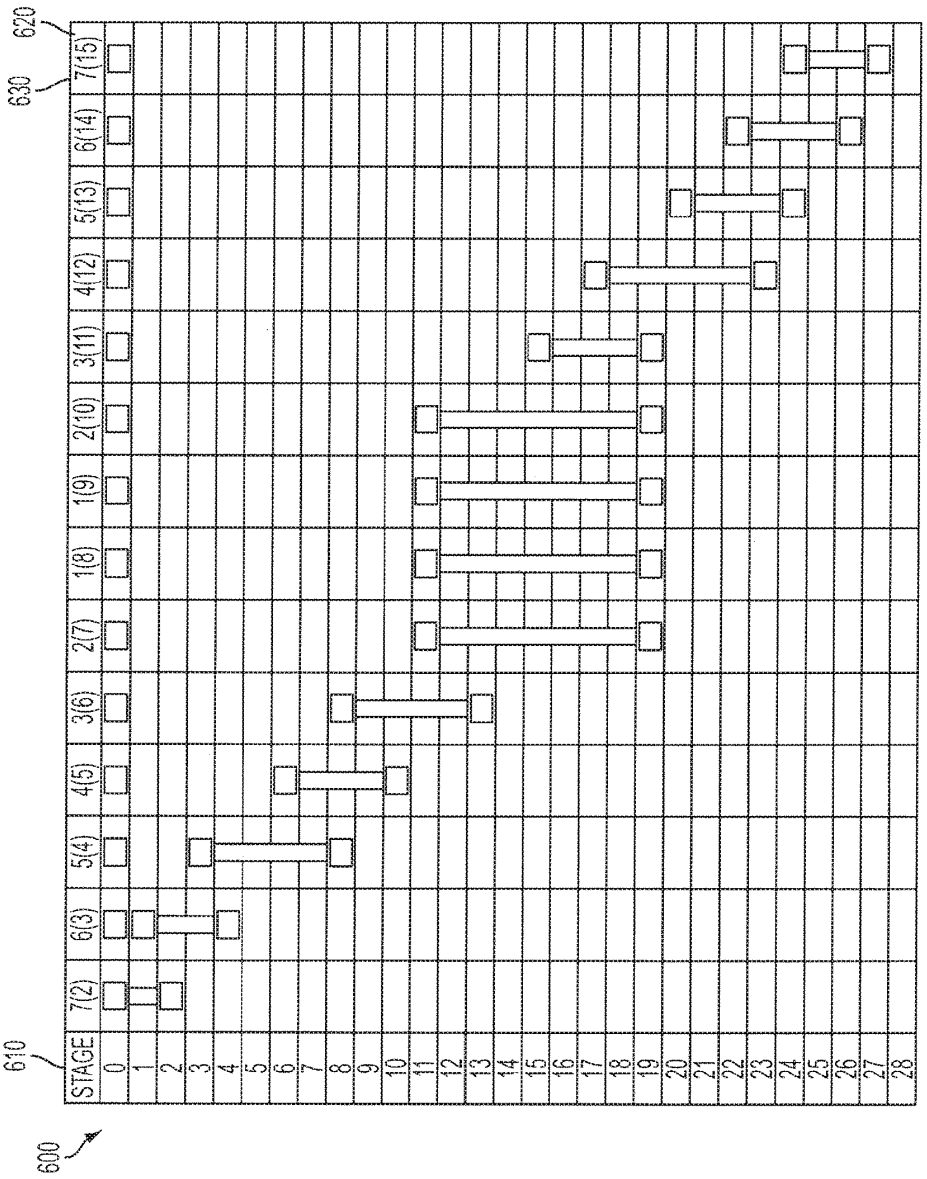

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FIG. 6A

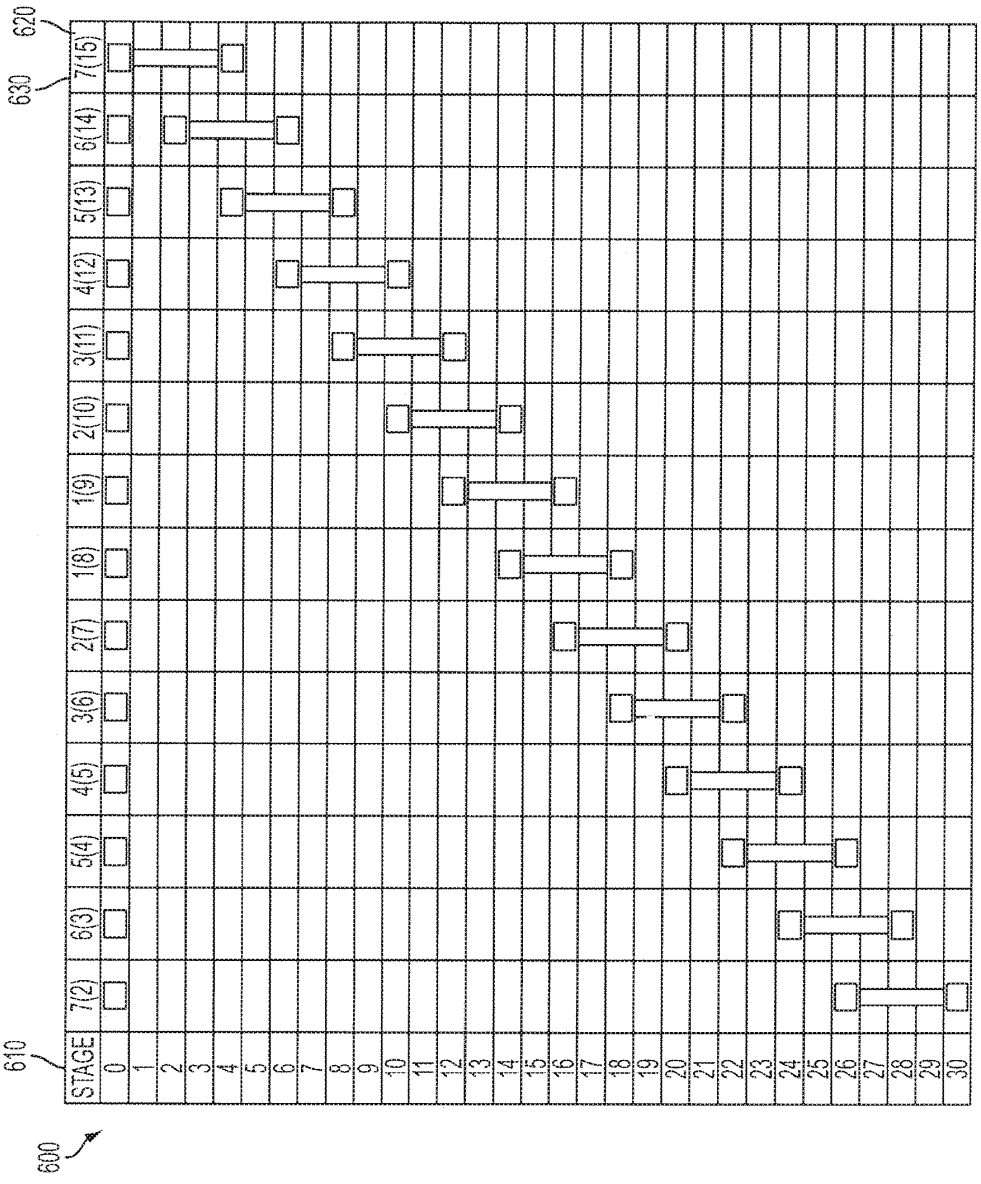

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FIG. 6B

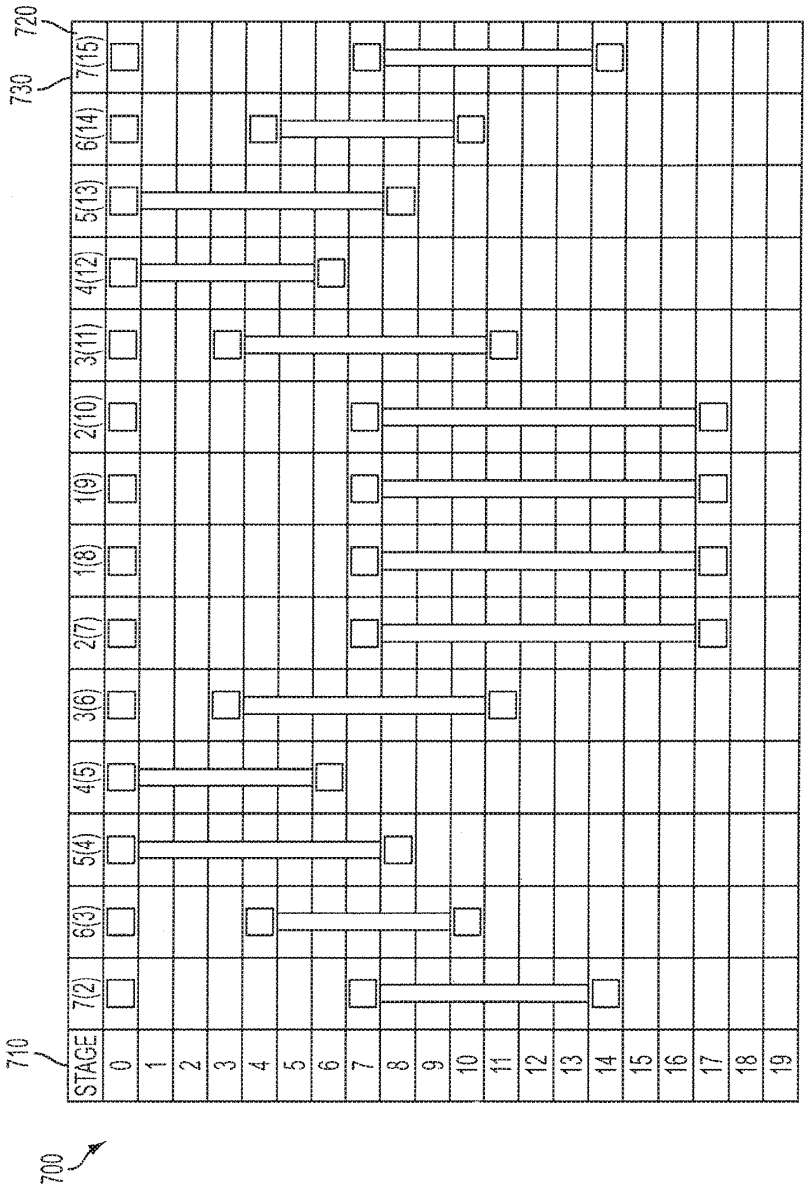

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FIG. 7

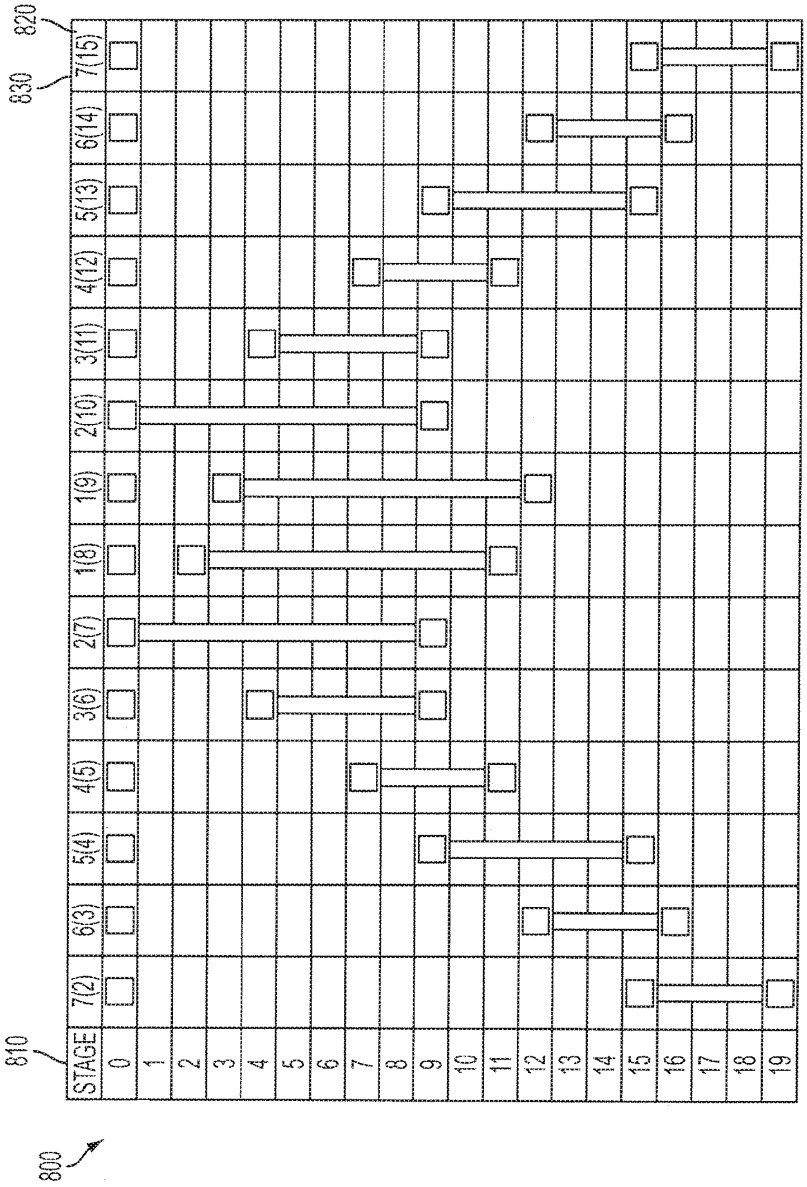

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FIG. 8

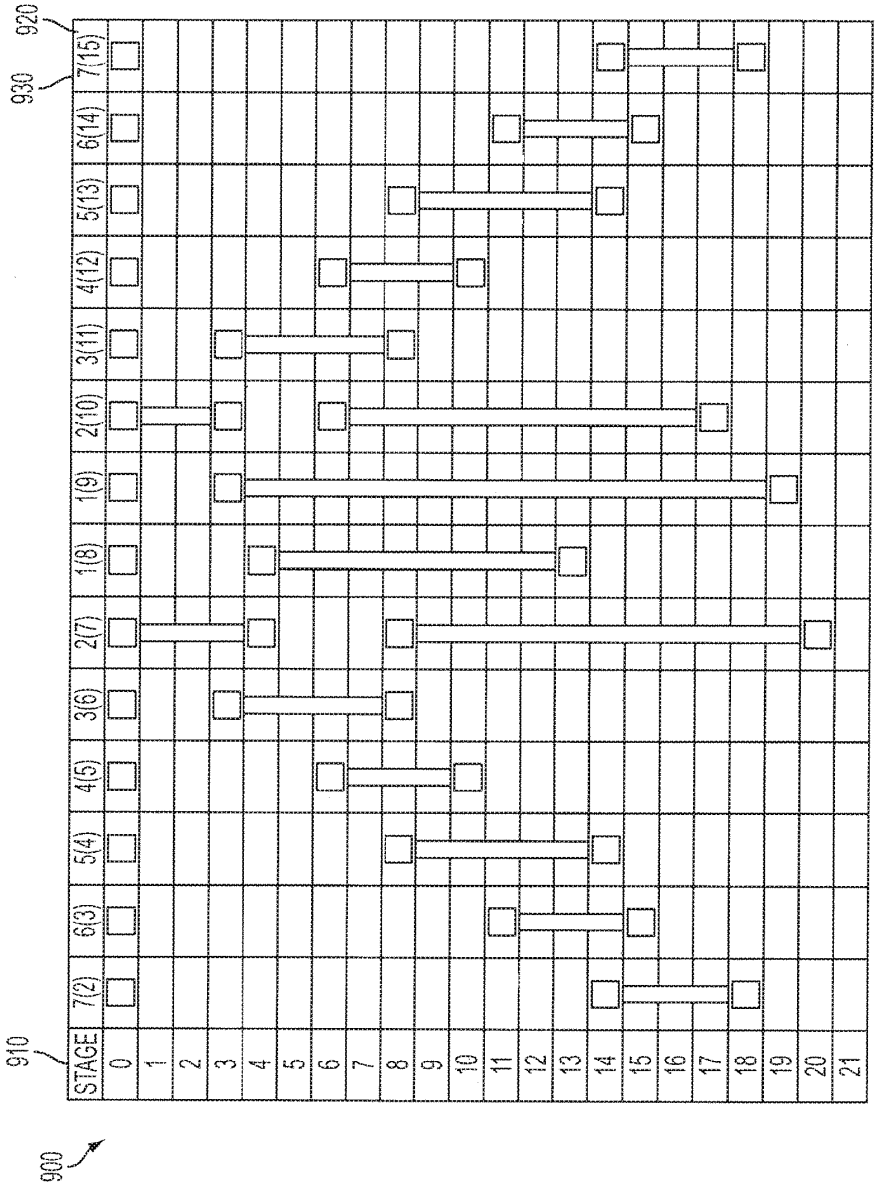

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FIG. 9

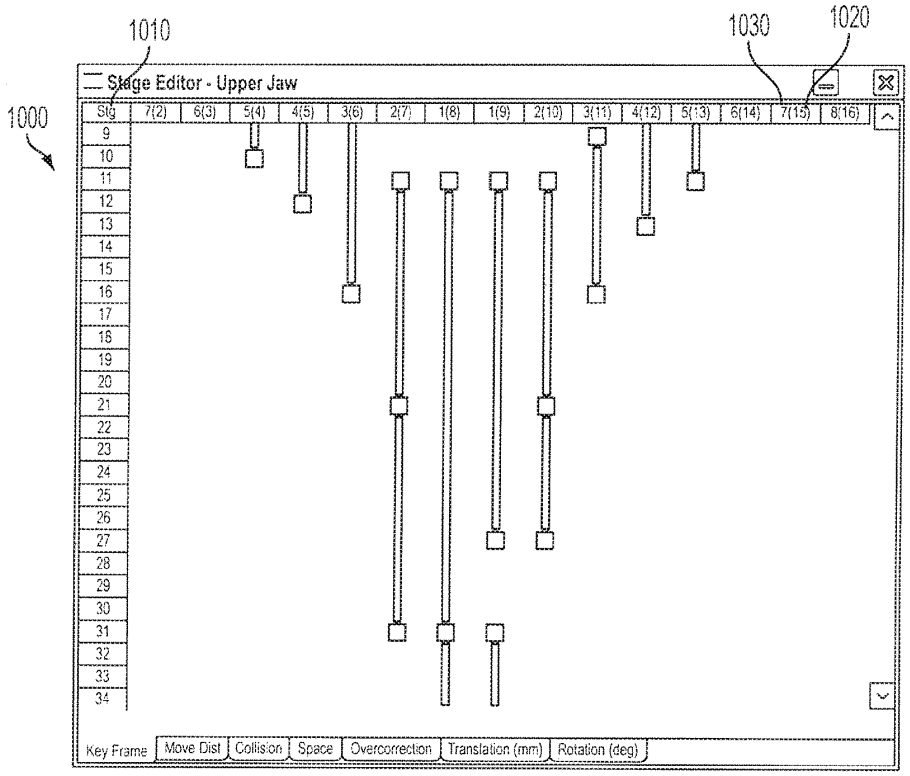

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Stage Editor - Upper Jaw
Stg
7(2)
6(3)
5(4)
4(5)
3(6)
2(7)
1(8)
1(9)
2(10)
3(11)
4(12)
5(13)
6(14)
7(15)
8(16)
9
10
11
12
13
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16
17
18
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22
23
24
25
26
27
28
29
30
31
32
33
34
Key Frame
Move Dist
Collision
Space
Overcorrection
Translation (mm)
Rotation (deg)

FIG. 10A

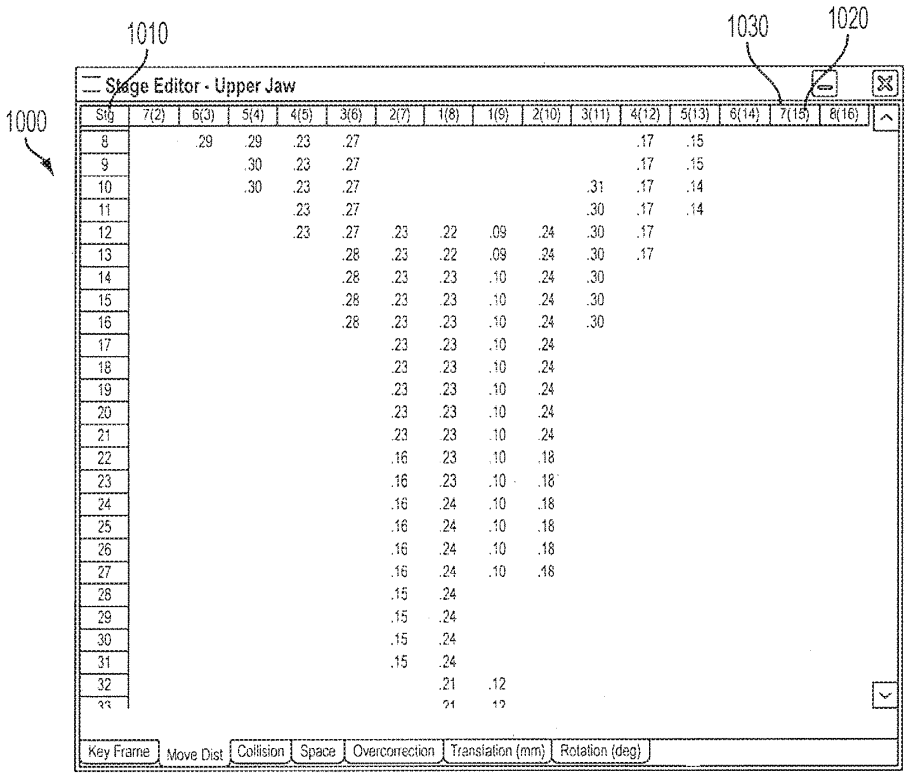

1000
1010
1020
1030
Stage Editor - Upper Jaw
Stg
7(2)
6(3)
5(4)
4(5)
3(6)
2(7)
1(8)
1(9)
2(10)
3(11)
4(12)
5(13)
6(14)
7(15)
8(16)
Key Frame
Move Dist
Collision
Space
Overcorrection
Translation (mm)
Rotation (deg)

FIG. 10B

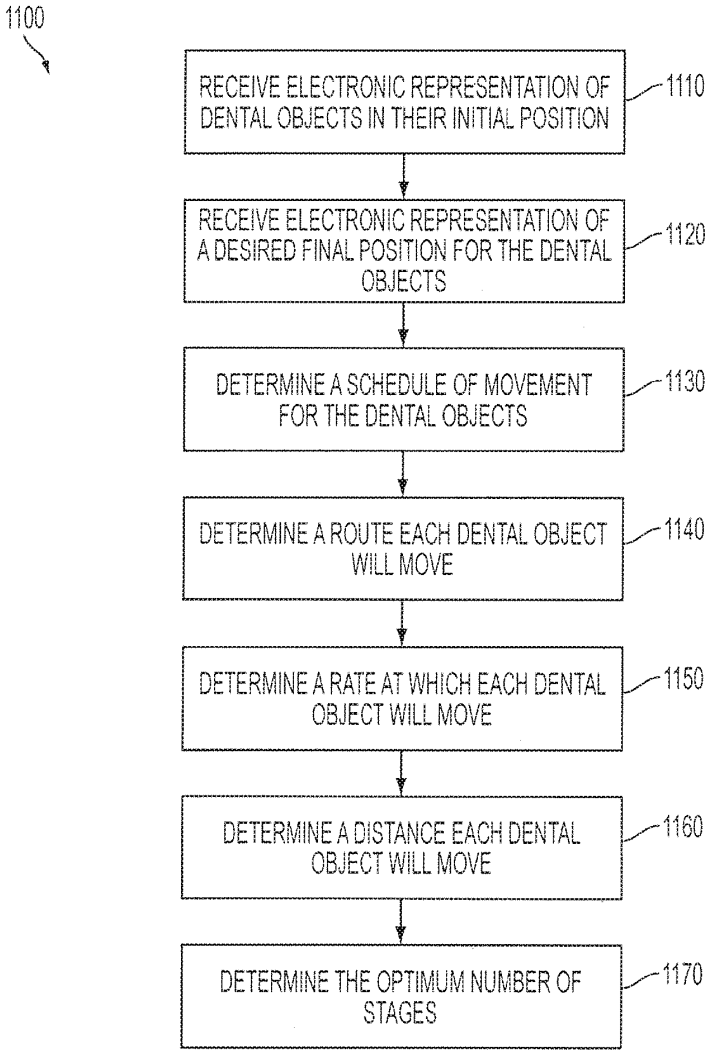

1100
RECEIVE ELECTRONIC REPRESENTATION OF DENTAL OBJECTS IN THEIR INITIAL POSITION
1110
RECEIVE ELECTRONIC REPRESENTATION OF A DESIRED FINAL POSITION FOR THE DENTAL OBJECTS
1120
DETERMINE A SCHEDULE OF MOVEMENT FOR THE DENTAL OBJECTS
1130
DETERMINE A ROUTE EACH DENTAL OBJECT WILL MOVE
1140
DETERMINE A RATE AT WHICH EACH DENTAL OBJECT WILL MOVE
1150
DETERMINE A DISTANCE EACH DENTAL OBJECT WILL MOVE
1160
DETERMINE THE OPTIMUM NUMBER OF STAGES
1170

FIG. 11

Doc code: Oath
Document Description: Oath or declaration filed

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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 15/086,491 filed on Mar 31, 2016.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Ian KITCHING

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Saratoga	CA	US

Mailing Address (except for a deceased or legally incapacitated inventor):

13398 Christie Drive (last known address)

City	State	Zip	Country
Saratoga	CA	95070	US

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

☐ Legal Representative (for deceased or legally incapacitated inventor only),

☒ Assignee,

☐ Person to whom the inventor is under an obligation to assign,

☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or

☐ Joint Inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
- ☐ Inventor is under legal incapacity,
- ■ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ■ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: David M. Mason	Date (Optional):

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: Align Technology, Inc.

Title of Person Executing This Substitute Statement: Sr. Director, Patent Portfolio

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City	State	Country

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

City	State	Zip	Country

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

Doc code: Oath
Document Description: Oath or declaration filed

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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 15/086,491 filed on Mar 31,2016.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Alexander Dmitriev

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Moscow		Russian Federation

Mailing Address (except for a deceased or legally incapacitated inventor):

30-182 Taliskaya Street (last known address)

City	State	Zip	Country
Moscow		123458	Russian Federation

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
- ☐ Inventor is under legal incapacity,
- ■ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ■ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: David M. Mason	Date (Optional):

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: Align Technology, Inc.

Title of Person Executing This Substitute Statement: David M. Mason,Sr. Director, Patent Portfolio

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City	State	Country

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

City	State	Zip	Country

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

Attorney Docket No.: 22773-774.302

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

■ United States application or PCT international application number 15/086,491 filed on March 31, 2016.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Alexey Vishnevskiy Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ian		Kitching	

Residence Information (Select One) ● US Residency ○ Non US Residency ○ Active US Military Service

City	State/Province	Country of Residence
Saratoga	CA	US

Mailing Address of Inventor:

Address 1	13398 Christie Drive
Address 2	

City	State/Province	Postal Code	Country
Saratoga	CA	95070	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Alexander		Dmitriev	

Residence Information (Select One) ○ US Residency ● Non US Residency ○ Active US Military Service

City	Country of Residence
Moscow	RU

Mailing Address of Inventor:

Address 1	30-182 Tallinskaya Street
Address 2	

City	State/Province	Postal Code	Country
Moscow		123458	RU

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Alexey		Vishnevskiy	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Residence Information (Select One) ○ US Residency ◉ Non US Residency Active US Military Service

City	Moscow	Country of Residence [i]	RU

Mailing Address of Inventor:

Address 1	44-2-41 Michurinskiy Prospekt		
Address 2			
City	Moscow	**State/Province**	
Postal Code	119192	**Country** [i]	RU

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	107046		
Email Address	patentdocket@wsgr.com	Add Email	Remove Email

Application Information:

Title of the Invention	AUTOMATED TREATMENT STAGING FOR TEETH		
Attorney Docket Number	22773-774.304	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	15	**Suggested Figure for Publication (if any)**	2B

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country [i]

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	**Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	107046		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15086491	2016-03-31

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15086491	Continuation of	13209276	2011-08-12	9326830	2016-05-03

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13209276	Continuation of	11848172	2007-08-30	8038444	2011-10-18

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11848172	Claims benefit of provisional	60824022	2006-08-30

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11848172	Claims benefit of provisional	60824024	2006-08-30
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	ALIGN TECHNOLOGY, INC.		
Mailing Address Information For Applicant:			
Address 1	2820 Orchard Parkway		
Address 2			
City	San Jose	**State/Province**	CA
Country	US	Postal Code	95134
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Charles Hagadorn, III/			Date (YYYY-MM-DD)	2017-12-07
First Name	Charles	Last Name	Hagadorn, III	Registration Number	62367

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	22773-774.304
	Application Number	
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Ian Kitching	Nonprovisional Application Number (if known):	
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Charles Hagadorn, III/	Date 2017-12-07
Name (Print/Typed) Charles Hagadorn, III	Practitioner Registration Number 62367

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☐ *Total of _____ forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian 22773-774.304 KITCHING
Filer:	Charles C. Hagadorn III/Kevin Chance
Attorney Docket Number:	
Filed as Large Entity	

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	10	80	800
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	420	420

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous-Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6960**

Electronic Acknowledgement Receipt	
EFS ID:	31159738
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian 22773-774.304 KITCHING
Customer Number:	107046
Filer:	Charles C. Hagadorn III/Kevin Chance
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	
Receipt Date:	07-DEC-2017
Filing Date:	
Time Stamp:	14:51:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$6960
RAM confirmation Number	120817INTEFSW00002661232415
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	22773-774-304_UtilityTransmittal.PDF	289419 470c3a2355df946e786cdea18ca11f2e35f97774	no	2
Warnings:					
Information:					
2	Transmittal Letter	22773-774-304_FeeTransmittal.PDF	269793 a0072909390403201277328c387fb3c586a726d9	no	2
Warnings:					
Information:					
3		22773-774-304_Spec.pdf	159929 380724af45ffc8f529419d3375d03d1bf8807161	yes	29

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	21
Claims	22	28
Abstract	29	29

Warnings:					
Information:					
4	Drawings-only black and white line drawings	22773-774-304_Drawings.PDF	1260485 61b1a2f96cab8b93f33f9257657d62f83aca39c1	no	15
Warnings:					
Information:					
5	Oath or Declaration filed	22773-774-304_Declarations_from302.PDF	865598 130a1d9f1ec67788b34b51127884f78afe983d91	no	5

Warnings:					
Information:					
6	Application Data Sheet	22773-774-304_ADS.PDF	1866462 0106046817bc87d57e6b1827763e5fc742fbb759	no	9
Warnings:					
Information:					
7	TrackOne Request	22773-774-304_TrackOneRequest.PDF	141999 3155f6a5c775181bd687635dd7e5ca07bd5975b8	no	2
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	41270 1cb4b9960560bc724201bed106cd2a30014951fd	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4894955		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/80 (07-17)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 107046

OR

[ ] Practitioner(s) named below (If more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 107046

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: Align Technology, Inc.
2820 Orchard Parkway
San Jose, California 95134

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	Date September 13, 2017
Name Arthur Hsieh	Telephone 408-470-1000
Title VP, Associate General Counsel, Intellectual Property & Licensing	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: ALIGN TECHNOLOGY, INC.

Application No./Patent No.: Unassigned Filed/Issue Date: concurrently herewith

Titled: AUTOMATED TREATMENT STAGING FOR TEETH

ALIGN TECHNOLOGY, INC., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 020039, Frame 0505, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

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STATEMENT UNDER 37 CFR 3.73(c)

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Charles Hagadorn, III/	2017-12-07
Signature	Date
Charles Hagadorn, III	62367
Printed or Typed Name	Title or Registration Number

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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EFS ID:	31159884
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Correspondence Address:	WSGR / Align Technology , Inc. - 650 Page Mill Road - Palo Alto CA 94304 US 650.493.9300 patentdocket@wsgr.com
Filer:	Charles C. Hagadorn III/Kevin Chance
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	22773-774.304
Receipt Date:	07-DEC-2017
Filing Date:	
Time Stamp:	14:55:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	AlignPOA_AIA.PDF	867803 884f31c451370b770d70f855ef8f919c1a156a19	no	1
Warnings:					
Information:					
2	Assignee showing of ownership per 37 CFR 3.73	22773-774-304_StatementUnder373c.PDF	131498 1f0ba2d5b96c6c1bed1d283f7c9b99f25cc42e7b	no	3
Warnings:					
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		Total Files Size (in bytes):	999301		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	001	US-RE35169	03-05-1996	LEMCHEN; Marc S. et al.	
	002	US-2467432	04-19-1949	KESLING; Harold D.	
	003	US-3407500	10-29-1968	KESLING; Peter C.	
	004	US-3600808	08-24-1971	JAMES; Jackson Reeve	
	005	US-3660900	05-09-1972	LAWRENCE; F. Andrews	
	006	US-3683502	08-15-1972	MELVIN; Wallshein	
	007	US-3738005	06-12-1973	COHEN; Mus et al.	
	008	US-3860803	01-14-1975	LEVINE; Richard Carl	
	009	US-3916526	11-04-1975	SCHUDY; Fred Frank	
	010	US-3922786	12-02-1975	LAVIN; Joseph L.	
	011	US-3950851	04-20-1976	BERGERSEN; Earl O.	
	012	US-3983628	10-05-1976	ACEVEDO; Raul	
	013	US-4014096	03-29-1977	DELLINGER; Eugene L.	
	014	US-4195046	03-25-1980	KESLING; Peter C.	
	015	US-4253828	03-03-1981	COLES; Donna C. et al.	
	016	US-4324546	04-13-1982	HEITLINGER; Paul et al.	
	017	US-4324547	04-13-1982	ARCAN; Mircea et al.	
	018	US-4348178	09-07-1982	KURZ; Craven H.	
	019	US-4478580	10-23-1984	BARRUT; Luc P.	
	020	US-4500294	02-19-1985	LEWIS; William D.	
	021	US-4504225	03-12-1985	YOSHII; Osamu	
	022	US-4505673	03-19-1985	YOSHII; Osamu	

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First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	023	US-4526540	07-02-1985	DELLINGER; Eugene L.	
	024	US-4575330	03-11-1986	HULL; Charles W.	
	025	US-4575805	03-11-1986	MOERMANN; Werner H. et al.	
	026	US-4591341	05-27-1986	ANDREWS; Lawrence F.	
	027	US-4609349	09-02-1986	CAIN; Steve B.	
	028	US-4611288	09-09-1986	DURET; Francois et al.	
	029	US-4656860	04-14-1987	ORTHUBER; Wolfgang et al.	
	030	US-4663720	05-05-1987	DURET; Francois et al.	
	031	US-4664626	05-12-1987	KESLING; Peter C.	
	032	US-4676747	06-30-1987	KESLING; Christopher K.	
	033	US-4742464	05-03-1988	DURET; Francois et al.	
	034	US-4755139	07-05-1988	ABBATTE; Gerard P. et al.	
	035	US-4763791	08-16-1988	HALVERSON; George E. et al.	
	036	US-4793803	12-27-1988	MARTZ; Martin G.	
	037	US-4798534	01-17-1989	BREADS; Peter R.	
	038	US-4836778	06-06-1989	BAUMRIND; Sheldon et al.	
	039	US-4837732	06-06-1989	BRANDESTINI; Marco et al.	
	040	US-4850864	07-25-1989	DIAMOND; Michael K.	
	041	US-4850865	07-25-1989	NAPOLITANO; John R.	
	042	US-4856991	08-15-1989	BREADS; Peter R. et al.	

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Sheet 3 of 30

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First Named Inventor	KITCHING; Ian
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Examiner Name	Not yet assigned
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U. S. PATENT DOCUMENTS

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	043	US-4877398	10-31-1989	KESLING; Peter C.	
	044	US-4880380	11-14-1989	MARTZ; Martin G.	
	045	US-4889238	12-26-1989	BATCHELOR; Jay A.	
	046	US-4890608	01-02-1990	STEER; Peter L.	
	047	US-4935635	06-19-1990	O'HARRA; Dale G.	
	048	US-4936862	06-26-1990	WALKER; Peter S. et al.	
	049	US-4937928	07-03-1990	VAN DER ZEL; Joseph M.	
	050	US-4941826	07-17-1990	LORAN; William et al.	
	051	US-4964770	10-23-1990	STEINBICHLER; Hans et al.	
	052	US-4975052	12-04-1990	SPENCER; William et al.	
	053	US-4983334	01-08-1991	ADELL; Loren S.	
	054	US-5011405	04-30-1991	LEMCHEN; Marc S.	
	055	US-5017133	05-21-1991	MIURA; Fujio	
	056	US-5027281	06-25-1991	REKOW; Elizabeth D. et al.	
	057	US-5035613	07-30-1991	BREADS; Peter R. et al.	
	058	US-5055039	10-08-1991	ABBATTE; Gerard P. et al.	
	059	US-5059118	10-22-1991	BREADS; Peter R. et al.	
	060	US-5100316	03-31-1992	WILDMAN; Alexander J.	
	061	US-5121333	06-09-1992	RILEY; Donald R. et al.	
	062	US-5125832	06-30-1992	KESLING; Peter C.	
	063	US-5128870	07-07-1992	ERDMAN; Arthur G. et al.	
	064	US-5130064	07-14-1992	SMALLEY; Dennis R. et al.	

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 4 of 30

Complete if Known	
Application Number	15834608
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First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	065	US-5131843	07-21-1992	HILGERS; James J. et al.	
	066	US-5131844	07-21-1992	MARINACCIO; Paul J. et al.	
	067	US-5139419	08-18-1992	ANDREIKO; Craig A. et al.	
	068	US-5145364	09-08-1992	MARTZ; Martin G. et al.	
	069	US-5176517	01-05-1993	TRUAX; Lloyd H.	
	070	US-5184306	02-02-1993	ERDMAN; Arthur G. et al.	
	071	US-5186623	02-16-1993	BREADS; Peter R. et al.	
	072	US-5257203	10-26-1993	RILEY; Donald R. et al.	
	073	US-5273429	12-28-1993	REKOW; Dianne et al.	
	074	US-5278756	01-11-1994	LEMCHEN; Marc S. et al.	
	075	US-5328362	07-12-1994	WATSON; Sherman L. et al.	
	076	US-5338198	08-16-1994	WU; Chuang-Jy et al.	
	077	US-5340309	08-23-1994	ROBERTSON; James G.	
	078	US-5342202	08-30-1994	DESHAYES; Marie-Josephe	
	079	US-5368478	11-29-1994	ANDREIKO; Craig A. et al.	
	080	US-5382164	01-17-1995	STERN; Sylvan S.	
	081	US-5395238	03-07-1995	ANDREIKO; Craig A. et al.	
	082	US-5431562	07-11-1995	ANDREIKO; Craig A. et al.	
	083	US-5440326	08-08-1995	QUINN; Thomas J.	
	084	US-5440496	08-08-1995	ANDERSSON; Matts et al.	
	085	US-5447432	09-05-1995	ANDREIKO; Craig A. et al.	
	086	US-5452219	09-19-1995	DEHOFF; Barry D. et al.	

Examiner Signature		Date Considered	

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Sheet | 5 | of | 30

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	087	US-5454717	10-03-1995	ANDREIKO; Craig A. et al.	
	088	US-5456600	10-10-1995	ANDREIKO; Craig A. et al.	
	089	US-5474448	12-12-1995	ANDREIKO; Craig A. et al.	
	090	US-5518397	05-21-1996	ANDREIKO; Craig A. et al.	
	091	US-5528735	06-18-1996	STRASNICK; Steven L. et al.	
	092	US-5533895	07-09-1996	ANDREIKO; Craig A. et al.	
	093	US-5542842	08-06-1996	ANDREIKO; Craig A. et al.	
	094	US-5549476	08-27-1996	STERN; Sylvan S.	
	095	US-5562448	10-08-1996	MUSHABAC; David R.	
	096	US-5587912	12-24-1996	ANDERSSON; Matts et al.	
	097	US-5605459	02-25-1997	KURODA; Takayuki et al.	
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	099	US-5614075	03-25-1997	ANDRE SR., LARRY E.	
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	103	US-5655653	08-12-1997	CHESTER; Bruce E.	
	104	US-5683243	11-04-1997	ANDREIKO; Craig A. et al.	
	105	US-5692894	12-02-1997	SCHWARTZ; Dann A. et al.	
	106	US-5725376	03-10-1998	POIRIER; Michel	
	107	US-5725378	03-10-1998	WANG; Hong-Chi	

Examiner Signature		Date Considered	

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Sheet 6 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	108	US-5733126	03-31-1998	ANDERSSON; Matts et al.	
	109	US-5740267	04-14-1998	ECHERER; Scott J. et al.	
	110	US-5742700	04-21-1998	YOON; Douglas C. et al.	
	111	US-5799100	08-25-1998	CLARKE; Laurence P. et al.	
	112	US-5800174	09-01-1998	ANDERSSON; Matts	
	113	US-5823778	10-20-1998	SCHMITT; Stephen M. et al.	
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	119	US-5880962	03-09-1999	ANDERSSON; Matts et al.	
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	121	US-5957686	09-28-1999	ANTHONY; Wayne L.	
	122	US-5964587	10-12-1999	SATO; Mikio	
	123	US-5971754	10-26-1999	SONDHI; Anoop et al.	
	124	US-5975893	11-02-1999	CHISHTI; Muhammad et al.	
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	126	US-6044309	03-28-2000	HONDA; Kenichi	
	127	US-6049743	04-11-2000	BABA; Masami	
	128	US-6062861	05-16-2000	ANDERSSON; Matts	

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Sheet 7 of 30

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First Named Inventor	KITCHING; Ian
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	129	US-6068482	05-30-2000	SNOW; Michael Desmond	
	130	US-6099314	08-08-2000	KOPELMAN; Avi et al.	
	131	US-6123544	09-26-2000	CLEARY; James D.	
	132	US-6152731	11-28-2000	JORDAN; Russell A. et al.	
	133	US-6183248	02-06-2001	CHISHTI; Muhammad et al.	
	134	US-6190165	02-20-2001	ANDREIKO; Craig A. et al.	
	135	US-6217325	04-17-2001	CHISHTI; Muhammad et al.	
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	137	US-6244861	06-12-2001	ANDREIKO; Craig A. et al.	
	138	US-6309215	10-30-2001	PHAN; Loc X. et al.	
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	141	US-6322359	11-27-2001	JORDAN; Russell A. et al.	
	142	US-6350120	02-26-2002	SACHDEVA; Rohit et al.	
	143	US-6382975	05-07-2002	POIRIER; Michel	
	144	US-6398548	06-04-2002	MUHAMMAD; Chishti et al.	
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	146	US-6409504	06-25-2002	JONES; Timothy N. et al.	
	147	US-6471511	10-29-2002	CHISHTI; Muhammad et al.	
	148	US-6482298	11-19-2002	BHATNAGAR; Parijat	
	149	US-6514074	02-04-2003	CHISHTI; Muhammad et al.	

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Sheet 8 of 30

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Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	150	US-6524101	02-25-2003	PHAN; Loc X. et al.	
	151	US-6554611	04-29-2003	CHISHTI; Muhammad et al.	
	152	US-6572372	06-03-2003	PHAN; Loc X. et al.	
	153	US-6629840	10-07-2003	CHISHTI; Muhammad et al.	
	154	US-6682346	01-27-2004	CHISHTI; Muhammad et al.	
	155	US-6705863	03-16-2004	PHAN; Loc X. et al.	
	156	US-6722880	04-20-2004	CHISHTI; Muhammad et al.	
	157	US-6729876	05-04-2004	MUHAMMAD; Chishti et al.	
	158	US-7063532	06-20-2006	JONES; Timothy N. et al.	
	159	US-7331783	02-19-2008	CHISHTI; Muhammad et al.	
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	161	US-7435083	10-14-2008	CHISHTI; Muhammad et al.	
	162	US-7578674	08-25-2009	CHISHTI; Muhammad et al.	
	163	US-7637740	12-29-2009	KNOPP; Peter G.	
	164	US-7658610	02-09-2010	KNOPP; Peter G.	
	165	US-7819659	10-26-2010	WEN; Huafeng	
	166	US-7844356	11-30-2010	MATOV; Vadim et al.	
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	170	US-9326830	05-03-2016	KITCHING; Ian et al.	

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Sheet 9 of 30

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Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	171	US-20020006597	01-17-2002	ANDREIKO; Craig A. et al.	
	172	US-20030009252	01-09-2003	PAVLOVSKAIA; Elena et al.	
	173	US-20030139834	07-24-2003	NIKOLSKIY; Sergey et al.	
	174	US-20030224311	12-04-2003	CRONAUER; Edward A.	
	175	US-20040128010	07-01-2004	PAVLOVSKAIA; Elena et al.	
	176	US-20040137400	07-15-2004	CHISHTI; Muhammad et al.	
	177	US-20050055118	03-10-2005	NIKOLSKIY; Sergey et al.	
	178	US-20060275736	12-07-2006	WEN; Huafeng et al.	
	179	US-20120035901	02-09-2012	KITCHING; Ian et al.	
	180	US-20160206402-A1	07-21-2016	IAN; Kitching et al.	

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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	001	AU-3031677-A	05-10-1979	SUYEHIRO H.		☐
	002	AU-517102-B2	07-09-1981	HITO SUYEHIRO.		☐
	003	AU-5598894-A	06-08-1994	ORMCO CORP.		☐

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Sheet 10 of 30

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First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
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	004	CA-1121955-A	04-20-1982	SUYEHIRO HITO.		☐
	005	DE-2749802-A1	05-11-1978	SUYEHIRO HITO.		☒
	006	DE-69327661-T2	07-20-2000	ORMCO CORP [US]		☒
	007	EP-0091876-A1	10-19-1983	DURET FRANCOIS [FR], et al.		☒
	008	EP-0299490-A2	01-18-1989	STEINBICHLER HANS [DE]		☒
	009	EP-0376873-A2	07-04-1990	SHAFIR AARON [IL], et al.		☐
	010	EP-0490848-A2	06-17-1992	NOBELPHARMA AB [SE]		☐
	011	EP-0541500-A1	05-12-1993	NOBELPHARMA AB [SE]		☐
	012	EP-0667753-B1	01-19-2000	ORMCO CORP [US]		☐
	013	EP-0731673-B1	05-30-2001	NOBEL BIOCARE AB [SE]		☐

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Sheet 11 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	014	EP-0774933-B1	12-06-2000	SANDVIK AB [SE], et al.		☐
	015	ES-463897-A1	01-01-1980	HITO SUYEHIRO D [US]		☒
	016	FR-2369828-A1	06-02-1978	SUYEHIRO HITO [US]		☒
	017	FR-2652256-A1	03-29-1991	JOURDA GERARD., et al.		☒
	018	GB-1550777-A	08-22-1979	SUYEHIRO H.		☒
	019	JP-H0428359-A	01-30-1992	MITSUBISHI PETROCHEMICAL CO.		☒
	020	JP-H08508174-A	09-03-1996			☒
	021	JP-S5358191-A	05-25-1978			☒
	022	WO-9008512-A1	08-09-1990	DOLPHIN IMAGING SYSTEMS INC [US]		☐
	023	WO-9104713-A1	04-18-1991	JOURDA GERARD [FR], et al.		☒

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Sheet 12 of 30

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First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]–Number[4]–Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	024	WO-9410935-A1	05-26-1994	ORMCO CORP [US]		☐
	025	WO-9832394-A1	07-30-1998	HULTGREN BRUCE WILLARD [US]		☐
	026	WO-9844865-A1	10-15-1998	NOBEL BIOCARE AB [SE], et al.		☐
	027	WO-9858596-A1	12-30-1998	ALIGN TECHNOLOGY INC [US], et al.		☐

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Sheet 13 of 30

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NON-PATENT LITERATURE DOCUMENTS

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	001	AADR. AMERICAN ASSOCIATION FOR DENTAL RESEARCH, Summary of Activities, March 20-23,1980, Los Angeles, CA, p. 195.	☐
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	010	BARTELS, et al., An Introduction to Splines for Use in Computer Graphics and Geometric Modeling, Morgan Kaufmann Publishers, pp. 422-425 (1987).	☐
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	019	BIGGERSTAFF et al., "Computerized Analysis of Occlusion in the Postcanine Dentition," Am. J. Orthod., 61(3): 245-254 (March 1972).	☐
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	029	Cardinal Industrial Finishes, Powder Coatings information posted at< http://www.cardinalpaint.com> on Aug. 25, 2000, 2 pages.	☐
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	039	CURRY et al., "Integrated Three-Dimensional Craniofacial Mapping at the Craniofacial Research Instrumentation Laboratory/University of the Pacific," Semin. Orthod., 7(4):258-265 (December 2001).	☐
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Sheet 20 of 30

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Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

NON-PATENT LITERATURE DOCUMENTS

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	069	HUCKINS, "CAD-CAM Generated Mandibular Model Prototype from MRI Data," AAOMS, p. 96 (1999).	☐
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	090	MCNAMARA et al., Orthodontic and Orthopedic Treatment in the Mixed Dentition, Needham Press, pp. 347-353 (January 1993).	☐
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	100	PONITZ, "Invisible Retainers," Am. J. Orthod., 59(3):266-272 (March 1971).	☐
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	110	REKOW et al., "CAD/CAM for Dental Restorations - Some of the Curious Challenges," IEEE Trans. Biomed. Eng., 38(4):314-318 (April 1991).	☐
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	138	VARADY et al., "Reverse Engineering Of Geometric Models—An Introduction," Computer-Aided Design, 29(4):255-268,1997.	☐

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 27 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T[2]
	139	VERSTREKEN et al., "An Image-Guided Planning System for Endosseous Oral Implants," IEEE Trans. Med. Imaging, 17(5):842-852 (October 1998).	☐
	140	WARUNEK et al., "Physical and Mechanical Properties of Elastomers in Orthodonic Positioners, Am J. Orthod. Dentofac. Orthop, Vol. 95, No. 5, (May 1989) pp. 399-400.	☐
	141	WARUNEK et.al., Clinical Use of Silicone Elastomer Applicances, JCO (1989) XXIII(10):694-700.	☐
	142	WELLS, Application of the Positioner Appliance in Orthodontic Treatment, Am. J. Orthodont. (1970) 58:351-366.	☐
	143	WILLIAMS, "Dentistry and CAD/CAM: Another French Revolution," J. Dent. Practice Admin., pp. 2-5 (January/March 1987).	☐
	144	WILLIAMS, "The Switzerland and Minnesota Developments in CAD/CAM," J. Dent. Practice Admin., pp. 50-55 (April/June 1987.	☐
	145	WISHAN, "New Advances in Personal Computer Applications for Cephalometric Analysis, Growth Prediction, Surgical Treatment Planning and Imaging Processing," Symposium: Computerized Facial Imaging in Oral and Maxilofacial Surgery Presented on September 13,1990.	☐
	146	WSCG'98 - Conference Program, "The Sixth International Conference in Central Europe on Computer Graphics and Visualization '98," February 9-13, 1998, pp. 1-7, retrieved from the Internet on 11/05/2004, URL<http://wscg.zcu.cz/wscg98/wscg98.h>.	☐
	147	XIA et al., "Three-Dimensional Virtual-Reality Surgical Planning and Soft-Tissue Prediction for Orthognathic Surgery," IEEE Trans. Inf. Technol. Biomed., 5(2):97-107 (June 2001).	☐

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 28 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T[2]
	148	YAMAMOTO et al., "Optical Measurement of Dental Cast Profile and Application to Analysis of Three-Dimensional Tooth Movement in Orthodontics," Front. Med. Biol. Eng., 1(2):119-130 (1988).	☐
	149	YAMAMOTO et al., "Three-Dimensional Measurement of Dental Cast Profiles and Its Applications to Orthodontics," Conf. Proc. IEEE Eng. Med. Biol. Soc., 12(5):2051-2053 (1990).	☐
	150	YAMANY et al., "A System for Human Jaw Modeling Using Intra-Oral Images," Proc. of the 20th Annual Conf. of the IEEE Engineering in Medicine and Biology Society, November 1, 1998, Vol. 2, pp. 563-566.	☐
	151	YOSHII, "Research on a New Orthodontic Appliance: The Dynamic Positioner (D.P.); I. The D.P. Concept and Implementation of Transparent Silicone Resin (Orthocon)," Nippon Dental Review, 452:61-74 (June 1980).	☐
	152	YOSHII, "Research on a New Orthodontic Appliance: The Dynamic Positioner (D.P.); II. The D.P. Manufacturing Procedure and Clinical Applications," Nippon Dental Review, 454:107-130 (August 1980).	☐
	153	YOSHII, "Research on a New Orthodontic Appliance: The Dynamic Positioner (D.P.); III. The General Concept of the D.P. Method and Its Therapeutic Effect, Part 1, Dental and Functional Reversed Occlusion Case Reports," Nippon Dental Review, 457:146-164 (November 1980).	☐
	154	YOSHII, "Research on a New Orthodontic Appliance: The Dynamic Positioner (D.P.); III.- The General Concept of the D.P. Method and Its Therapeutic Effect, Part 2. Skeletal Reversed Occlusion Case Reports," Nippon Dental Review, 458:112-129 (December 1980).	☐
	155	You May Be A Candidate For This Invisible No-Braces Treatment," Allesee Orthodontic Appliances-Pro Lab product information for patients, 2 pages (2002).	☐

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 29 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Charles Hagadorn III/	Date (YYYY-MM-DD)	2017-12-14
Name/Print	Charles Hagadorn III	Registration Number	62,367

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt	
EFS ID:	31250234
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Customer Number:	107046
Filer:	John K. Shimmick/Eric Evitt (JSHI)
Filer Authorized By:	John K. Shimmick
Attorney Docket Number:	22773-774.304
Receipt Date:	17-DEC-2017
Filing Date:	
Time Stamp:	18:53:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IDS22773-774-304-12-17-2017.pdf	609980 e1fbefd1c1aeba7a26bba6bb0a1ce68ea827466c	yes	34

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	4
	Information Disclosure Statement (IDS) Form (SB08)	5	34
Warnings:			
Information:			
	Total Files Size (in bytes):	609980	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	KITCHING; Ian et al.	Group Art Unit:	3732
Serial Number:	15/834,608	Examiner:	Not yet assigned
Filing or 371 (c) Date:	2017-12-07	**CONFIRMATION NO:**	**1210**
Title:	AUTOMATED TREATMENT STAGING FOR TEETH		

FILED ELECTRONICALLY ON: December 17, 2017

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.97

Commissioner for Patents:

An Information Disclosure Statement along with attached PTO/SB/08 is hereby submitted. A copy of each listed publication is submitted, if required, pursuant to 37 CFR §§1.97-1.98, as indicated below.

The Examiner is requested to review the information provided and to make the information of record in the above-identified application. The Examiner is further requested to initial and return the attached PTO/SB/08 in accordance with MPEP § 609.

The right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered, is hereby reserved.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, prior art or material to patentability as defined in § 1.56.

A. ☒ *37 CFR § 1.97 (b).* This Information Disclosure Statement should be considered by the Office because:

☐ (1) It is being filed within 3 months of the filing date of a national application and is other than a continued prosecution application under § 1.53 (d);

-- OR --

☐ (2) It is being filed within 3 months of entry of the national stage as set forth in § 1.491 in an international application;

-- OR --

☒ (3) It is being filed before the mailing of a first Office action on the merits;

-- OR --

☐ (4) It is being filed before the mailing of a first Office action after the filing of a request for continued examination under § 1.114.

B. ☐ *37 CFR § 1.97(c).* Although this Information Disclosure Statement is being filed after the period specified in *37 CFR § 1.97(b),* above, it is filed before the mailing date of the earlier of (1) a final office action under § 1.113, (2) a notice of allowance under § 1.311, or (3) an action that otherwise closes prosecution in the application, this Information Disclosure Statement should be considered because it is accompanied by one of:

☐ a statement as specified in §1.97 (e) provided concurrently herewith;

-- OR --

☐ a fee of $180.00 as set forth in § 1.17 (p) authorized below, enclosed, or included with the payment of other papers filed together with this statement.

C. ☐ *37 CFR § 1.97 (d).* Although this Information Disclosure Statement is being filed after the mailing date of the earlier of (1) a final office action under § 1.113, (2) a notice of allowance under § 1.311, or (3) an action that otherwise closes prosecution in the application, it is being filed before payment of the issue fee and should be considered because it is accompanied by:

i. a statement as specified in § 1.97 (e);

-- AND --

ii. a fee of $180.00 as set forth in §1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this Statement.

D. ☐ *37 CFR §1.97 (e).* Statement.

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§ 1.97 (c);

-- AND/OR --

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§ 1.97 (d);

-- AND/OR --

☐ A copy of a dated communication from a foreign patent office clearly showing that the information disclosure statement is being submitted within 3 months of the filing date on the communication is provided in lieu of a statement under 37 C.F.R. § 1.97(e) (1) as provided for under MPEP 609.04(b) V.

E. ☐ *Statement Under 37 C.F.R. §1.704(d).* Each item of information contained in the information disclosure statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office or is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office that was received by an individual designated in § 1.56(c) not more than thirty (30) days prior to the filing of this information disclosure statement. This statement is made pursuant to the requirements of 37 C.F.R. §1.704(d) to avoid reduction of the period of adjustment of the patent term for Applicant(s) delay.

F. ☒ *37 CFR §1.98 (a) (2).* The content of the Information Disclosure Statement is as follows:

☐ Copies of each of the references listed on the attached Form PTO/SB/08 are enclosed herewith.

-- OR --

☒ Copies of U.S. Patent Documents (issued patents and patent publications) listed on the attached Form PTO/SB/08 are not enclosed.

-- AND/OR --

☐ Copies of Foreign Patent Documents and/or Non Patent Literature Documents listed on the attached Form PTO/SB/08 are enclosed in accordance with 37 CFR §1.98 (a)(2).

-- AND/OR --

☐ Copies of pending unpublished U.S. patent applications are enclosed in accordance with 37 CFR §1.98 (a) (2) (iii).

G. ☐ *37 CFR §1.98(a)(3).* The Information Disclosure Statement includes non-English patents and/or references.

☐ Pursuant to 37 CFR §1.98(a)(3)(i), a concise explanation of the relevance of each patent, publication or other information provided that is not in English is provided herewith.

☐ Pursuant to MPEP 609(B), an English language copy of a foreign search report is submitted herewith to satisfy the requirement for a concise explanation where non-English language information is cited in the search report.

-- OR --

☐ A concise explanation of the relevance of each patent, publication or other information provided that is not in English is as follows: _____

☐ Pursuant to 37 CFR §1.98(a) (3) (ii), a copy of a translation, or a portion thereof, of the non-English language reference(s) is provided herewith.

H. ☒ *37 CFR §1.98(d).* Copies of patents, publications and pending U.S. patent applications, or other information specified in 37 C.F.R. § 1.98(a) are not provided herewith because:

☒ Pursuant to 37 CFR §1.98(d)(1) the information was previously submitted in an Information Disclosure Statement, or cited by examiner for another application under which this application claims priority for an earlier effective filing date under 35 U.S.C. 120.

Application in which the information was submitted: 15/086,491.

Information Disclosure Statement(s) filed on: 06-15-2016.

AND

☒ The information disclosure statement submitted in the earlier application complied with paragraphs (a) through (c) of 37 CFR §1.98.

I. ☒ *Fee Authorization*. The Commissioner is hereby authorized to charge the above-referenced fees of $0.00 and charge any additional fees or credit any overpayment associated with this communication to Deposit Account No. 23-2415 (Docket No.22773-774.304).

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI

Dated: December 14, 2017

By: /Charles Hagadorn III/
Charles Hagadorn III
Reg. No. 62,367

650 Page Mill Road
Palo Alto, CA 94304-1050
(650) 493-9300
Customer No. 107046

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/834,608

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	30 minus 20 =	* 10			OR	x 80 =	800
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1				x 420 =	420
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/834,608	12/07/2017	3732	2820	22773-774.304	30	4

CONFIRMATION NO. 1210

107046
WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

FILING RECEIPT

OC000000096331568

Date Mailed: 12/29/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ian Kitching, Saratoga, CA;
Alexander Dmitriev, Moscow, RUSSIAN FEDERATION;
Alexey Vishnevskiy, Moscow, RUSSIAN FEDERATION;

Applicant(s)

ALIGN TECHNOLOGY, INC., San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 107046

Domestic Priority data as claimed by applicant

This application is a CON of 15/086,491 03/31/2016
which is a CON of 13/209,276 08/12/2011 PAT 9326830
which is a CON of 11/848,172 08/30/2007 PAT 8038444
which claims benefit of 60/824,022 08/30/2006
and claims benefit of 60/824,024 08/30/2006

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/27/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/834,608**

Projected Publication Date: 04/05/2018

Non-Publication Request: No

Early Publication Request: No

Title

AUTOMATED TREATMENT STAGING FOR TEETH

Preliminary Class

433

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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To: patentdocket@wsgr.com,,
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Subject: Private PAIR Correspondence Notification for Customer Number 107046

Dec 29, 2017 03:25:09 AM

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650 Page Mill Road
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UNITED STATES

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	APP.FILE.REC	12/29/2017	22773-774.304

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OFFICE OF PETITIONS

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto CA 94304

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/834,608

1. THE REQUEST FILED December 7, 2017 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

U.S. Patent and Trademark Office
PTO-2298 (Rev. 02-2012)

To: patentdocket@wsgr.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 107046

Jan 09, 2018 04:19:07 AM

Dear PAIR Customer:

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	TRACK1.GRANT	01/04/2018	22773-774.304

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 04/05/2018

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3732	

NOTIFICATION DATE	DELIVERY MODE
04/05/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

Office Action Summary	Application No. 15/834,608	Applicant(s) KITCHING ET AL.	
	Examiner MIRAYDA A. APONTE	Art Unit 3732	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7 December 2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-30* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-30* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *7 December 2017* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *17 Dec. 2017*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Element **100** in **Fig. 1A-1C**.

   Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

   > Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. **Claims 1-11** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because claimed invention is not patent eligible subject matter by identifying what the claims are directed to and explain why it does not fall within at least one of the four categories of patent eligible

subject matter recited in 35 U.S.C. 101 (process, machine, manufacture, or composition of matter), e.g. the claimed invention is directed to a judicial exception of an abstract idea without significantly more.

Claims 1-11 are directed to a method including a computer processor. The claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the claimed invention does not include from where the movement pattern from a plurality of movement patterns is the method selecting for moving the dental objects from the initial arrangement toward the final arrangement, what device is used for selecting the movement patter, how and what device is used to input the previous selection of calculating a respective treatment path, identifying a collision and performing a first modification of the schedule of movement. Therefore due to the claims do not include any device that provides any of the claimed steps, it is considered that the claims are directed to an abstract idea of identifying the movement patterns for dental objects from an initial arrangement toward a final arrangement which "is not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving methods of organizing human activity [792 F.3d. at 1367-68, 115 USPQ2d at 1640; *In re Meyer,* 688 F.2d 789, 791-93, 215 USPQ 193, 194-96 (CCPA 1982); *Synopsys, Inc. v. Mentor Graphics Corp.,* 839 F.3d 1138, 120 USPQ2d 1473 (Fed. Cir. 2016); *Electric Power Group, LLC v. Alstom, S.A.,* 830 F.3d 1350, 1351-52, 119 USPQ2d 1739, 1740 (Fed. Cir. 2016)].

4. **Claims 12-22** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because claimed invention is not patent eligible subject matter by identifying what the claims are directed to and explain why it does not fall within at least one of the four categories of patent eligible subject matter recited in 35 U.S.C. 101 (process, machine, manufacture, or composition of matter), e.g. the claimed invention is directed to a judicial exception of an abstract idea without significantly more.

Claims 12-22 are directed to a non-transitory computer-readable medium including instructions executed by one or more computer processors. The claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the claimed invention does not include from where the movement pattern from a plurality of movement patterns is the method selecting for moving the dental objects from the initial arrangement toward the final arrangement, what device is used for selecting the movement patter, how and what device is used to input the previous selection of calculating a respective treatment path, identifying a collision and performing a first modification of the schedule of movement. Therefore due to the claims do not include any device that provides any of the claimed steps, it is considered that the claims are directed to an abstract idea of identifying the movement patterns for dental objects from an initial arrangement toward a final arrangement which "is not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving

methods of organizing human activity [792 F.3d. at 1367-68, 115 USPQ2d at 1640; *In re Meyer,* 688 F.2d 789, 791-93, 215 USPQ 193, 194-96 (CCPA 1982); *Synopsys, Inc. v. Mentor Graphics Corp.,* 839 F.3d 1138, 120 USPQ2d 1473 (Fed. Cir. 2016); *Electric Power Group, LLC v. Alstom, S.A.,* 830 F.3d 1350, 1351-52, 119 USPQ2d 1739, 1740 (Fed. Cir. 2016)].

5. **Claims 23-26** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because claimed invention is not patent eligible subject matter by identifying what the claims are directed to and explain why it does not fall within at least one of the four categories of patent eligible subject matter recited in 35 U.S.C. 101 (process, machine, manufacture, or composition of matter), e.g. the claimed invention is directed to a judicial exception of an abstract idea without significantly more.

   Claims 23-26 are directed to a method including a computer processor. The claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the claimed invention does not include from where the movement pattern from a plurality of movement patterns is the method selecting for moving the dental objects from the initial arrangement toward the final arrangement, how and what device is used to input the previous selection for calculating a respective treatment path, or for identifying a collision and performing a first modification of the respective treatment paths, what device is used for performing the schedule of movement of delaying, slowing or stopping or round-

tripping for the first dental object, and what device is used for recalculating the respective treatment path for at least one of the dental objects. Therefore due to the claims do not include any device that provides any of the claimed steps, it is considered that the claims are directed to an abstract idea of identifying the movement patterns for dental objects from an initial arrangement toward a final arrangement which "is not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving methods of organizing human activity [792 F.3d. at 1367-68, 115 USPQ2d at 1640; *In re Meyer,* 688 F.2d 789, 791-93, 215 USPQ 193, 194-96 (CCPA 1982); *Synopsys, Inc. v. Mentor Graphics Corp.,* 839 F.3d 1138, 120 USPQ2d 1473 (Fed. Cir. 2016); *Electric Power Group, LLC v. Alstom, S.A.,* 830 F.3d 1350, 1351-52, 119 USPQ2d 1739, 1740 (Fed. Cir. 2016)].

6. **Claims 27-30** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because claimed invention is not patent eligible subject matter by identifying what the claims are directed to and explain why it does not fall within at least one of the four categories of patent eligible subject matter recited in 35 U.S.C. 101 (process, machine, manufacture, or composition of matter), e.g. the claimed invention is directed to a judicial exception of an abstract idea without significantly more.

   Claims 27-30 are directed to a non-transitory computer-readable medium including instructions executed by one or more computer processors. The claims do

not include additional elements that are sufficient to amount to significantly more than the judicial exception because the claimed invention does not include from where the movement pattern from a plurality of movement patterns is the method selecting for moving the dental objects from the initial arrangement toward the final arrangement, what device is used for selecting the movement patter, how and what device is used to input the previous selection of calculating a respective treatment path, identifying a collision and performing a first modification of the schedule of movement, and what device is used for recalculate the respective treatment path for at least one of the dental objects, or how and what device is used to produce a series of orthodontic appliances based at least on the modified schedule of movement. Therefore due to the claims do not include any device that provides any of the claimed steps, it is considered that the claims are directed to an abstract idea of identifying the movement patterns for dental objects from an initial arrangement toward a final arrangement which "is not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving methods of organizing human activity [792 F.3d. at 1367-68, 115 USPQ2d at 1640; *In re Meyer,* 688 F.2d 789, 791-93, 215 USPQ 193, 194-96 (CCPA 1982); *Synopsys, Inc. v. Mentor Graphics Corp.,* 839 F.3d 1138, 120 USPQ2d 1473 (Fed. Cir. 2016); *Electric Power Group, LLC v. Alstom, S.A.,* 830 F.3d 1350, 1351-52, 119 USPQ2d 1739, 1740 (Fed. Cir. 2016)].

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. **Claims 1-7, 10, 12-18, 21, 23-25 and 27-29 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Chishti et al. (US 2004/0137400 A1)**.

9. **Regarding claim 1**, Chishti et al. discloses a method including selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"), the movement pattern defining a schedule of movement coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position; calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions ([0131-0133]); identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); and performing, by a computer processor, a first modification of the schedule of

movement in response to the identifying ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position*"; and [0131] – "*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 first modification including delaying initial movement of the first dental object; slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*").

10. **Regarding claim 2,** Chishti et al. discloses that wherein the movement pattern is selected by a user. ([0021] – "*than one candidate treatment path for each tooth can be generated and graphically displayed for each candidate treatment path to a human user for selection*.")
11. **Regarding claim 3**, Chishti et al. discloses that the selecting includes analyzing, by a computer processor, the dental objects in their respective initial and final positions.

([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns; and generating the malocclusion treatment plan implementing the selected tooth treatment pattern*" and [0090] - "*At each stage, major and minor tooth movements are analyzed*")

12. **Regarding claim 4**, Chishti et al. discloses that wherein the analyzing includes determining, by a computer processor, a respective distance needed to move each of the dental objects from its respective initial position to its respective final position. [0021]

13. **Regarding claim 5**, Chishti et al. discloses that further includes determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

14. **Regarding claim 6,** Chishti et al. discloses that it further includes determining, by a computer processor, that the second modification does not avoid a collision between the first and second dental objects; and performing, by a computer processor after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object. [0021]

15. **Regarding claim 7,** Chishti et al. discloses that it further includes determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

16. **Regarding claim 10,** Chishti et al. discloses that it further includes 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. [0201]

17. **Regarding claim 12**, Chishti et al. discloses a non-transitory computer-readable medium comprising instructions that, when executed by one or more computer

processors, cause at least one of the one or more processors to [0015]: select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculate a respective treatment path for each of the dental objects between its respective initial an final positions [0131-0133]; identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); and perform a first modification of the schedule of movement in response to the identifying, the first modification comprising: delaying initial movement of the first dental object ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position*"; and [0131] – "*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)"); slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or round-tripping the first dental object ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*").

18. **Regarding claim 13,** Chishti et al. discloses that wherein the movement pattern is selected by a user. ([0021] – "*than one candidate treatment path for each tooth can be generated and graphically displayed for each candidate treatment path to a human user for selection*.")
19. **Regarding claim 14,** Chishti et al. discloses that wherein the selecting comprises analyzing the dental objects in their respective initial and final positions. ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns; and generating the malocclusion treatment plan implementing the selected tooth treatment pattern*" and [0090] - "*At each stage, major and minor tooth movements are analyzed*")
20. **Regarding claim 15,** Chishti et al. discloses that wherein the analyzing includes determining a respective distance needed to move each of the dental objects from its respective initial position to its respective final position. [0021]

21. **Regarding claim 16,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and perform, after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping the movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

22. **Regarding claim 17,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the second modification does not avoid a collision between the first and second dental objects; and perform, after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object moved. [0021]

23. **Regarding claim 18,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or

more processors to: determine that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and perform, after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

24. **Regarding claim 21,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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. [0201]

25. **Regarding claim 23,** Chishti et al. discloses method including selecting a movement pattern from a plurality of movement patterns for moving the patient's teeth from the initial arrangement toward the final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculating, by a

computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions ([0131-0133]); identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"; performing, by a computer processor, a first modification of the schedule of movement in response to the identifying ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position*"; and [0131] – "*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 first modification including delaying initial movement of the first dental object; slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)"); and recalculating, by a computer processor after the performing, the respective treatment path for at least one of the dental objects ([0131] – "*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*").

26. **Regarding claim 24,** Chishti et al. discloses that it further includes determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising: slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

27. **Regarding claim 25,** Chishti et al. discloses that it further includes 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. [0201]

28. **Regarding claim 27,** Chishti et al. discloses a non-transitory computer-readable medium including instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to [0015]: select a movement pattern from a plurality of movement patterns for moving the patient's teeth from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculate a respective treatment path for each of the dental objects between its respective initial and final positions [0131-0133]; identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); perform a first modification of the schedule of movement in response to the identifying, the first modification comprising: delaying initial movement of the first dental object ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target*

position"; and [0131] – "*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)*"); slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or round-tripping the first dental object ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*"); and recalculate, after the performing, the respective treatment path for at least one of the dental objects ([0131] – "*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*").

29. **Regarding claim 28,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and perform, after the determining, a second modification of the schedule of movement, the second modification comprising: slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment

stages during which the first dental object moved 0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

30. **Regarding claim 29,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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. [0201]

Claim Rejections - 35 USC § 103

31. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

32. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

33. **Claims 8, 9, 19 and 20 are rejected under 35 U.S.C.103(a) as being unpatentable over Chishti et al. (US 2004/0137400 A1) aka Chishti ('400), in view of Chishti et al. (US 6471511 B1) aka Chishti ('511)**.

Chishti ('400) discloses the claimed invention substantially as claimed, as set forth above for claim 1, where Chishti ('400) mentions that it is well known the concept of round-tripping. However Chishti ('400) does not disclose the definition of round-tripping.

Chishti ('511) teaches that round-tripping is any motion of a tooth in any direction other than directly toward the desired final position (col. 4, lines 13-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the Chishti ('400)'s method, to the Chishti ('511)'s round-tripping definition, in order to allow teeth to move past each other avoiding collisions.

34. **Claims 11, 22, 26 and 30 are rejected under 35 U.S.C.103(a) as being unpatentable over Chishti et al. (US 2004/0137400 A1) aka Chishti ('400), in view of Chishti et al. (US 6471511 B1) aka Chishti ('511), in further view of Phan et al. (US 6309215 B1)**.

Chishti ('400) discloses the claimed invention substantially as claimed, as set forth above for claim 1. However Chishti ('400) does not disclose that wherein the

producing includes fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

Chishti ('511) teaches the producing includes fabricating a respective positive mold of the dental objects for at least two of the treatment stages (col. 9, ln 43-47), and that it is used a polymeric material over a positive physical model. However they are silenced disclosing thermoforming the respective one of the orthodontic appliances over each of the respective positive molds.

Phan et al. teaches that the orthodontic appliance is of a thermoformable polymer material (col. 2, line 26-46). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the Chishti (‘400)/ Chishti (‘511)'s orthodontic appliance, to the Phan’s thermoformable polymer material, in order to provide an orthodontic appliance with the stiffness from the polymeric material to impart a resilient repositioning force against one or a portion of the remaining teeth.

Conclusion

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIRAYDA A. APONTE whose telephone number is (571)270-1933. The examiner can normally be reached on 8:00 am - 5:00 pm Monday through Thursday.

36. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

37. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cris Rodriguez can be reached on (571) 272-4964. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

38. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MIRAYDA A. APONTE/
Examiner, Art Unit 3732

/Cris L. Rodriguez/
Supervisory Patent Examiner, Art Unit 3732

Notice of References Cited	Application/Control No. 15/834,608	Applicant(s)/Patent Under Reexamination KITCHING ET AL.	
	Examiner MIRAYDA A. APONTE	Art Unit 3732	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2004/0137400 A1	07-2004	Chishti, Muhammad	A61C7/00	433/24
*	B	US-6,471,511 B1	10-2002	Chishti; Muhammad	A61C7/00	433/24
*	C	US-6,309,215 B1	10-2001	Phan; Loc X.	A61C7/00	433/24
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Bibliographic Data

Application No: 15834608

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /MIRAYDA A APONTE/ (Examiner's Signature) | (Initials)

Title: AUTOMATED TREATMENT STAGING FOR TEETH

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
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RULE			

APPLICANTS

ALIGN TECHNOLOGY, INC., San Jose, CA, UNITED STATES

INVENTORS

Ian Kitching, Saratoga, CA, UNITED STATES

Alexander Dmitriev, Moscow, RUSSIAN FEDERATION

Alexey Vishnevskiy, Moscow, RUSSIAN FEDERATION

CONTINUING DATA

This application is a CON of 15086491 03/31/2016

15086491 is a CON of 13209276 08/12/2011 PAT 9326830

13209276 is a CON of 11848172 08/30/2007 PAT 8038444

11848172 has PRO of 60824024 08/30/2006

11848172 has PRO of 60824022 08/30/2006

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

12/27/2017

STATE OR COUNTRY

UNITED STATES

ADDRESS

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

FILING FEE RECEIVED

$6,960

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15086491"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 08:57
S2	183	("0060050" | "20020006597" | "20030009252" | "20030139834" | "20030224311" | "20040128010" | "20040137400" | "20050055118" | "20060275736" | "20080057462" | "20120035901" | "2467432" | "3407500" | "3600808" | "3660900" | "3683502" | "3737005" | "3738005" | "3860803" | "3916526" | "3922786" | "3950851" | "3983628" | "4014096" | "4195046" | "4253828" | "4324546" | "4324547" | "4348178" | "4478580" | "4500294" | "4504225" | "4505673" | "4526540" | "4575330" | "4575805" | "4591341" | "4609349" | "4611288" | "4656860" | "4663720" | "4664626" | "4676747" | "4742464" | "4755139" | "4763791" | "4793803" | "4798534" | "4836778" | "4837732" | "4850864" | "4850865" | "4856991" | "4877398" | "4880380" | "4889238" | "4890608" | "4935635" | "4936862" | "4937928" | "4941826" | "4964770" | "4975052" | "4983334" | "5011405" | "5017133" | "5027281" | "5035613" | "5055039" | "5059118" | "5100316" | "5121333" | "5125832" | "5128870" | "5130064" | "5131843" | "5131844" | "5139419" | "5145364" | "5152219" | "5176517" | "5184306" | "5186623" | "5257203" | "5273429" | "5278756" | "5328362" | "5338198" | "5340309" | "5342202" | "5368478" | "5382164" | "5395238" | "5431562" | "5440326" | "5440496" | "5447432" | "5452219" | "5454717" | "5456600" | "5474448" | "5518397" | "5528735" | "5533895" | "5542842" | "5549476" | "5562448" | "5587912" | "5605459" | "5607305" | "5614075" | "5621648" | "5645420" | "5645421" | "5655653" | "5683243" | "5692894" | "5725376" | "5725378" | "5733126" | "5740267" | "5742700" | "5799100" | "5800174" | "5823778" | "5848115" | "5857853" | "5866058" | "5879158" | "5880961" | "5880962" | "5934288" | "5957686" | "5964587" | "5971754" |	US-PGPUB; USPAT	OR	ON	2018/03/19 09:12

		"5975893" | "6015289" | "6044309" | "6049743" | "6062861" | "6068482" | "6099314" | "6123544" | "6152731" | "6183248" | "6190165" | "6217325" | "6217334" | "6244861" | "6309215" | "6315553" | "6318994" | "6322359" | "6350120" | "6382975" | "6398548" | "6402707" | "6409504" | "6471511" | "6482298" | "6514074" | "6524101" | "6554611" | "6572372" | "6629840" | "6682346" | "6705863" | "6722880" | "6729876" | "7063532" | "7331783" | "7377778" | "7435083" | "7578674" | "7637740" | "7658610" | "7819659" | "7844356" | "7844429" | "7904307" | "8038444" | "9326830" | "RE35169").PN.				
S3	7791	(A61C7/002 or A61C7/00 or A61C3/00).cpc. or (433/24).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 11:25
S5	44	S3 and dental and ((move movement) near tooth) same (pattern stagger$4 "round-tipping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 12:44
S6	7	S2 and dental and ((move movement) near tooth) same (pattern stagger$4 "round-tipping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 12:45
S7	4	S2 and dental and ((move movement) near tooth) same (stagger$4 "round-tipping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 12:56
S8	13	S2 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:03
S9	99	S3 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:04
S10	9178	(A61C7/002 or A61C7/00 or A61C3/00).cpc. or (433/24,213,214).ccls.	US-PGPUB; USPAT; USOCR;	OR	ON	2018/03/19 13:06

			FPRS; EPO; JPO			
S11	99	S10 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:06
S12	13	S2 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:09
S13	99	S10 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping" slowing) and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:27
S14	99	S10 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:30
S15	6	S10 and dental and (((move movement) near tooth) same stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:32
S16	4	S2 and dental and (((move movement) near tooth) same stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:33
S17	6	orthodontic and (((move movement) near tooth) same stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/19 13:35
S18	2	("6318994").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/19 13:41
S19	724	orthodontic and (((move movement) near tooth) same$4 stagger$4 same "round-	US-PGPUB;	OR	ON	2018/03/20 15:29

		tripping") and (collision obstruction) and (computer program code) and system	USPAT; USOCR; FPRS; EPO; JPO			
S20	5	S19 and stagger	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:29
S21	102	S19 and "round-tripping"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:30
S22	14	S19 and ("round-tripping" WITH avoid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:33
S23	14	S21 and ("round-tripping" WITH avoid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:34
S24	88	S21 not S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:52
S25	43	S21 and ("round-tripping" WITH (avoid$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:58
S26	59	S21 not S25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/20 15:58
S27	1	("6471544").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/20 16:04

S28	1	("6471511").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/20 16:05
S29	1	("20040137400").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/21 11:33
S30	5	"13209276"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/21 12:50
S31	1	"15086491"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/21 12:52
S32	4	(("20130071811") or ("20070162014") or ("20090263764")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/22 09:08
S33	2	("20090130630").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/22 10:59
S34	9187	(A61C7/002 or A61C7/00 or A61C3/00).cpc. or (433/24,213,214).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:33
S35	91	S34 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and ((thermo temperature) same form$3 mold$3) and polymer$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:33
S36	91	S34 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and ((thermo$4 temperature) same form$3 mold$3) and polymer$3	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2018/03/23 12:37

			EPO; JPO			
S37	91	S36 and ((thermo$4 temperature) same form$3 mold$3) and polymer$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:37
S38	8	S36 and ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:37
S39	352	S34 and ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:38
S40	255	S34 and ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3 and orthodontic	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:38
S41	98	S40 and "align technology"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 12:56
S42	1	("9326830").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/03/23 19:43
S43	8	"11848172"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/03/23 19:44
S44	180	("20020006597" | "20030009252" | "20030139834" | "20030224311" | "20040128010" | "20040137400" | "20050055118" | "20060275736" | "20120035901" | "20160206402" | "2467432" | "3407500" | "3600808" | "3660900" | "3683502" | "3738005" | "3860803" | "3916526" | "3922786" | "3950851" | "3983628" | "4014096" | "4195046" | "4253828" | "4324546" | "4324547" |	US-PGPUB; USPAT	OR	ON	2018/03/23 19:46

		"4348178" | "4478580" | "4500294" | "4504225" | "4505673" | "4526540" | "4575330" | "4575805" | "4591341" | "4609349" | "4611288" | "4656860" | "4663720" | "4664626" | "4676747" | "4742464" | "4755139" | "4763791" | "4793803" | "4798534" | "4836778" | "4837732" | "4850864" | "4850865" | "4856991" | "4877398" | "4880380" | "4889238" | "4890608" | "4935635" | "4936862" | "4937928" | "4941826" | "4964770" | "4975052" | "4983334" | "5011405" | "5017133" | "5027281" | "5035613" | "5055039" | "5059118" | "5100316" | "5121333" | "5125832" | "5128870" | "5130064" | "5131843" | "5131844" | "5139419" | "5145364" | "5176517" | "5184306" | "5186623" | "5257203" | "5273429" | "5278756" | "5328362" | "5338198" | "5340309" | "5342202" | "5368478" | "5382164" | "5395238" | "5431562" | "5440326" | "5440496" | "5447432" | "5452219" | "5454717" | "5456600" | "5474448" | "5518397" | "5528735" | "5533895" | "5542842" | "5549476" | "5562448" | "5587912" | "5605459" | "5607305" | "5614075" | "5621648" | "5645420" | "5645421" | "5655653" | "5683243" | "5692894" | "5725376" | "5725378" | "5733126" | "5740267" | "5742700" | "5799100" | "5800174" | "5823778" | "5848115" | "5857853" | "5866058" | "5879158" | "5880961" | "5880962" | "5934288" | "5957686" | "5964587" | "5971754" | "5975893" | "6015289" | "6044309" | "6049743" | "6062861" | "6068482" | "6099314" | "6123544" | "6152731" | "6183248" | "6190165" | "6217325" | "6217334" | "6244861" | "6309215" | "6315553" | "6318994" | "6322359" | "6350120" | "6382975" | "6398548" | "6402707" | "6409504" | "6471511" | "6482298" | "6514074" | "6524101" | "6554611" | "6572372" | "6629840" | "6682346" | "6705863" | "6722880" | "6729876" | "7063532" | "7331783" | "7377778" | "7435083" | "7578674" | "7637740" | "7658610" | "7819659" | "7844356" | "7844429" | "7904307" | "8038444" | "9326830" | "RE35169").PN.				

EAST Search History (Interference)

<This search history is empty>

3/24/2018 8:41:23 AM
C:\Users\maponte\Documents\EAST\Workspaces\15834608.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15834608	KITCHING ET AL.
	Examiner	Art Unit
	MIRAYDA A APONTE	3732

CPC- SEARCHED		
Symbol	Date	Examiner
A61C7/002, 00	3/24/2018	MA
A61C3/00	3/24/2018	MA

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
433	24		

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SEARCH NOTES		
Search Notes	Date	Examiner
EAST search	3/24/2018	MA
Word search on orthodontic and (((move movement) near tooth) same$4 stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system, dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and ((thermo temperature) same form$3 mold$3) and polymer$3, ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3 and orthodontic	3/24/2018	MA

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/MIRAYDA A APONTE/ Examiner.Art Unit 3732	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15834608	KITCHING ET AL.
	Examiner	Art Unit
	MIRAYDA A APONTE	3732

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/26/2018								
	1	✓								
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	001	US-RE35169	03-05-1996	LEMCHEN; Marc S. et al.	
	002	US-2467432	04-19-1949	KESLING; Harold D.	
	003	US-3407500	10-29-1968	KESLING; Peter C.	
	004	US-3600808	08-24-1971	JAMES; Jackson Reeve	
	005	US-3660900	05-09-1972	LAWRENCE; F. Andrews	
	006	US-3683502	08-15-1972	MELVIN; Wallshein	
	007	US-3738005	06-12-1973	COHEN; Mus et al.	
	008	US-3860803	01-14-1975	LEVINE; Richard Carl	
	009	US-3916526	11-04-1975	SCHUDY; Fred Frank	
	010	US-3922786	12-02-1975	LAVIN; Joseph L.	
	011	US-3950851	04-20-1976	BERGERSEN; Earl O.	
	012	US-3983628	10-05-1976	ACEVEDO; Raul	
	013	US-4014096	03-29-1977	DELLINGER; Eugene L.	
	014	US-4195046	03-25-1980	KESLING; Peter C.	
	015	US-4253828	03-03-1981	COLES; Donna C. et al.	
	016	US-4324546	04-13-1982	HEITLINGER; Paul et al.	
	017	US-4324547	04-13-1982	ARCAN; Mircea et al.	
	018	US-4348178	09-07-1982	KURZ; Craven H.	
	019	US-4478580	10-23-1984	BARRUT; Luc P.	
	020	US-4500294	02-19-1985	LEWIS; William D.	
	021	US-4504225	03-12-1985	YOSHII; Osamu	
	022	US-4505673	03-19-1985	YOSHII; Osamu	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 2 of 30

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	023	US-4526540	07-02-1985	DELLINGER; Eugene L.	
	024	US-4575330	03-11-1986	HULL; Charles W.	
	025	US-4575805	03-11-1986	MOERMANN; Werner H. et al.	
	026	US-4591341	05-27-1986	ANDREWS; Lawrence F.	
	027	US-4609349	09-02-1986	CAIN; Steve B.	
	028	US-4611288	09-09-1986	DURET; Francois et al.	
	029	US-4656860	04-14-1987	ORTHUBER; Wolfgang et al.	
	030	US-4663720	05-05-1987	DURET; Francois et al.	
	031	US-4664626	05-12-1987	KESLING; Peter C.	
	032	US-4676747	06-30-1987	KESLING; Christopher K.	
	033	US-4742464	05-03-1988	DURET; Francois et al.	
	034	US-4755139	07-05-1988	ABBATTE; Gerard P. et al.	
	035	US-4763791	08-16-1988	HALVERSON; George E. et al.	
	036	US-4793803	12-27-1988	MARTZ; Martin G.	
	037	US-4798534	01-17-1989	BREADS; Peter R.	
	038	US-4836778	06-06-1989	BAUMRIND; Sheldon et al.	
	039	US-4837732	06-06-1989	BRANDESTINI; Marco et al.	
	040	US-4850864	07-25-1989	DIAMOND; Michael K.	
	041	US-4850865	07-25-1989	NAPOLITANO; John R.	
	042	US-4856991	08-15-1989	BREADS; Peter R. et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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	043	US-4877398	10-31-1989	KESLING; Peter C.	
	044	US-4880380	11-14-1989	MARTZ; Martin G.	
	045	US-4889238	12-26-1989	BATCHELOR; Jay A.	
	046	US-4890608	01-02-1990	STEER; Peter L.	
	047	US-4935635	06-19-1990	O'HARRA; Dale G.	
	048	US-4936862	06-26-1990	WALKER; Peter S. et al.	
	049	US-4937928	07-03-1990	VAN DER ZEL; Joseph M.	
	050	US-4941826	07-17-1990	LORAN; William et al.	
	051	US-4964770	10-23-1990	STEINBICHLER; Hans et al.	
	052	US-4975052	12-04-1990	SPENCER; William et al.	
	053	US-4983334	01-08-1991	ADELL; Loren S.	
	054	US-5011405	04-30-1991	LEMCHEN; Marc S.	
	055	US-5017133	05-21-1991	MIURA; Fujio	
	056	US-5027281	06-25-1991	REKOW; Elizabeth D. et al.	
	057	US-5035613	07-30-1991	BREADS; Peter R. et al.	
	058	US-5055039	10-08-1991	ABBATTE; Gerard P. et al.	
	059	US-5059118	10-22-1991	BREADS; Peter R. et al.	
	060	US-5100316	03-31-1992	WILDMAN; Alexander J.	
	061	US-5121333	06-09-1992	RILEY; Donald R. et al.	
	062	US-5125832	06-30-1992	KESLING; Peter C.	
	063	US-5128870	07-07-1992	ERDMAN; Arthur G. et al.	
	064	US-5130064	07-14-1992	SMALLEY; Dennis R. et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 4 of 30

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	065	US-5131843	07-21-1992	HILGERS; James J. et al.	
	066	US-5131844	07-21-1992	MARINACCIO; Paul J. et al.	
	067	US-5139419	08-18-1992	ANDREIKO; Craig A. et al.	
	068	US-5145364	09-08-1992	MARTZ; Martin G. et al.	
	069	US-5176517	01-05-1993	TRUAX; Lloyd H.	
	070	US-5184306	02-02-1993	ERDMAN; Arthur G. et al.	
	071	US-5186623	02-16-1993	BREADS; Peter R. et al.	
	072	US-5257203	10-26-1993	RILEY; Donald R. et al.	
	073	US-5273429	12-28-1993	REKOW; Dianne et al.	
	074	US-5278756	01-11-1994	LEMCHEN; Marc S. et al.	
	075	US-5328362	07-12-1994	WATSON; Sherman L. et al.	
	076	US-5338198	08-16-1994	WU; Chuang-Jy et al.	
	077	US-5340309	08-23-1994	ROBERTSON; James G.	
	078	US-5342202	08-30-1994	DESHAYES; Marie-Josephe	
	079	US-5368478	11-29-1994	ANDREIKO; Craig A. et al.	
	080	US-5382164	01-17-1995	STERN; Sylvan S.	
	081	US-5395238	03-07-1995	ANDREIKO; Craig A. et al.	
	082	US-5431562	07-11-1995	ANDREIKO; Craig A. et al.	
	083	US-5440326	08-08-1995	QUINN; Thomas J.	
	084	US-5440496	08-08-1995	ANDERSSON; Matts et al.	
	085	US-5447432	09-05-1995	ANDREIKO; Craig A. et al.	
	086	US-5452219	09-19-1995	DEHOFF; Barry D. et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 5 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	087	US-5454717	10-03-1995	ANDREIKO; Craig A. et al.	
	088	US-5456600	10-10-1995	ANDREIKO; Craig A. et al.	
	089	US-5474448	12-12-1995	ANDREIKO; Craig A. et al.	
	090	US-5518397	05-21-1996	ANDREIKO; Craig A. et al.	
	091	US-5528735	06-18-1996	STRASNICK; Steven L. et al.	
	092	US-5533895	07-09-1996	ANDREIKO; Craig A. et al.	
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	094	US-5549476	08-27-1996	STERN; Sylvan S.	
	095	US-5562448	10-08-1996	MUSHABAC; David R.	
	096	US-5587912	12-24-1996	ANDERSSON; Matts et al.	
	097	US-5605459	02-25-1997	KURODA; Takayuki et al.	
	098	US-5607305	03-04-1997	ANDERSSON; Matts et al.	
	099	US-5614075	03-25-1997	ANDRE SR., LARRY E.	
	100	US-5621648	04-15-1997	CRUMP; Craig D.	
	101	US-5645420	07-08-1997	BERGERSEN; Earl O.	
	102	US-5645421	07-08-1997	SLOOTSKY; Gary Lee	
	103	US-5655653	08-12-1997	CHESTER; Bruce E.	
	104	US-5683243	11-04-1997	ANDREIKO; Craig A. et al.	
	105	US-5692894	12-02-1997	SCHWARTZ; Dann A. et al.	
	106	US-5725376	03-10-1998	POIRIER; Michel	
	107	US-5725378	03-10-1998	WANG; Hong-Chi	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 6 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

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	108	US-5733126	03-31-1998	ANDERSSON; Matts et al.	
	109	US-5740267	04-14-1998	ECHERER; Scott J. et al.	
	110	US-5742700	04-21-1998	YOON; Douglas C. et al.	
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	112	US-5800174	09-01-1998	ANDERSSON; Matts	
	113	US-5823778	10-20-1998	SCHMITT; Stephen M. et al.	
	114	US-5848115	12-08-1998	LITTLE; Francis H. et al.	
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	116	US-5866058	02-02-1999	BATCHELDER; John Samuel et al.	
	117	US-5879158	03-09-1999	DOYLE; Walter A. et al.	
	118	US-5880961	03-09-1999	CRUMP; Craig D.	
	119	US-5880962	03-09-1999	ANDERSSON; Matts et al.	
	120	US-5934288	08-10-1999	AVILA; Ricardo Scott et al.	
	121	US-5957686	09-28-1999	ANTHONY; Wayne L.	
	122	US-5964587	10-12-1999	SATO; Mikio	
	123	US-5971754	10-26-1999	SONDHI; Anoop et al.	
	124	US-5975893	11-02-1999	CHISHTI; Muhammad et al.	
	125	US-6015289	01-18-2000	ANDREIKO; Craig A. et al.	
	126	US-6044309	03-28-2000	HONDA; Kenichi	
	127	US-6049743	04-11-2000	BABA; Masami	
	128	US-6062861	05-16-2000	ANDERSSON; Matts	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 7 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	129	US-6068482	05-30-2000	SNOW; Michael Desmond	
	130	US-6099314	08-08-2000	KOPELMAN; Avi et al.	
	131	US-6123544	09-26-2000	CLEARY; James D.	
	132	US-6152731	11-28-2000	JORDAN; Russell A. et al.	
	133	US-6183248	02-06-2001	CHISHTI; Muhammad et al.	
	134	US-6190165	02-20-2001	ANDREIKO; Craig A. et al.	
	135	US-6217325	04-17-2001	CHISHTI; Muhammad et al.	
	136	US-6217334	04-17-2001	HULTGREN; Bruce Willard	
	137	US-6244861	06-12-2001	ANDREIKO; Craig A. et al.	
	138	US-6309215	10-30-2001	PHAN; Loc X. et al.	
	139	US-6315553	11-13-2001	SACHDEVA; Rohit et al.	
	140	US-6318994	11-20-2001	CHISHTI; Muhammad Ziaullah Khan et al.	
	141	US-6322359	11-27-2001	JORDAN; Russell A. et al.	
	142	US-6350120	02-26-2002	SACHDEVA; Rohit et al.	
	143	US-6382975	05-07-2002	POIRIER; Michel	
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	145	US-6402707	06-11-2002	ERNST; Maurice M.	
	146	US-6409504	06-25-2002	JONES; Timothy N. et al.	
	147	US-6471511	10-29-2002	CHISHTI; Muhammad et al.	
	148	US-6482298	11-19-2002	BHATNAGAR; Parijat	
	149	US-6514074	02-04-2003	CHISHTI; Muhammad et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 8 of 30

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Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	150	US-6524101	02-25-2003	PHAN; Loc X. et al.	
	151	US-6554611	04-29-2003	CHISHTI; Muhammad et al.	
	152	US-6572372	06-03-2003	PHAN; Loc X. et al.	
	153	US-6629840	10-07-2003	CHISHTI; Muhammad et al.	
	154	US-6682346	01-27-2004	CHISHTI; Muhammad et al.	
	155	US-6705863	03-16-2004	PHAN; Loc X. et al.	
	156	US-6722880	04-20-2004	CHISHTI; Muhammad et al.	
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	159	US-7331783	02-19-2008	CHISHTI; Muhammad et al.	
	160	US-7377778	05-27-2008	CHISHTI; Muhammad Ziaullah Khan et al.	
	161	US-7435083	10-14-2008	CHISHTI; Muhammad et al.	
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	163	US-7637740	12-29-2009	KNOPP; Peter G.	
	164	US-7658610	02-09-2010	KNOPP; Peter G.	
	165	US-7819659	10-26-2010	WEN; Huafeng	
	166	US-7844356	11-30-2010	MATOV; Vadim et al.	
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	168	US-7904307	03-08-2011	ABOLFATHI; Amir et al.	
	169	US-8038444	10-18-2011	KITCHING; Ian et al.	
	170	US-9326830	05-03-2016	KITCHING; Ian et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 9 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	171	US-20020006597	01-17-2002	ANDREIKO; Craig A. et al.	
	172	US-20030009252	01-09-2003	PAVLOVSKAIA; Elena et al.	
	173	US-20030139834	07-24-2003	NIKOLSKIY; Sergey et al.	
	174	US-20030224311	12-04-2003	CRONAUER; Edward A.	
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	176	US-20040137400	07-15-2004	CHISHTI; Muhammad et al.	
	177	US-20050055118	03-10-2005	NIKOLSKIY; Sergey et al.	
	178	US-20060275736	12-07-2006	WEN; Huafeng et al.	
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	180	US-20160206402-A1	07-21-2016	IAN; Kitching et al.	

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	001	AU-3031677-A	05-10-1979	SUYEHIRO H.		☐
	002	AU-517102-B2	07-09-1981	HITO SUYEHIRO.		☐
	003	AU-5598894-A	06-08-1994	ORMCO CORP.		☐

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 10 of 30

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Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
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Examiner Name	Not yet assigned
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	004	CA-1121955-A	04-20-1982	SUYEHIRO HITO.		☐
	005	DE-2749802-A1	05-11-1978	SUYEHIRO HITO.		☒
	006	DE-69327661-T2	07-20-2000	ORMCO CORP [US]		☒
	007	EP-0091876-A1	10-19-1983	DURET FRANCOIS [FR], et al.		☒
	008	EP-0299490-A2	01-18-1989	STEINBICHLER HANS [DE]		☒
	009	EP-0376873-A2	07-04-1990	SHAFIR AARON [IL], et al.		☐
	010	EP-0490848-A2	06-17-1992	NOBELPHARMA AB [SE]		☐
	011	EP-0541500-A1	05-12-1993	NOBELPHARMA AB [SE]		☐
	012	EP-0667753-B1	01-19-2000	ORMCO CORP [US]		☐
	013	EP-0731673-B1	05-30-2001	NOBEL BIOCARE AB [SE]		☐

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Sheet 11 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	014	EP-0774933-B1	12-06-2000	SANDVIK AB [SE], et al.		☐
	015	ES-463897-A1	01-01-1980	HITO SUYEHIRO D [US]		☒
	016	FR-2369828-A1	06-02-1978	SUYEHIRO HITO [US]		☒
	017	FR-2652256-A1	03-29-1991	JOURDA GERARD., et al.		☒
	018	GB-1550777-A	08-22-1979	SUYEHIRO H.		☒
	019	JP-H0428359-A	01-30-1992	MITSUBISHI PETROCHEMICAL CO.		☒
	020	JP-H08508174-A	09-03-1996			☒
	021	JP-S5358191-A	05-25-1978			☒
	022	WO-9008512-A1	08-09-1990	DOLPHIN IMAGING SYSTEMS INC [US]		☐
	023	WO-9104713-A1	04-18-1991	JOURDA GERARD [FR], et al.		☒

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	024	WO-9410935-A1	05-26-1994	ORMCO CORP [US]		☐
	025	WO-9832394-A1	07-30-1998	HULTGREN BRUCE WILLARD [US]		☐
	026	WO-9844865-A1	10-15-1998	NOBEL BIOCARE AB [SE], et al.		☐
	027	WO-9858596-A1	12-30-1998	ALIGN TECHNOLOGY INC [US], et al.		☐

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	001	AADR. AMERICAN ASSOCIATION FOR DENTAL RESEARCH, Summary of Activities, March 20-23,1980, Los Angeles, CA, p. 195.	☐
	002	ALCANIZ, et aL, "An Advanced System for the Simulation and Planning of Orthodontic Treatments," Karl Heinz Hohne and Ron Kikinis (eds.), Visualization in Biomedical Computing, 4th Intl. Conf., VBC '96, Hamburg, Germany, September 22-25, 1996, Springer-Verlag, pp. 511-520.	☐
	003	ALEXANDER et al., "The DigiGraph Work Station Part 2 Clinical Management," JCO, pp. 402-407 (July 1990).	☐
	004	ALTSCHULER, "3D Mapping of Maxillo-Facial Prosthesis," AADR Abstract #607, 2 pages total, (1980).	☐
	005	ALTSCHULER et al., "Analysis of 3-D Data for Comparative 3-D Serial Growth Pattern Studies of Oral-Facial Structures, " AADR Abstracts, Program and Abstracts of Papers, 57th General Session, IADR HP Annual Session, March 29, 1979 - April 1, 1979, New Orleans Marriot, Journal of Dental Research, Vol. 58, January 1979, Special Issue A, p. 221.	☐
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	007	ALTSCHULER et al., "Measuring Surfaces Space-Coded by a Laser-Projected Dot Matrix," SPIE Imaging Applications for Automated Industrial Inspection and Assembly, Vol. 182, p. 187-191 (1979).	☐
	008	ANDERSSON et al., "Clinical Results with Titanium Crowns Fabricated with Machine Duplication and Spark Erosion," Acta. Odontol. Scand., 47:279-286 (1989).	☐
	009	ANDREWS, The Six Keys to Optimal Occlusion Straight Wire, Chapter 3, pp 13-24 (1989).	☐

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	010	BARTELS, et al., An Introduction to Splines for Use in Computer Graphics and Geometric Modeling, Morgan Kaufmann Publishers, pp. 422-425 (1987).	☐
	011	BAUMRIND, "A System for Craniofacial Mapping Through the Integration of Data from Stereo X-Ray Films and Stereo Photographs," an invited paper submitted to the 1975 American Society of Photogram Symposium on Close-Range Photogram Systems, University of Ill., Aug. 26-30, 1975, pp. 142-166.	☐
	012	BAUMRIND et al., "A Stereophotogrammetric System for the Detection of Prosthesis Loosening in Total Hip Arthroplasty," NATO Symposium on Applications of Human Biostereometrics," July 9-13, 1978, SPIE, Vol. 166, pp. 112-123.	☐
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	014	BAUMRIND, "Integrated Three-Dimensional Craniofacial Mapping: Background, Principles, and Perspectives," Semin. in Orthod., 7(4):223-232 (December 2001).	☐
	015	BEGOLE et al., "A Computer System for the Analysis of Dental Casts," The Angle Orthod., 51(3):253-259 (July 1981).	☐
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	017	BHATIA et al., "A Computer-Aided Design for Orthognathic Surgery," Br. J. Oral Maxillofac. Surg., 22:237- 253 (1984).	☐
	018	BIGGERSTAFF, "Computerized Diagnostic Setups and Simulations," Angle Orthod., 40(1):28-36 (January 1970).	☐

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	019	BIGGERSTAFF et al., "Computerized Analysis of Occlusion in the Postcanine Dentition," Am. J. Orthod., 61(3): 245-254 (March 1972).	☐
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	021	BLU, et al., "Linear interpolation revitalized", IEEE Trans. Image Proc., 13(5):710-719 (May 2004.	☐
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	026	BURSTONE et al., Precision Adjustment of the Transpalatal Lingual Arch: Computer Arch Form IN Predetermination, Am. Journal of Orthodontics, Vol. 79, No. 2 (Feb. 1981), pp. 115-133.	☐
	027	BURSTONE (interview), "Dr. Charles J. Burstone on The Uses of the Computer in Orthodontic Practice (Part 1)," J. Clin. Orthod., 13(7):442-453 (July 1979).	☐
	028	BURSTONE (interview), "Dr. Charles J. Burstone on The Uses of the Computer in Orthodontic Practice (Part 2)," J. Clin. Orthod., 13(8):539-551 (August 1979).	☐

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	029	Cardinal Industrial Finishes, Powder Coatings information posted at< http://www.cardinalpaint.com> on Aug. 25, 2000, 2 pages.	☐
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	039	CURRY et al., "Integrated Three-Dimensional Craniofacial Mapping at the Craniofacial Research Instrumentation Laboratory/University of the Pacific," Semin. Orthod., 7(4):258-265 (December 2001).	☐
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	044	DENTAL INSTITUTE UNIVERSITY OF ZURICH SWITZERLAND, Program for International Symposium JD on Computer Restorations: State of the Art of the CEREC-Method, May 1991, 2 pages total.	☐
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	048	DuraClearTM product information, Allesee Orthodontic Appliances-Pro Lab, 1 page (1997)	☐
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Sheet 18 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

NON-PATENT LITERATURE DOCUMENTS

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	068	HOJJATIE et al., "Three-Dimensional Finite Element Analysis of Glass-Ceramic Dental Crowns," J. Biomech., 23(11):1157-1166 (1990).	☐

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	078	KANAZAWA et al., "Three-Dimensional Measurements of the Occlusal Surfaces of Upper Molars in a Dutch Population," J. Dent Res., 63(11):1298-1301 (November 1984).	☐

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Examiner Signature	/MIRAYDA A APONTE/	Date Considered	03/23/2018

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Sheet 25 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	129	The Red, White & Blue Way to Improve Your Smile!" Allesee Orthodontic Appliances-Pro Lab product information for patients, 2 pages 1992.	☐
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	138	VARADY et al., "Reverse Engineering Of Geometric Models—An Introduction," Computer-Aided Design, 29(4):255-268,1997.	☐

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	148	YAMAMOTO et al., "Optical Measurement of Dental Cast Profile and Application to Analysis of Three-Dimensional Tooth Movement in Orthodontics," Front. Med. Biol. Eng., 1(2):119-130 (1988).	☐
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	155	You May Be A Candidate For This Invisible No-Braces Treatment," Allesee Orthodontic Appliances-Pro Lab product information for patients, 2 pages (2002).	☐

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Attorney Docket Number	22773-774.304

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SIGNATURE

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Signature	/Charles Hagadorn III/	Date (YYYY-MM-DD)	2017-12-14
Name/Print	Charles Hagadorn III	Registration Number	62,367

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/834,608	12/07/2017	Ian Kitching	22773-774.304

CONFIRMATION NO. 1210

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650 Page Mill Road
Palo Alto, CA 94304

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	NTC.PUB	04/05/2018	22773-774.304

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WILSON SONSINI GOODRICH & ROSATI

By: Kevin J. Chance

Attorney Docket No.: 22773-774.304
Align Ref. No.: 1004.US.C1.C1.C2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 1210
Ian Kitching et al.	
Application No.: 15/834,608	Examiner: Mirayda Arlene Aponte
Filed: December 7, 2017	Art Unit: 3732
For: AUTOMATED TREATMENT STAGING FOR TEETH	AMENDMENT
Customer No.: 107046	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

In response to the Office Action mailed April 5, 2018, please enter the following amendments and remarks.

Amendments to the Specification begin on page 2.

Amendments to the Claims are reflected in the listing of claims beginning on page 3.

Remarks begin on page 11.

Amendments to the Specification:

Please replace paragraph **[0025]** with the following amended paragraph:

[0025] FIGS. 1A, 1B, and 1C show a patient's dentition 100 at three stages during a course of treatment. FIG. 1A illustrates the initial positions of the patient's teeth before treatment begins. A digital model of the teeth at these initial positions is captured in an initial digital data set (IDDS). The digital model contained in the IDDS also includes portions representing gingival tissue surrounding the patient's teeth. A computer program segments the IDDS into digital models of individual teeth and the gingival tissue.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; [[or]] and

round-tripping the first dental object.

2. (Original) The method of claim 1, wherein the movement pattern is selected by a user.

3. (Original) The method of claim 1, wherein the selecting comprises analyzing, by a computer processor, the dental objects in their respective initial and final positions.

4. (Original) The method of claim 3, wherein the analyzing comprises determining, by a computer processor, a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

5. (Original) The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved.

6. (Original) The method of claim 5, further comprising:

determining, by a computer processor, that the second modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object.

7. (Original) The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

8. (Original) The method of claim 1, wherein the round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

9. (Original) The method of claim 1, wherein the round-tripping comprises:

moving the first dental object away from the respective path of the second dental object; and

moving the first dental object toward its previous position.

10. (Original) 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.

11. (Original) The method of claim 10, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

12. (Currently Amended) A non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial an final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; [[or]] and

round-tripping the first dental object.

13. (Original) The medium of claim 12, wherein the movement pattern is selected by a user.

14. (Original) The medium of claim 12, wherein the selecting comprises analyzing the dental objects in their respective initial and final positions.

15. (Original) The medium of claim 14, wherein the analyzing comprises determining a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

16. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping the movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved.

17. (Original) The medium of claim 16, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object moved.

18. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

19. (Original) The medium of claim 12, wherein round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

20. (Original) The medium of claim 12, wherein round-tripping comprises:

moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its previous position.

21. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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.

22. (Original) The medium of claim 21, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

23. (Currently Amended) A method comprising:

selecting a movement pattern from a plurality of movement patterns for moving the patient's teeth from the initial arrangement toward the final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths;

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; [[or]] and

round-tripping the first dental object; and

recalculating, by a computer processor after the performing, the respective treatment path for at least one of the dental objects.

24. (Original) The method of claim 23, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising:

slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

25. (Original) The method of claim 23, 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.

26. (Original) The method of claim 25, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

27. (Original) A non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving the patient's teeth from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial and final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths;

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; [[or]] and

round-tripping the first dental object; and

recalculate, after the performing, the respective treatment path for at least one of the dental objects.

28. (Original) The medium of claim 27, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising:

slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or

round-tripping the first dental object.

29. (Original) The medium of claim 27, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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.

30. (Original) The medium of claim 29, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

REMARKS

Upon entry of this amendment, claims 1-30 will be pending in the present application. Claims 1, 12, 23, and 27 have been amended. Support for the amendments can be found in the specification as originally filed. Accordingly, no new matter has been added. Reconsideration is respectfully requested.

Related Applications and Inter-Parties Review

Applicant hereby advises the Office of co-pending applications in compliance with the Applicant's duty to disclose under 37 C.F.R. §§1.56 and 1.2 (see also MPEP §2001.06(b)) as discussed in *McKesson Info. Soln. Inc., v. Bridge Medical Inc.*, 487 F.3d 897; 82 USPQ2d 1865 (Fed. Cir. 2007) including US 15/086,419 and US 15/834,649 (Attorney Docket Nos. 22773-774.302 and 22773-774.303, respectively). The copies of the applications, Office Actions, and allowances are available from USPTO's website in PUBLIC PAIR and thus are not provided with this communication.

Applicant further advises the Office of the proceedings of IPR2017-01829 of U.S. Pat. 8,038,444. It is our understanding that the Examiner has access to and has considered the contents of IPR2017-01829 of U.S. Pat. 8,038,444, and that, accordingly, additional documentation from these proceedings should not be submitted in the present examination. If this understanding is incorrect, Patent Owner respectfully requests notification. If at any point the Examiner would like to be provided with copies of any contents of any related proceeding, Patent Owner will readily provide such copies upon request.

Examiner Interview

Applicant thanks Examiner Aponte and Examiner Patel for participating in a telephonic interview on June 28, 2018, with Applicant's representative, Charles Hagadorn. The Examiner's rejections of the claims made in a Non-Final Office Action mailed on April 5, 2018, and IPR2017-01829 of U.S. Pat. 8,038,444 were discussed. During the Interview it was agreed that amending the claims to include subject matter directed to the scanning device and amending the claims to recite, in part, "perform a first modification . . ., the first modification comprising one or more of: delaying initial movement of the first dental object; slowing or stopping movement

of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and round-tripping the first dental object" would overcome the rejections. Accordingly, Applicant has made such amendments.

Objections to the Drawing

Applicant has amended the specification to include reference numeral 100. Applicant respectfully submits that the application is now more clearly in compliance with 37 C.F.R. § 1.84(p)(5).

Accordingly, withdrawal of the objection to the drawings is respectfully requested.

Claim Rejections – 35 USC § 101

Claims 1-30 are rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter.

Without conceding the merits of the rejection and solely to expedite prosecution and allowance of the application, Applicant has amended claims 1, 12, 23, and 27 to include subject matter directed to the source of the electronic representation, e.g. a scanning device, as helpfully suggested by the Examiners who agreed that such amendment would overcome the rejections under 35 U.S.C. § 101. Accordingly, Applicant has amended claims 1, 12, 23, and 27 to recite, in part, "the dental objects being based from output of a scanning device."

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 1-30 under 35 U.S.C. § 101 is respectfully requested.

Claim Rejections – 35 USC § 102

Claims 1-7, 10, 12-18, 21, 23-25, and 27-29 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Chishti et al. (U.S. Pub No. 2004/0137400, hereinafter "Chishti '400").

Without conceding the merits of the rejection and solely to expedite prosecution and allowance of the application, Applicant has amended claims 1, 12, 23, and 27 to recite, in part, "perform a first modification . . ., the first modification comprising one or more of: delaying initial movement of the first dental object; slowing or stopping movement of the first dental

object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and round-tripping the first dental object," which the Examiners agreed would overcome the rejection of claims 7, 12, 23, and 27, in view of Chishti '511.

Dependent claims 2-6, 10, 13-18, 21, 24, 25, 28, and 29 are allowable for their dependence on one of allowable independent claims 1, 7, 12, 23, and 27, respectively, and on their own merits.

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 1-7, 10, 12-18, 21, 23-25, and 27-29 under 35 U.S.C. § 102(b) is respectfully requested.

Claim Rejections – 35 USC § 103

Claims 8, 9, 19, and 20 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chishti '400 in view of Chishti et al. (U.S. Patent No. 6,471,511, hereinafter "Chishti '511").

Dependent claims 8, 9, 19, and 20 are allowable for their dependence on one of allowable independent claims 7 and 12, respectively, and on their own merits.

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 8, 9, 19, and 20 under 35 U.S.C. § 103(a) is respectfully requested.

Claims 11, 22, 26, and 30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chishti '400, in view of Chishti '511, in further view of Phan et al. (U.S. Patent No. 6,309215, hereinafter "Phan").

Dependent claims 11, 22, 26, and 30 are allowable for their dependence on one of allowable independent claims 7, 12, 23, and 27, respectively, and on their own merits.

Moreover, Phan has not been shown to remedy the deficiencies of Chishti '400 and Chishti '511, as described above.

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 11, 22, 26, and 30 under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

Further, the Commissioner is hereby authorized to charge any additional fees or credit any overpayment in connection with this paper to Deposit Account No. 23-2415.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 206-883-2500.

Respectfully submitted,

Dated: July 3, 2018

/Charles Hagadorn, III/

Charles Hagadorn, III
Registration No. 62,367

WILSON SONSINI GOODRICH & ROSATI
650 Page Mill Road
Palo Alto, CA 94304-1050
Tel: 650-493-9300
Fax 650-493-6811

Electronic Acknowledgement Receipt	
EFS ID:	33081450
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Customer Number:	107046
Filer:	Charles C. Hagadorn III/Kevin Chance
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	22773-774.304
Receipt Date:	03-JUL-2018
Filing Date:	07-DEC-2017
Time Stamp:	14:25:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		22773-774-304_RespNFOA.pdf	54301 3ba6054a8f8b47fd8ed4aa95cd9797ab5e9ef53a	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	2
	Claims	3	10
	Applicant Arguments/Remarks Made in an Amendment	11	14
Warnings:			
Information:			
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 07/23/2018
WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3732	

NOTIFICATION DATE	DELIVERY MODE
07/23/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	15/834,608	KITCHING ET AL.	
	Examiner	Art Unit	
	MIRAYDA A. APONTE	3732	

All participants (applicant, applicant's representative, PTO personnel):

(1) *MIRAYDA A. APONTE*.

(2) *YOGESH PATEL (1er - EXAMINER)*.

(3) *CHARLES HAGADORN (Attorney)*.

(4) _____.

Date of Interview: *28 June 2018*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☒101 ☐112 ☒102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1-30*.

Identification of prior art discussed: *Chishti et al. (US 2007/013740 A1) and Chishti et al (US 6471511 B1)*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/MIRAYDA A. APONTE/ Examiner, Art Unit 3732	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments:
- The attorney submitted and discussed the PTAB's decision denying institution of IPR2017-01829 of U.S. Patent 8,038,444, where both of the Chishti's referenses were used in the present rejections. It was informed that due to the analysis provided in the IPR, the interpretation given to the claims which was the motivation to use both references of Chishti will not be used in further rejections of the present case. However if in the instance that said references provide a description to any other steps and/or limitation added to the claims that as of today has not been jet introduced, the Office will use said referecences again in a rejection.
- Regarding the 101 rejections, it were explained some of the steps including instructions that are not linked to any device, therefore are considered to be an abstract idea. The attorney understood and will amend the claims as discussed.
- No final agreement was reached at this time. The attorney will submitt a set of amended claims for examintation based on the discussion.

Trials@uspto.gov
571-272-7822

Paper No. 10
Entered: February 5, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CLEARCORRECT OPERATING LLC,
Petitioner,

v.

ALIGN, INC.,
Patent Owner.

Case IPR2017-01829
Patent 8,038,444

Before JOSEPH A. FISCHETTI, KEVIN TURNER and JOSIAH C. COCKS, *Administrative Patent Judges.*

FISCHETTI, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108(a)

I. INTRODUCTION

A. Summary

ClearCorrect Operating LLC ("Petitioner") filed a Petition (Paper 1, "Pet.") to institute an *inter partes* review of claims 1–42 of U.S. Patent No. 8,038,444 (Ex. 1001, "the '444 patent"). Align, Inc., ("Patent Owner") filed a Preliminary Response (Paper 7, Prelim. Resp.) on November 10, 2017.

An *inter partes* review may not be instituted unless the information presented in the Petition shows "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). For the reasons set forth below, we conclude that the information presented in the Petition fails to establish a reasonable likelihood that Petitioner will prevail in showing the unpatentability of at least one of claims 1–42 of the '444 patent. Accordingly, we do not institute an *inter partes* review as to those claims.

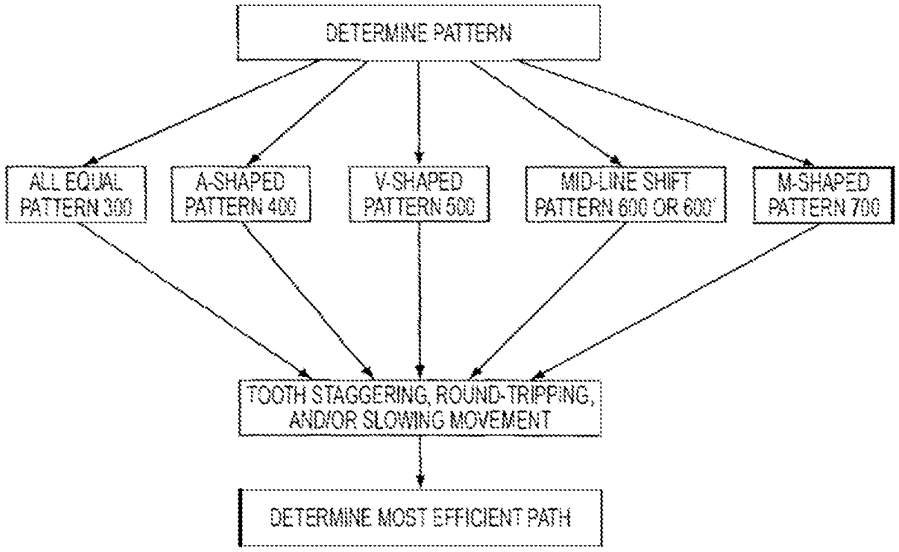
B. Related Matters

The parties do not identify any cases pending in District Court, nor any related U.S. Patent which is the subject of post-grant proceedings. Pet. 2; Paper 4, 1. Patent Owner does identify an issued U.S. Patent and pending U.S. Patent Applications as related. Paper 4, 1.

C. The '444 patent

The '444 patent is titled "AUTOMATED TREATMENT STAGING FOR TEETH." Ex. 1001, (Title). The '444 patent describes the invention as "systems, and methods for automated staging of teeth, from an initial position to a final, corrected position." *Id*. at 2:6–8. The '444 Patent explains that, "[d]epending upon the particular needs of the patient, the

patient's teeth are scheduled to move according to various movement patterns, routes, rates, and/or distances; and the need for utilizing tooth staggering, round-tripping, and/or slowing techniques." *Id.* at 2:8–12. Figure 2B of the '444 patent is reproduced below showing a flow diagram illustrating a plurality of patterns and options for optimizing the movement of a patient's teeth during treatment.



D. Illustrative Claims

Of the challenged claims, claims 1, 15, and 29 are independent. Claims 2–14 ultimately depend from claim 1, claims 16–28 ultimately depend from claim 15, and claims 30–42 ultimately depend from claim 29. Claims 1, 15, and 29 are reproduced below:

> 1. A computer-implemented method for staging the movement of a plurality of dental objects, the method comprising:
>
> receiving, at a host computer, an electronic representation of

each dental object of the plurality of dental objects in relation to one another;

receiving, by the host computer, an electronic representation of a desired final position for each respective dental object; and

determining, by the host computer, an order of movement for each respective dental object such that the dental objects avoid colliding with or obstructing each other on their respective routes from said initial position to said desired final position through at least one of staggering and round-tripping of at least one dental object.

15. A system for staging the movement of a plurality of dental objects, the system comprising:

means for receiving an electronic representation of each dental object of the plurality of dental objects in relation to one another; means for receiving an electronic representation of a desired final position for each respective dental object; and

means for determining an order of movement for each respective dental object such that the dental objects avoid colliding with each other on their respective routes from said initial position to said desired final position.

29. A machine-readable medium having stored thereon a plurality of instructions for staging the movement of a plurality of dental objects, the plurality of instructions when executed by a processor, causing the processor to:
receive an electronic representation of each dental object in relation to one another in an initial position;

receive an electronic representation of a desired final position for each respective dental object; and

determine an order of movement for each respective dental object such that the dental objects avoid colliding with each other on their respective routes from said initial position to said desired final position.

Id. at 15:38–51, 17:49–60.

E. The Prior Art

Petitioner relies on the following prior art references:

Reference	Issue Date	Exhibit No.
U.S. Patent No. US 6,729,876 issued to Chishti et al. ("Chishti '876")	May 4, 2004	1004
U.S. Patent No. 6,471,511 issued to Chishti et al. ("Chishti '511")	Oct. 29, 2002	1005

F. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–42 under 35 U.S.C. § 103 as unpatentable over Chishti '876 either alone or in combination with Chishti '511. Pet. 20, 44.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, a claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Nonetheless, if the specification "reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor's lexicography

governs." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc) (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)).

In its Petition, Petitioner states that the '444 patent explicitly defines the claim terms "staggering" and "round tripping". Pet. 16, 17. Petitioner, cites to column 12, lines 44–48 of the '444 patent (Pet. 16), for the explicit definition for "staggering" as:

> *delaying one or more teeth from moving one or more stages where it would otherwise move in order to prevent another tooth from colliding with and/or obstructing the path of the delayed tooth.*

Ex. 1001, 12:44–48.

Petitioner, cites to column 12, lines 51–55 of the '444 patent (Pet. 17), for the explicit definition of "round tripping" as:

> *moving a first tooth out of the path of a second tooth, and once the second tooth has moved sufficiently, moving the first tooth back to its previous position before proceeding to a desired final position of that first tooth.*

Ex. 1001, 12:51–55.

Petitioner also makes reference to the Declaration of Dr. James Mah. (Pet. 17, *citing* Ex. 1003, ¶¶ 72–73, 81–85) concerning the claim terms "staggering" and "round tripping," and concludes that a person of ordinary skill in the art would understand "staggering" and "round tripping" to refer to the explicit definitions set forth in the '444 patent.

On the record before us, and for purposes of this Decision, we apply the explicit definitions for the terms "staggering" and "round tripping," as defined in the '444 patent.

Independent claim 15 and dependent claims 16–28 are system claims. Petitioner contends claims 15–28 contain means-plus-function limitations, invoking 35 U.S.C. § 112, ¶ 6. *Id.* at 18. Petitioner states that the structure corresponding to the recited means is found in the '444 patent at 3:42–52, 4:42–5:28, 5:40–41, 6:17–20, 6:27–38, 7:12–14, 12:57–59. *Id.* at 19. But, independent claim 15 contains three distinct elements each described using means–plus–function language. Petitioner states only generally what it considers as pertinent sections of the '444 patent in a single blanket listing, without deference to each separately recited claimed function. *See id.*

The required content of a Petition is set forth in 37 C.F.R. § 42.104. In particular, 37 C.F.R. § 42.104 (b)(3) is reproduced below:

> (3) How the challenged claim is to be construed. Where the claim to be construed contains a means-plus-function or step-plus-function limitation as permitted under 35 U.S.C. 112(f), the construction of the claim must identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function[.]

Based on the record before us, we find Petitioner's statements concerning claims 15–28 insufficient to identify the specific portions of the specification of the '444 patent that describe the structure, material, or acts corresponding to each claimed function as required by 37 C.F.R. § 42.104 (b)(3). Accordingly, Petitioners have failed to properly construe the means-plus-function terms, and thus have failed to demonstrate adequately how challenged claims 15–28 are to be construed. Therefore, we deny the Petitioner's request to institute *inter partes* review for claims 15–28. *See id.*

Petitioner and Patent Owner propose contrasting interpretations of the claim 1 limitation, "through at least one of staggering and round-tripping of at least one dental object." Petitioner contends that the limitation, determining an order of movement "through at least one of staggering and round-tripping of at least one dental object," is met by the "disclosure of either staggering or round-tripping . . . ." Pet. 18. Patent Owner cites to *SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 886 (Fed. Cir. 2004) for its contention that "the 'at least one of' preceding the 'staggering and round-tripping' connotes a conjunctive list rather than a disjunctive list." Prelim. Resp. 8. We determine that the claims in *SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 886 (Fed. Cir. 2004) are distinguishable from claims 1–14 of the '444 patent because first, the claim construction in *SuperGuide* was fact specific. *Cf. Rowe Int'l Corp. v. Ecast, Inc.* 500 F. Supp. 2d 891, 909 (N.D. Ill. 2007). Second, claim 1 in *SuperGuide Corp.* used means-plus-function language[1] which requires corresponding structure for the full algorithm, and thus a computer configured to effect the claimed functions would need to be programmed for both options. When 35 U.S.C. § 112, ¶ 6 is invoked, the corresponding computer structure must be a "special purpose computer programmed to perform the disclosed algorithm." *WMS Gaming Inc. v. Int'l Game Tech.*,

[1] Claim 1 of U.S. Patent 5,038,211 (one of *SuperGuide*'s patents in suit) recites in pertinent part "means for receiving television program schedule information, said television program schedule information comprising at least one of program start time, program end time, program service, and program type for a plurality of television programs; … ."

184 F.3d 1339, 1349 (Fed. Cir. 1999), (citing *In re Alappat*, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (en banc)).

In contrast, the process claim 1 in the '444 patent is a series of steps for staging the movement of a plurality of dental objects which we construe as being accomplished by one of "staggering" and "round-tripping." Our construction here is consistent with the '444 patent's Specification describing that teeth "may be 'staggered,' 'round-tripped,' *and/or* slowed." Ex. 1001, *see* col., 9, ll. 31–33, col. 10, ll. 40–41 (emphasis added).

At this time, we determine that it is not necessary to construe expressly any other claim term of the '444 patent. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.").

B. Alleged Obviousness

1. Overview of Chishti '876

Chishti '876 is titled "TOOTH PATH TREATMENT PLAN." Ex. 1004 at [54]. Chishti '876's Figure 7 is reproduced below.

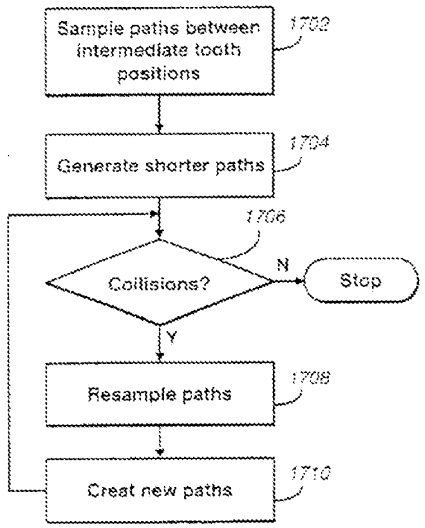


FIG._7

Figure 7 above depicts a flowchart of a process for optimizing a collision-free path of a tooth from an initial position to a final position. *Id.* at 5:51–52; 14:25–27. Sampling each path occurs at two points (step 1704) between treatment steps (1702) and, for each tooth, a calculation is made for a more linear treatment path that fits among the sample points (step 1704). *Id.* at 14:30–34. A collision detection algorithm is applied to determine whether collisions result from the altered paths (step 1706). *Id.* at 14:34–36. In the event that collisions result from the altered paths, the altered paths (step 1708) are resampled and then alternative paths are constructed (step 1710). *Id.* at 14:36–39. This process continues in this manner until no collisions occur (step 1712). *Id.* at 14:39–40.

In some embodiments,

> a path scheduling algorithm … determines the rate at which each component, i.e., each tooth, moves along the path from 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.

Id. at 14:43–51.

2. Discussion—Obviousness over Chishti '876 taken alone

Independent claim 1 of the '444 patent is drawn to a method for staging the movement of a plurality of dental objects, the method including the step of:

> determining, by the host computer, an order of movement for each respective dental object such that the dental objects avoid colliding with or obstructing each other on their respective routes from said initial position to said desired final position through at least one of staggering and round-tripping of at least one dental object.

Petitioner alleges that Chishti '876 discloses all the features of claim 1. Pet. 20–44. Petitioner also relies on the declaration testimony of Dr. James Mah. *Id*. at 26–27, 31, 34–36 (citing Ex. 1003). Petitioner advances that the treatment plan in Chishti '876 can incorporate both "staggering and "round tripping." Pet. 21 (citing Ex. 1004, 11:59–60, 14:46–51).

Patent Owner, however, contends that Chishti '876 explicitly teaches away from "round tripping," citing the disclosure in Chishti '876 that the treatment path avoids "round tripping." Prelim. Resp. 53 (citing Ex. 1004, 14:46–50). Additionally, Patent Owner argues that "round tripping" motion is highly undesirable. Prelim. Resp. 53 (citing Ex. 1004, 14:50–51). We are persuaded that Patent Owner's position is correct because Chishti '876 uses the terms "while avoiding" and "highly undesirable" in connection with the use of "round tripping," so that Chishti '876 sufficiently discourages the practice of "round tripping" enough to teach away from that practice. *See*

United States v. Adams, 383 U.S. 39, 52 (1966).

Independent claim 1 alternatively requires "staggering." *See* Section II. A. To meet this limitation, Petitioner relies on Chishti '876's disclosure of, "[t]he algorithm then resorts to less direct routes to the final positions only if collisions will occur," and "[c]onsiderations on when a tooth may be moved include…which teeth need to be moved before others are moved." Pet. 26 (citing Ex. 1004, 14:55–58, 11:43–60). Petitioner then attempts to extrapolate from Chishti '876's general teachings, arguing that a person of ordinary skill in the art would have understood them to be the equivalent of "staggering" as defined in the '444 patent. Pet. 26–27 (citing Ex. 1003 ¶¶ 72–73).

We are unpersuaded by Dr. Mah's testimony that one of ordinary skill in the art would have understood the above-noted disclosure in Chishti '876 to be equivalent to the '444 patent's explicit definition of "staggering." Although Chishti '876 generally contemplates consideration of the order in which teeth are to be moved, Chishti '876 fails to disclose the specific act of "*delaying* one or more teeth from moving one or more stages where it would otherwise move in order," which is a requirement of "staggering" as defined by the '444 patent. More particularly, Chishti '876 is silent as to any consideration of purposefully "delaying" the movement of a tooth from where it otherwise would move, and Dr. Mah's testimony fails to explain why this missing disclosure would be known by ordinarily skilled artisans. In fact, Dr. Mah's testimony ultimately uses the words of the '444 patent definition (*see* Ex. 1003 ¶ 73) to define "staggering" without regard to the general teachings cited by Petitioner from Chishti '876.

With regard to independent claim 29, Petitioner's assertions of

unpatentability simply reference the arguments made for independent claim 1.[2] Pet. 40. Independent claims 1 and 29 differ in scope from one another.[3] Because the determining steps of claims 1 and 29 are substantially different from one another, and because Petitioner applies the same citations and arguments made for claim 1, Petitioner fails to specify where each element of claim 29 is found in the prior art patent relied upon. *See* 37 CFR § 42.104 b(4).

3. Overview of Chishti '511

Chishti '511 is titled "DEFINING TOOTH-MOVING APPLIANCES COMPUTATIONALLY." Ex. 1005 at [54]. Chishti '511's Figure 5A is reproduced below.

[2] Petitioner also cites to Chishti '876 at column 23, lines 7–32, but this section only discloses system specific device parts, e.g., storage medium, processor, input/output devices, etc., which do not further disclose features of the determining step of claim 29.

[3] Independent claim 29 does not require "through at least one of staggering and round-tripping" but instead recites instructions to "determine an order of movement for each respective dental object such that the dental objects avoid colliding with each other on their respective routes from said initial position to said desired final position."

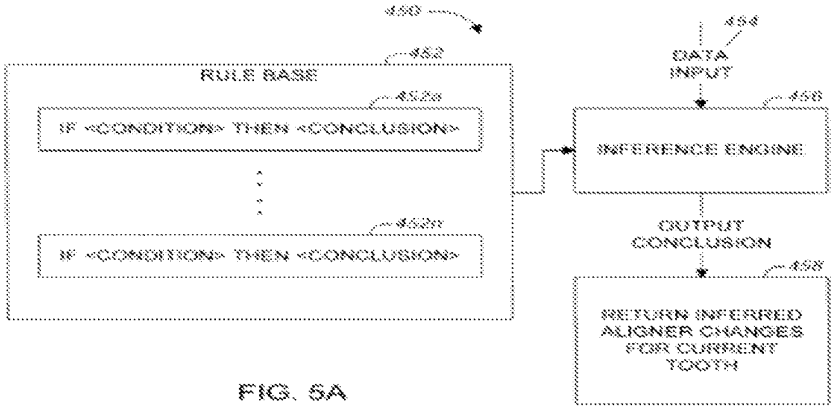


FIG. 5A

Figure 5A above illustrates an implementation of computing an aligner change in a region of a current tooth (step 450). *Id*. at 7:23–25. A rule-based inference engine 456 is used to process input data 454 and a set of rules 452a–452n in a rule base of rules 452. *Id*. at 7:24–27. The result is a production system which acts on the factual input data and produces a set of output conclusions which specify the changes to be made to the aligner in the region of the current tooth (output 458). *Id*. at 7:28–32.

4. Discussion—Obviousness over Chishti '876 in view of Chishti '511

In the Petition, Petitioner alleges where it believes all of the features of claim 1 are accounted for based on the teachings of Chishti '876 and Chishti '511. Pet. 47–50. Petitioner also relies on the declaration testimony of Dr. Mah for claim 1 and other claims. *Id*. at 50, 53–58 (citing Ex. 1003). Petitioner relies on Chishti '511 to meet the claimed "round tripping" feature. *Id*. at 50. Petitioner acknowledges that "Chishti '511 describes 'round-tripping' differently than the '444 patent (compare Ex.1005, 4:13–16,

with Ex. 1001, 12:51–55) . . . ."[4] *Id.* Petitioner, however, then attempts to extrapolate from Chishti '511's definition of "round tripping" to arrive at the '444 patent's definition. Pet. 50 (citing Ex. 1003 ¶¶ 81–85). Petitioner concludes that a person of ordinary skill in the art would have understood "that, as used in the field of orthodontics, round-tripping is a broad concept related to moving one tooth more than required, and moving it back again, in order to accommodate the movement of a second tooth." *Id.*

Assuming arguendo, that Dr. Mah's statement is correct, i.e., that generally "'the concept of round tripping' has been described and applied to a number of scenarios involving undesirable tooth movements" (Ex. 1003 ¶ 85), this does not and cannot obviate the explicit definition of "round tripping" which the '444 patent specifies, Petitioner acknowledges, and we have adopted. *See Hoechst Celanese Corp. v. BP Chems. Ltd.,* 78 F.3d 1575, 1578 (Fed. Cir. 1996). Petitioner admits the claim terms "round tripping" and "staggering" are entitled to their respective explicit definitions. *See* Pet. 16, 17. The '444 patent explicitly and clearly defines "round tripping," and thus the term speaks for itself.[5] *See Hoechst Celanese Corp.* 78 F.3d 1575, 1578. Dr. Mah's statements regarding round tripping in general do not contradict this explicit definition of "round tripping,"[6] but in

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[4] The '511 patent states: "Round-tripping is any motion of a tooth in any direction other than directly toward the desired final position." Ex. 1005, 4:13–16.

[5] The '444 patent issued by first action allowance without any file history except for an Examiner's Reasons for Allowance, which only restates the pertinent language of claim 1. *See* Ex. 3001.

[6] *See* Section II.A.

fact actually describe it in much the same way as in the '444 patent's definition. *See* Ex. 1003 ¶ 82. Yet, as we note above, the record reflects that the "round tripping" described in Chishti '511 is something different than the "round tripping" required by the '444 patent.

Independent claim 1 alternatively requires "staggering." *See* Section II. A. To meet this limitation, Petitioner again relies on Chishti '876's disclosure and references the arguments advanced by its case for unpatentability over Chishti '876 alone. *See* Pet. 50. For the same reasons we found these arguments unpersuasive above, they are likewise unpersuasive for this ground.

As discussed above, independent claims 1 and 29 differ in scope from one another. Once again, with regard to independent claim 29, Petitioner's assertions of unpatentability reference the same arguments made for independent claim 1.[7] Pet. 40. Petitioner has, thus, failed to show how the construed claim is unpatentable under the statutory grounds since the determining step of claim 29 is substantially different from the corresponding step in claim 1. Thus, Petitioner fails to specify where each element of claim 29 is found in the prior art patent relied upon. *See* 37 CFR § 42.104 (b)(4).

We conclude that Petitioner has failed to present a credible basis for concluding that all of the features of claims 1, 15, and 29 are accounted for

[7] Petitioner also cites to Chishti '511 (Pet. 63 (citing Ex. 1005, 2:34–39, 3:36–39, 10:19–51)), but these sections of Chishti '511 only disclose system specific device parts, e.g., computer program product, computer medium, conventional digital computer, etc., which do not further disclose features of the determining step of claim 29.

in the teachings of Chishti '876 alone or in view of Chishti '511. In light of our review of the record before us, we determine that Petitioner has not demonstrated a reasonable likelihood of establishing that claims 1, 15, and 29, and claims ultimately dependent on those claims, are unpatentable based on Chishti '876 taken alone or, alternatively, taken in combination with Chishti '511. Thus, we determine that Petitioner has not demonstrated a reasonable likelihood that "at least 1 of the claims challenged in the petition" is unpatentable. *See* 35 U.S.C. § 314(a).

III. CONCLUSION

Having evaluated the Petition, its underlying supporting evidence, and Patent Owner's Preliminary Response, we determine that Petitioner has not shown a reasonable likelihood that any of claims 1–42 of the '444 patent are unpatentable.

IV. ORDER

It is

ORDERED that the Petition is *denied*; and

FURTHER ORDERED that that no trial or *inter partes* review is instituted for any claims of the '444 patent on any ground presented in this proceeding.

PETITIONER:

Scott McKeown
Gabrielle Higgins
ROPES & GRAY LLP
Scott.mckeown@ropesgray.com
Gabrielle.higgins@ropesgray.com

PATENT OWNER:

Robert Greene Sterne
Jason D. Eisenberg
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
rsterne-PTAB@skgf.com
jasone-PTAB @skgf.com

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/834,608	Filing Date 12/07/2017	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **07/03/2018**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0	X $100 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $460 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
ANNETTE COWAN

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 11/05/2018

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3772	

NOTIFICATION DATE	DELIVERY MODE
11/05/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

PTOL-90A (Rev. 04/07)

Office Action Summary	**Application No.** 15/834,608	**Applicant(s)** Kitching et al.	
	Examiner MIRAYDA A APONTE	**Art Unit** 3772	**AIA Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 03 July 2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-30 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-7,10-18 and 21-30 is/are rejected.

8) ☑ Claim(s) 8-9 and 19-20 is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Specification

2. The amended specification was received on 3 July 2018. This amended specification is acceptable.

Claim Rejections - 35 USC § 101

3. **35 U.S.C. 101** reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claims 27-30** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because claimed invention is not patent eligible subject matter by identifying what the claims are directed to and explain why it does not fall within at least one of the four categories of patent eligible subject matter recited in 35 U.S.C. 101 (process, machine, manufacture, or composition of matter), e.g. the claimed invention is directed to a judicial exception of an abstract idea without significantly more.

5. **Claims 27-30** are directed to a non-transitory computer-readable medium including instructions executed by one or more computer processors. The claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the claimed invention does not include from where the

movement pattern from a plurality of movement patterns is the method selecting for moving the dental objects from the initial arrangement toward the final arrangement, what device is used for selecting the movement patter, how and what device is used to input the previous selection of calculating a respective treatment path, identifying a collision and performing a first modification of the schedule of movement, and what device is used for recalculate the respective treatment path for at least one of the dental objects, or how and what device is used to produce a series of orthodontic appliances based at least on the modified schedule of movement. Therefore due to the claims do not include any device that provides any of the claimed steps, it is considered that the claims are directed to an abstract idea of identifying the movement patterns for dental objects from an initial arrangement toward a final arrangement which "is not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving methods of organizing human activity [792 F.3d. at 1367-68, 115 USPQ2d at 1640; *In re Meyer,* 688 F.2d 789, 791-93, 215 USPQ 193, 194-96 (CCPA 1982); *Synopsys, Inc. v. Mentor Graphics Corp.,* 839 F.3d 1138, 120 USPQ2d 1473 (Fed. Cir. 2016); *Electric Power Group, LLC v. Alstom, S.A.,* 830 F.3d 1350, 1351-52, 119 USPQ2d 1739, 1740 (Fed. Cir. 2016)].

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. **Claims 1-6, 10, 12-17, 21, 23-25 and 27-29 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Chishti et al. (US 2004/0137400 A1)**.

8. **Regarding claim 1**, Chishti et al. discloses a method including selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"), the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position; calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions ([0131-0133]); identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); and performing, by a computer processor, a first modification of the schedule of movement in response to the identifying ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position*"; and [0131] – "*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 first modification including delaying initial movement of the first dental object; slowing movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*", [0053] – "*Often, only certain one(s) of the teeth will be repositioned while others of the teeth will provide a base or an anchor region for holding the appliance 111 in place as the appliance 111 applies a resilient repositioning force against the tooth or teeth to be repositioned. In complex cases, however, multiple teeth may be repositioned at some point during the treatment. In such cases, the teeth which are moved can also serve as a base or anchor region for holding the repositioning appliance*", and [0097-0113]).

9. **Regarding claim 2,** Chishti et al. discloses that wherein the movement pattern is selected by a user. ([0021] – "*than one candidate treatment path for each tooth can be generated and graphically displayed for each candidate treatment path to a human user for selection.*")

10. **Regarding claim 3**, Chishti et al. discloses that the selecting includes analyzing, by a computer processor, the dental objects in their respective initial and final positions. ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth*

treatment patterns; and generating the malocclusion treatment plan implementing the selected tooth treatment pattern" and [0090] - "*At each stage, major and minor tooth movements are analyzed*")

11. **Regarding claim 4**, Chishti et al. discloses that wherein the analyzing includes determining, by a computer processor, a respective distance needed to move each of the dental objects from its respective initial position to its respective final position. [0021]

12. **Regarding claim 5**, Chishti et al. discloses that further includes determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

13. **Regarding claim 6,** Chishti et al. discloses that it further includes determining, by a computer processor, that the second modification does not avoid a collision between the first and second dental objects; and performing, by a computer processor after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object. [0021]

14. **Regarding claim 10,** Chishti et al. discloses that it further includes 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. [0201]

15. **Regarding claim 12**, Chishti et al. discloses a non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to [0015]: select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculate a respective treatment path for each of the dental objects between its respective initial an final positions [0131-0133]; identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); and perform a first modification of the schedule of movement in response to the identifying, the first modification comprising: delaying initial movement of the first dental object ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move,*

possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position"; and [0131] – "*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)"*); slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or round-tripping the first dental object ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*", [0053] – "*Often, only certain one(s) of the teeth will be repositioned while others of the teeth will provide a base or an anchor region for holding the appliance 111 in place as the appliance 111 applies a resilient repositioning force against the tooth or teeth to be repositioned. In complex cases, however, multiple teeth may be repositioned at some point during the treatment. In such cases, the teeth which are moved can also serve as a base or anchor region for holding the repositioning appliance*", and [0097-0113]).

16. **Regarding claim 13,** Chishti et al. discloses that wherein the movement pattern is selected by a user. ([0021] – "*than one candidate treatment path for each tooth can be generated and graphically displayed for each candidate treatment path to a human user for selection.*")

17. **Regarding claim 14,** Chishti et al. discloses that wherein the selecting comprises analyzing the dental objects in their respective initial and final positions. ([0012] –

"*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns; and generating the malocclusion treatment plan implementing the selected tooth treatment pattern*" and [0090] - "*At each stage, major and minor tooth movements are analyzed*")

18. **Regarding claim 15,** Chishti et al. discloses that wherein the analyzing includes determining a respective distance needed to move each of the dental objects from its respective initial position to its respective final position. [0021]

19. **Regarding claim 16,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and perform, after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping the movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

20. **Regarding claim 17,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the second modification does not avoid a collision between

the first and second dental objects; and perform, after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object moved. [0021]

21. **Regarding claim 21,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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. [0201]

22. **Regarding claim 23,** Chishti et al. discloses method including selecting a movement pattern from a plurality of movement patterns for moving the patient's teeth from the initial arrangement toward the final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions ([0131-0133]); identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"; performing, by a computer processor, a first modification of the schedule of movement in response to the identifying ([0115] – "*If the user specifies two*

key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position"; and [0131] – "*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 first modification including delaying initial movement of the first dental object; slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)*"), [0053] – "*Often, only certain one(s) of the teeth will be repositioned while others of the teeth will provide a base or an anchor region for holding the appliance 111 in place as the appliance 111 applies a resilient repositioning force against the tooth or teeth to be repositioned. In complex cases, however, multiple teeth may be repositioned at some point during the treatment. In such cases, the teeth which are moved can also serve as a base or anchor region for holding the repositioning appliance*", and [0097-0113]; and recalculating, by a computer processor after the performing, the respective treatment path for at least one of the dental objects ([0131] – "*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").

23. **Regarding claim 24,** Chishti et al. discloses that it further includes determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising: slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved [0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

24. **Regarding claim 25,** Chishti et al. discloses that it further includes 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. [0201]

25. **Regarding claim 27,** Chishti et al. discloses a non-transitory computer-readable medium including instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to [0015]: select a movement pattern from a plurality of movement patterns for moving the patient's teeth from an initial arrangement toward a final arrangement, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as

each of the dental objects moves from a respective initial position toward a respective final position ([0012] – "*computer-implemented method to prepare a malocclusion treatment plan includes selecting a tooth treatment pattern from a library of predetermined tooth treatment patterns*"); calculate a respective treatment path for each of the dental objects between its respective initial and final positions [0131-0133]; identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths ([0131] – "*program then samples each spline curve between the intermediate positions (step 1604) and applies the collision detection algorithm to the samples (step 1606)*"); perform a first modification of the schedule of movement in response to the identifying, the first modification comprising: delaying initial movement of the first dental object ([0115] – "*If the user specifies two key frames for that component, the component will "move" linearly from the initial position through different stages to the position defined by the first key frame. It will then move, possibly in a different direction, linearly to the position defined by the second key frame. Finally, it will move, possibly in yet a different direction, linearly to the target position*"; and [0131] – "*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)"*); slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; or round-tripping the first dental object ([0116] – "*One component may accelerate along a curve between one pair of stages (e.g., stages 3 and 8 in a treatment plan having that many 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)"), [0053] – "*Often, only certain one(s) of the teeth will be repositioned while others of the teeth will provide a base or an anchor region for holding the appliance 111 in place as the appliance 111 applies a resilient repositioning force against the tooth or teeth to be repositioned. In complex cases, however, multiple teeth may be repositioned at some point during the treatment. In such cases, the teeth which are moved can also serve as a base or anchor region for holding the repositioning appliance*", and [0097-0113]; and recalculate, after the performing, the respective treatment path for at least one of the dental objects ([0131] – "*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*").

26. **Regarding claim 28,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to: determine that the first modification does not avoid a collision between the first and second dental objects ([0021] – "*determining that a collision occurs if any of the pair of signed distances indicates a collision*"); and perform, after the determining, a second modification of the schedule of movement, the second modification comprising: slowing or stopping movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved 0116]. (Fig. 3 – step element 206 - "*generate multiple intermediate digital data sets corresponding to successive tooth arrangements from initial to final*", therefore if it generate multiple data sets for each incremental movement it will verify all the parameters for a proper non-collision movement and adjustment.)

27. **Regarding claim 29,** Chishti et al. discloses that wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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. [0201]

Claim Rejections - 35 USC § 103

28. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

29. **Claims 11, 22, 26 and 30 are rejected under 35 U.S.C.103(a) as being unpatentable over Chishti et al. (US 2004/0137400 A1) aka Chishti ('400), in view of Chishti et al. (US 6471511 B1) aka Chishti ('511), in further view of Phan et al. (US 6309215 B1)**.

Chishti ('400) discloses the claimed invention substantially as claimed, as set forth above for claim 1. However Chishti ('400) does not disclose that wherein the producing includes fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

Chishti ('511) teaches the producing includes fabricating a respective positive mold of the dental objects for at least two of the treatment stages (col. 9, ln 43-47), and that it is used a polymeric material over a positive physical model. However they are silenced disclosing thermoforming the respective one of the orthodontic appliances over each of the respective positive molds.

Phan et al. teaches that the orthodontic appliance is of a thermoformable polymer material (col. 2, line 26-46). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the Chishti ('400)/ Chishti ('511)'s orthodontic appliance, to the Phan's thermoformable polymer material, in order to provide an orthodontic appliance with the stiffness from the polymeric material to impart a resilient repositioning force against one or a portion of the remaining teeth.

Allowable Subject Matter

29. **Claims 8, 9, 19 and 20** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

30. **The allowability of the subject matter of round-tripping is limited to the definition of said term found as the specification;**

a. **"Round-tripping"** is the technique of moving a first tooth out of the path of a second tooth, and once the second tooth has moved sufficiently, moving the first tooth back to its previous position before proceeding to a desired final position of that first tooth.

Response to Arguments

31. Regarding the use of prior arts of Chishti ('511) and Chishti ('400), the prior art discussed in the Inter-Parties Review (IPR2017-01829 of U.S. Pat 803844) has been considered. The Chishti ('511)'s definition for the terms "round-tripping" and "slowing" has not been used in the present rejection. However the used prior art includes other elements and limitations that where not in question in the IPR, therefore Chishti ('511) and Chishti ('400) have been used in the present rejection. Therefore the 102(b) rejections are maintained due to Chishti ('400)'s was not in issue in the Inter-Parties Review, and the amendment does not change the interpretation of the claims, making the claimed elements been found in Chishti ('400)'s.

32. Regarding 103(a) rejection for claims 11, 22, 26 and 30, the rejection is maintained in addition to previously indicated on Chishti ('400), the elements found in Chishti ('511) are not related to the definition of the terms in issue. Therefore due to most of the claimed elements are found in Chishti ('400) and Chishti ('511), it is understood that at this point in prosecution the claims are not ready for allowance.

Conclusion

33. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

34. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension

fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

35. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIRAYDA ARLENE APONTE whose telephone number is (571)270-1933. The examiner can normally be reached on M-F 8-5.

36. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

37. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cris Rodriguez can be reached on 571-272-4964. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

38. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MIRAYDA A APONTE/
Examiner, Art Unit 3772

/HEIDI M EIDE/
Primary Examiner, Art Unit 3772
10/30/2018

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/26/2018	10/27/2018							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	O							
	9	✓	O							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	O							
	20	✓	O							
	21	✓	✓							
	22	✓	✓							
	23	✓	✓							
	24	✓	✓							
	25	✓	✓							
	26	✓	✓							
	27	✓	✓							
	28	✓	✓							
	29	✓	✓							
	30	✓	✓							

ClearCorrect Exhibit 1002, Page 250 of 391

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

CPC - Searched*		
Symbol	Date	Examiner
A61C7/002, 00	3/24/2018	MA
A61C3/00	3/24/2018	MA
Updated search	10/27/2018	MA

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
433	24		
	Updated search	10/27/2018	MA

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

	/MIRAYDA A APONTE/ Examiner.Art Unit 3732

ClearCorrect Exhibit 1002, Page 251 of 391

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

Search Notes		
Search Notes	**Date**	**Examiner**
EAST search	3/24/2018	MA
Word search on orthodontic and (((move movement) near tooth) same$4 stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system, dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and ((thermo temperature) same form$3 mold$3) and polymer$3, ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3 and orthodontic	3/24/2018	MA
Updated search and dental and ("round-tripping" staggering), dental and (delaying with movement) and computer, dental and orthodontic and (move movement) and stagger$4 and "round-tripping" and (computer program code), dental and orthodontic and move$4 and stagger$4, dental and orthodontic and move$4 and stagger$4 and (digital computer), dental and orthodontic and (move$4 same (delay$4 stagger$4)) and (digital computer), dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth)) and (digital computer), dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth)), dental and orthodontic and (move$4 with (delay$4 stagger$4 hold$3 " slow down" wait) same (teeth tooth)), dental and orthodontic and (move $4 with (delay$4 stagger$4 "slow down" wait) same (teeth tooth)), orthodontic and (((move movement) near tooth) same stagger$4 same " round-tripping") and (colli$3 obstruct$3), orthodontic and (((move movement) near tooth) same (colli$3 obstruct$3)), orthodontic and (((move movement) near tooth) same (colli$3 obstruct$3)) and (computer digital), orthodontic and (((move movement) near tooth) same (delay colli $3 obstruct$3)) and (computer digital)	10/27/2018	MA

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

	/MIRAYDA A APONTE/ Examiner.Art Unit 3732

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S43	7	"13209276"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 08:16
S44	2	"14804153"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 08:46
S45	8	dental and orthodontic and (move movement) and stagger$4 and "round-tripping" and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 08:57
S46	8	dental and orthodontic and (move movement) and stagger$4 and "round-tripping"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:06
S47	8	dental and orthodontic and move$4 and stagger$4 and "round-tripping"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:07
S48	767	(align near technology).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:13
S49	79	S48 and "round-tripping"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:14
S50	36	S49 and (avoid$3 with "round-tripping")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:15
S52	43	S49 not S50	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:16
S53	1	("6471511").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/26 09:31
S55	120	dental and orthodontic and move$4 and	US-PGPUB;	OR	ON	2018/10/26

		stagger$4	USPAT; USOCR; FPRS; EPO; JPO			09:33
S54	3	S48 and staggering	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:33
S56	64	dental and orthodontic and move$4 and stagger$4 and (digital computer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:34
S57	10	dental and orthodontic and (move$4 same stagger$4) and (digital computer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:35
S58	91	dental and orthodontic and (move$4 same (delay$4 stagger$4)) and (digital computer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:41
S59	39	dental and orthodontic and (move$4 with (delay$4 stagger$4)) and (digital computer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:42
S60	14	dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth)) and (digital computer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:45
S61	20	dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:47
S62	670	dental and orthodontic and (move$4 with (delay$4 stagger$4 hold$3 "slow down" wait) same (teeth tooth))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:56
S63	50	dental and orthodontic and (move$4 with (delay$4 stagger$4 "slow down" wait) same (teeth tooth))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 09:58
S64	7	orthodontic and (((move movement) near tooth) same stagger$4 same "round-tripping") and (colli$3 obstruct$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 12:41
S65	73	orthodontic and (((move movement) near tooth) same (colli$3 obstruct$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 12:43
S66	62	orthodontic and (((move movement)	US-PGPUB;	OR	ON	2018/10/26

		near tooth) same (colli$3 obstruct$3)) and (computer digital)	USPAT; USOCR; FPRS; EPO; JPO			12:45
S67	81	orthodontic and (((move movement) near tooth) same (delay colli$3 obstruct$3)) and (computer digital)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/26 12:47
L2	52	L1 and dental and ((move movement) near tooth) same (pattern stagger$4 "round-tipping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/27 12:13
L1	8267	(A61C7/002 or A61C7/00 or A61C3/00).cpc. or (433/24).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2018/10/27 12:13

EAST Search History (Interference)

< This search history is empty>

10/ 27/ 2018 12:14:24 PM
C:\ Users\ maponte\ Documents\ EAST\ Workspaces\ 15086491.wsp

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From: PAIR_eOfficeAction@uspto.gov
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Nov 05, 2018 03:46:39 AM

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	CTFR	11/05/2018	22773-774.304

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WILSON SONSINI GOODRICH & ROSATI

By: /John Bereznak/

Attorney Docket No.: 22773-774.304
Align Ref. No.: 1004.US.C1.C2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 1210
Ian Kitching et al.	
Application No.: 15/834,608	Examiner: Mirayda Arlene Aponte
Filed: December 7, 2017	Art Unit: 3772
For: AUTOMATED TREATMENT STAGING FOR TEETH	AMENDMENT
Customer No.: 107046	

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

In response to the Final Office Action mailed November 5, 2018, please enter the following amendments and remarks.

Amendments to the Claims are reflected in the listing of claims beginning on page 2.

Remarks begin on page 9.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method comprising:

selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and

round-tripping the first dental object, wherein round-tripping comprises moving the first dental object away from the respective path of the second dental object and moving the first dental object toward its previous position.

2. (Original) The method of claim 1, wherein the movement pattern is selected by a user.

3. (Original) The method of claim 1, wherein the selecting comprises analyzing, by a computer processor, the dental objects in their respective initial and final positions.

4. (Original) The method of claim 3, wherein the analyzing comprises determining, by a computer processor, a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

5. (Original) The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages in which the first dental object moved.

6. (Original) The method of claim 5, further comprising:

determining, by a computer processor, that the second modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object.

7. (Original) The method of claim 1, further comprising:

determining, by a computer processor, that the first modification does not avoid a collision between the first and second dental objects; and

performing, by a computer processor after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

8. (Currently Amended) [[The]] A method ~~of claim 1, wherein the round-tripping comprises~~comprising:

selecting a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement coordinates

movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculating, by a computer processor, a respective treatment path for each of the dental objects between its respective initial and final positions;

identifying, by a computer processor, a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and

round-tripping the first dental object, wherein round-tripping comprises moving the first dental object away from the respective treatment path of the second dental object; and

moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

9. (Canceled)

10. (Original) 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.

11. (Original) The method of claim 10, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

12. (Currently Amended) A non-transitory computer-readable medium comprising instructions that, when executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial an final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and

round-tripping the first dental object, wherein round-tripping comprises moving the first dental object away from the respective treatment path of the second dental object and moving the first dental object toward its previous position.

13. (Original) The medium of claim 12, wherein the movement pattern is selected by a user.

14. (Original) The medium of claim 12, wherein the selecting comprises analyzing the dental objects in their respective initial and final positions.

15. (Original) The medium of claim 14, wherein the analyzing comprises determining a respective distance needed to move each of the dental objects from its respective initial position to its respective final position.

16. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising slowing or stopping the movement of the first dental object during at least one of the treatment stages following a previous one of the treatment stages during which the first dental object moved.

17. (Original) The medium of claim 16, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after determining that the second modification does not avoid a collision, a third modification of the schedule of movement, the third modification comprising round-tripping the first dental object moved.

18. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to:

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

perform, after the determining, a second modification of the schedule of movement, the second modification comprising round-tripping the first dental object.

19. (Currently Amended) ~~The medium of claim 12, wherein round-tripping comprises:~~ A non-transitory computer-readable medium comprising instructions that, when

executed by one or more computer processors, cause at least one of the one or more processors to:

select a movement pattern from a plurality of movement patterns for moving dental objects from an initial arrangement toward a final arrangement, the dental objects being based on output of a scanning device, the movement pattern defining a schedule of movement that coordinates movement of the dental objects during treatment stages as each of the dental objects moves from a respective initial position toward a respective final position;

calculate a respective treatment path for each of the dental objects between its respective initial an final positions;

identify a collision between a first of the dental objects and a second of the dental objects based at least on one of the respective treatment paths; and

perform a first modification of the schedule of movement in response to the identifying, the first modification comprising one or more of:

delaying initial movement of the first dental object;

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved; and

round-tripping the first dental object, wherein round-tripping comprises moving the first dental object away from the respective treatment path of the second dental object[[;]] and moving the first dental object toward its respective final position after the second dental object has sufficiently traversed its respective treatment path to avoid the collision.

20. (Canceled)

21. (Original) The medium of claim 12, wherein the instructions, when executed by the one or more processors, further cause at least one of the one or more processors to produce 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.

22. (Original) The medium of claim 21, wherein the producing comprises:

fabricating a respective positive mold of the dental objects for at least two of the treatment stages; and

thermoforming a respective one of the orthodontic appliances over each of the respective positive molds.

23-30. (Canceled)

ClearCorrect Exhibit 1002, Page 264 of 391

REMARKS

Upon entry of this amendment, claims 1-8, 10-19, 21, and 22 will be pending in the present application. Claims 9, 20, and 23-30 have been canceled without prejudice or disclaimer. Applicant reserves the right to pursue any canceled subject matter in a related, future application. Claims 1, 8, 12, and 19 have been amended. Support for the amendments can be found in the specification as originally filed. Accordingly, no new matter has been added. Reconsideration is respectfully requested.

Allowable Subject Matter

Applicant thanks the examiner for indicating that claims 8, 9, 19, and 20 are allowable, subject to being rewritten in independent form. Accordingly, solely to expedite allowance, Applicant has amended claim 8 into independent form, amended claim 1 (from which claim 8 depended) to include the subject matter of claim 9 in independent form, amended claim 19 into independent form, and amended claim 12 (from which claim 20 depended) to include the subject matter of claim 20 in independent form. Applicant respectfully submits that claims 1-8, 10-19, 21, and 22 are allowable.

Although the undersigned attorney agrees with the Examiner's conclusion that referenced claims are allowable, the undersigned attorney notes that the claims may be allowable for reasons other than those identified by the Examiner and does not concede that the Examiner's characterization of the terms of the claims and the prior art are correct.

Claim Rejections – 35 USC § 101

Claims 27-30 are rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter.

Without conceding the merits of the rejection and solely to expedite prosecution and issuance of a notice of allowance, Applicant has canceled claims 27-30 rendering the rejection moot.

Applicant respectfully requests withdrawal of the rejection of claims 27-30 under 35 U.S.C. § 101.

Claim Rejections – 35 USC § 102

Claims 1-6, 10, 12-17, 21, 23-25, and 27-29 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Chishti et al. (U.S. Pub No. 2004/0137400, hereinafter "Chishti '400").

Claims 23-30 have been canceled, rendering their rejection moot. As discussed above claims 1, 8, 12, and 19 have been amended to recite allowable subject matter. Claims 2-6, 10, 13-17, and 21 depend from one of allowable claims 1, 8, 12, and 19 and are therefore allowable for at least the same reasons as claims 1, 8, 12, and 19, and on their own merits.

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 1-6, 10, 12-17, 21, 23-25, and 27-29 under 35 U.S.C. § 102(b) is respectfully requested.

Claim Rejections – 35 USC § 103

Claims 11, 22, 26, and 30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chishti '400, in view of Chishti et al. (U.S. Patent No. 6,471,511, hereinafter "Chishti '511"), in further view of Phan et al. (U.S. Patent No. 6,309215, hereinafter "Phan").

Claims 26 and 30 have been canceled, rendering their rejection moot. Claims 11 and 22 depend from one of allowable claims 1, 8, 12, and 19 and are therefore allowable at least for their dependence on one of allowable claims 1, 8, 12, and 19 and on their own merits.

Accordingly, for the reasons set forth above, withdrawal of the rejection of claims 11, 22, 26, and 30 under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

Further, the Commissioner is hereby authorized to charge any additional fees or credit any overpayment in connection with this paper to Deposit Account No. 23-2415.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 206-883-2500.

Respectfully submitted,

Dated: February 5, 2019

/Charles Hagadorn, III/

Charles Hagadorn, III
Registration No. 62,367

WILSON SONSINI GOODRICH & ROSATI
650 Page Mill Road
Palo Alto, CA 94304-1050
Tel: 650-493-9300
Fax 650-493-6811

ClearCorrect Exhibit 1002, Page 267 of 391

Electronic Acknowledgement Receipt	
EFS ID:	35069000
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Customer Number:	107046
Filer:	Charles C. Hagadorn III/John Bereznak
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	22773-774.304
Receipt Date:	05-FEB-2019
Filing Date:	07-DEC-2017
Time Stamp:	20:16:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		22773774304Amendment.pdf	126413 c462c564b41366774d51058113f2b971a074953c	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	8
	Applicant Arguments/Remarks Made in an Amendment	9	11
Warnings:			
Information:			
	Total Files Size (in bytes):	126413	

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/834,608	Filing Date 12/07/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT	02/05/2019	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 4	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/POLIN ANG/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 03/06/2019

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3772	

NOTIFICATION DATE	DELIVERY MODE
03/06/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

PTOL-90A (Rev. 04/07)

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 15/834,608	**Applicant(s)** Kitching et al.	
	Examiner MIRAYDA A APONTE	**Art Unit** 3772	**AIA (FITF) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 05 February 2019 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☑ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☑ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: _____ (See 37CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicants reply has overcome the following rejection(s): _____
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☑ For purposes of appeal, the proposed amendment(s):(a)☑ will not be entered, or (b)☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☑ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:_____.
    Claim(s) objected to:8-9 and 19-20.
    Claim(s) rejected:1-7,10-18 and 21-30.
    Claim(s) withdrawn from consideration:_____.

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/HEIDI M EIDE/ Primary Examiner, Art Unit 3772

Continuation of REQUEST FOR RECONSIDERATION/OTHER 12. The request for reconsideration has been considered but does NOT place the application in condition for allowance because: Regarding claims 1, 8, 12 and 19, applicant has amendment the claims by adding at least that the first modification of the schedule of movement includes the round-tripping of the first dental object, based on the definition given in the specification. However the language used in all the independent claims includes that the first modification includes one or more of delaying, slowing or stopping and round-tripping. It is understood that the claims can be rejected using Chishti's prior art. Chishti's discloses to avoid collision of a dental object, the dental object can move through different stages and in different direction to finally reach the targeted position [0115]. It is the understanding of the Office that by moving through the different stages and in different direction the dental object slows down and stop in instances when changing direction when the dental object moves toward the targeted position. Therefore it is understood that the claims can be rejected under Chishti, by not positively claiming the round-tripping movement as defined in the specification. Therefore it is understood that the claims are not ready for allowance.

DO NOT ENTER: /M.A.A/
02/28/2019

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on February 5, 2019

WILSON SONSINI GOODRICH & ROSATI

By: /John Bereznak/

Attorney Docket No.: 22773-774.304
Align Ref. No.: 1004.US.C1.C2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 1210
Ian Kitching et al.	
Application No.: 15/834,608	Examiner: Mirayda Arlene Aponte
Filed: December 7, 2017	Art Unit: 3772
For: AUTOMATED TREATMENT STAGING FOR TEETH	AMENDMENT
Customer No.: 107046	

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

In response to the Final Office Action mailed November 5, 2018, please enter the following amendments and remarks.

Amendments to the Claims are reflected in the listing of claims beginning on page 2.

Remarks begin on page 9.

To: patentdocket@wsgr.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 107046

Mar 06, 2019 04:09:11 AM

Dear PAIR Customer:

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 107046 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	CTAV	03/06/2019	22773-774.304

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 04/15/2019

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3772	

NOTIFICATION DATE	DELIVERY MODE
04/15/2019	ELECTRONIC

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The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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PTOL-90A (Rev. 04/07)

Applicant-Initiated Interview Summary	**Application No.** 15/834,608	**Applicant(s)** Kitching et al.	
	Examiner MIRAYDA A APONTE	**Art Unit** 3772	**AIA (FITF) Status** No

All participants (applicant, applicants representative, PTO personnel):

(1) MIRAYDA ARLENE. APONTE.

(2) HEIDI EIDE (Prim Examiner).

(3) CHARLES HAGEDORN (Attorney).

(4) _____.

Date of Interview: 04 April 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☑Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1-30.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/HEIDI M EIDE/ Primary Examiner, Art Unit 3772

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: It was discussed that the claims 1, 8 , 12 and 19 even when it was added the allowable subject matter of round-tripping, the claims are not positively claiming the round-tripping as indicated previously. The claims include the language of " comprising one or more of: delaying...., slowing or stopping,.... and round-tripping". Therefore if the previous rejection includes prior arts disclosing delaying or slowing or stopping, even when the " round-tripping movement" is in the claims it can be rejected under the other movement options. The attorney understood and will do the appropriate modification in the claims to positively claim the allowable subject matter of round-tripping. No final agreement was reached at this time.

To: patentdocket@wsgr.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 107046

Apr 15, 2019 03:39:46 AM

Dear PAIR Customer:

WSGR / Align Technology , Inc.
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UNITED STATES

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	INTV.SUM.APP	04/15/2019	22773-774.304

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If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

PTO/AIA/31 (03-14)
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NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 22773-774.304

I hereby certify that this correspondence is being facsimile transmitted to the USPTO, EFS-Web transmitted to the USPTO, or deposited with the United States Postal Service with sufficient postage in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, on Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on May 3, 2019.

Signature /Bobby Aboulhosn/

Typed or printed name Bobby Aboulhosn

In re Application of: Ian Kitching et al.

Application Number	Filed
15/834,608	December 7, 2017

For: AUTOMATED TREATMENT STAGING FOR TEETH

Art Unit	Examiner
3772	Mirayda Arlene Aponte

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800

☐ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ _____

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ _____
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 23-2415.

☑ Payment made via EFS-Web.

☑ A petition for an extension of time under 37 CFR 1.136(a) (PTO/AIA/22 or equivalent) is enclosed.
For extensions of time in reexamination proceedings, see 37 CFR 1.550.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant

☑ attorney or agent of record
Registration number 62367

☐ attorney or agent acting under 37 CFR 1.34
Registration number _____

Signature /Charles Hagadorn, III/

Typed or printed name Charles Hagadorn, III

Telephone Number (206) 883-2537

Date May 3, 2019

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 41.20(b)(1) and 41.31. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15834608
Filing Date:	07-Dec-2017
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Filer:	Charles C. Hagadorn III/Bobby Aboulhosn
Attorney Docket Number:	22773-774.304

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
NOTICE OF APPEAL	1401	1	800	800
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1400	1400
Miscellaneous:				
		Total in USD ($)		**2200**

Electronic Acknowledgement Receipt	
EFS ID:	35917429
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Customer Number:	107046
Filer:	Charles C. Hagadorn III/Bobby Aboulhosn
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	22773-774.304
Receipt Date:	03-MAY-2019
Filing Date:	07-DEC-2017
Time Stamp:	18:11:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$2200
RAM confirmation Number	050619INTEFSW00005140232415
Deposit Account	232415
Authorized User	Bobby Aboulhosn
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	774_304_EOT.pdf	141208 3541c29b4d5adc344e29a994716b70c0035c37c4	no	2
Warnings:					
Information:					
2	Notice of Appeal Filed	774_304_NOA.pdf	241756 4cfda399b7f824e20b21e1bb4215dba5b21cf3d9	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32426 4d96a7287403c0e072d8a127cec828fda60607c1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	415390		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/22 (03-13)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 22773-774.304
Application Number 15/834,608	Filed December 7, 2017
For AUTOMATED TREATMENT STAGING FOR TEETH	
Art Unit 3772	Examiner Mirayda Arlene Aponte

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 1400
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 23-2415.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 62367.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Charles Hagadorn, III/ — Signature

May 3, 2019 — Date

Charles Hagadorn, III — Typed or printed name

(206) 883-2537 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/25 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION**
Application Number	15834608
Filing Date	07-Dec-2017
First Named Inventor	Ian Kitching
Attorney Docket Number	22773-774.304
Title of Invention	AUTOMATED TREATMENT STAGING FOR TEETH

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Align Technology, Inc.	100%

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

15834649 filed on 12/07/2017

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ○ Small Entity ○ Micro Entity ◉ Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 62367 ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this request	
Signature	/Charles Hagadorn, III/
Name	Charles Hagadorn, III

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal	
Application Number:	15834608
Filing Date:	07-Dec-2017
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Filer:	Charles C. Hagadorn III/Kevin Chance
Attorney Docket Number:	22773-774.304
Filed as Large Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 15834608

Filing Date: 07-Dec-2017

Applicant/Patent under Reexamination: Kitching

Electronic Terminal Disclaimer filed on June 4, 2019

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	36196318
Application Number:	15834608
International Application Number:	
Confirmation Number:	1210
Title of Invention:	AUTOMATED TREATMENT STAGING FOR TEETH
First Named Inventor/Applicant Name:	Ian Kitching
Customer Number:	107046
Filer:	Charles C. Hagadorn III/Kevin Chance
Filer Authorized By:	Charles C. Hagadorn III
Attorney Docket Number:	22773-774.304
Receipt Date:	04-JUN-2019
Filing Date:	07-DEC-2017
Time Stamp:	14:17:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$160
RAM confirmation Number	060519INTEFSW00000596232415
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33940 e6224c7f61f2ff7a9f88715d1f303b147e0ee53f	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30110 7d5cfe0265fb4eb819f17e1a7c4f92a06f15dfba	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	64050		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/834,608	Filing Date 12/07/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT	06/08/2019	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 30	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 4	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DAWN BREWER/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

107046 7590 06/12/2019
WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3772	

DATE MAILED: 06/12/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

TITLE OF INVENTION: AUTOMATED TREATMENT STAGING FOR TEETH

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	09/12/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

107046 7590 06/12/2019
WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

TITLE OF INVENTION: AUTOMATED TREATMENT STAGING FOR TEETH

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	09/12/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
APONTE, MIRAYDA ARLENE	3772	433-024000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

ClearCorrect Exhibit 1002, Page 298 of 391

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 06/12/2019

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER	
APONTE, MIRAYDA ARLENE	
ART UNIT	PAPER NUMBER
3772	

DATE MAILED: 06/12/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/834,608	Applicant(s) Kitching et al.	
	Examiner MIRAYDA A APONTE	Art Unit 3772	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 3 July 2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-7,10-18,21-22 and 31-32 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. 20190507.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/HEIDI M EIDE/ Primary Examiner, Art Unit 3772

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

2. Authorization for this examiner's amendment was given in an interview with Charles Hagadorn on 4 June 2019.

3. The application has been amended as follows:

In the Claims received on 3 July 2018:

CLAIM 1, LINE 4, after "schedule of movement" delete "coordinates movement",

CLAIM 1, LINE 12, after "comprising" delete "one or more of",

CLAIM 1, LINE 13-16, delete lines,

CLAIMS 8 and 9, delete claims,

CLAIM 12, LINE 7, after "schedule of movement" delete "coordinates movement",

CLAIM 12, LINE 14, after "comprising" delete "one or more of",

CLAIM 12, LINES 15-18, delete lines, and

CLAIMS 19, 20 and 23-30, delete claims.

Insert new claims as follow;

Claim 31. The method of claim 1, further comprising:

performing, by a computer processor, a second modification of the schedule of movement in response to the identifying, the second modification comprising one or more of:

delaying initial movement of the first dental object; and

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved.

Claim 32. The method of 12, further comprising:

performing, by a computer processor, a second modification of the schedule of movement in response to the identifying, the second modification comprising one or more of:

delaying initial movement of the first dental object; and

slowing or stopping movement of the first dental object during one or more of the treatment stages following a previous one of the treatment stages during which the first dental object moved.

Reasons for Allowance

4. **Claims 1-7, 10-18, 21, 22 and 31-32** are allowed.

5. The following is an examiner's statement of reasons for allowance:

a. **Regarding claim 1**, the art of record does not teach or render obvious, either alone or in combination, a method including the step of performing, by a computer processor, a first modification of the schedule of movement in response to the identifying, the first modification including round-tripping the first dental object wherein round-tripping includes moving the first dental object away from the

respective path of the second dental object and moving the first dental object toward its previous position in combination with the elements set forth in the claim.

b. **Regarding claim 12**, the art of record does not teach or render obvious, either alone or in combination, a non-transitory computer-readable medium including instructions that includes perform of a first modification of the schedule of movement in response to the identifying, the first modification including round-tripping the first dental object, wherein round-tripping includes moving the first dental object away from the respective treatment path of the second dental object and moving the first dental object toward its previous position.

6. The allowability of the subject matter of "round-tripping" is limited to the definition found in the specification as indicated in the Final Office action submitted on 5 November 2018.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIRAYDA ARLENE APONTE whose telephone number is (571)270-1933. The examiner can normally be reached on M-F 8-5.

9. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cris Rodriguez can be reached on 571-272-4964. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MIRAYDA A APONTE/
Examiner, Art Unit 3772

/HEIDI M EIDE/
Primary Examiner, Art Unit 3772
6/6/2019

Applicant-Initiated Interview Summary	**Application No.** 15/834,608	**Applicant(s)** Kitching et al.	
	Examiner MIRAYDA A APONTE	**Art Unit** 3772	**AIA (FITF) Status** No

All participants (applicant, applicants representative, PTO personnel):

(1) MIRAYDA ARLENE. APONTE.

(2) Charlie Hagadorn (Attorney).

(3) Heidi Eide (Prim. Examiner).

(4) _____.

Date of Interview: 04 June 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☑Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1,8,12 and 19.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/HEIDI M EIDE/ Primary Examiner, Art Unit 3772

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: The attorney authorized the amendments of the claims as per Allowability Notice document.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	**Art Unit**
	MIRAYDA A APONTE	3772

CPC						
Symbol					**Type**	**Version**
A61C	/	7	/	002	F	2013-01-01
A61C	/	7	/	00	I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	04 June 2019	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HEIDI M EIDE/ Primary Examiner, Art Unit 3772	04 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1D

U.S. Patent and Trademark Office — Part of Paper No.: 20190507

ClearCorrect Exhibit 1002, Page 309 of 391

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

INTERNATIONAL CLASSIFICATION				
CLAIMED				
A61C	/	7	/	00

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	04 June 2019	Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/HEIDI M EIDE/ Primary Examiner, Art Unit 3772	04 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1D

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	8	10		19		28								
2	2	9	11		20		29								
3	3	11	12	18	21		30								
4	4	12	13	19	22	10	31								
5	5	13	14		23	20	32								
6	6	14	15		24										
7	7	15	16		25										
	8	16	17		26										
	9	17	18		27										

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	04 June 2019	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HEIDI M EIDE/ Primary Examiner, Art Unit 3772	04 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1D

U.S. Patent and Trademark Office Part of Paper No.: 20190507

ClearCorrect Exhibit 1002, Page 311 of 391

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

CPC - Searched*		
Symbol	**Date**	**Examiner**
A61C7/002, 00	3/24/2018	MA
A61C3/00	3/24/2018	MA
Updated search	10/27/2018	MA
Updated search	02/13/2019	MA
Updated search	05/07/2019	MA

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
433	24		
	Updated search	10/27/2018	MA
	Updated search	02/13/2019	MA
433	213,214	02/13/2019	MA
	Updated search	05/07/2019	MA

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

	/MIRAYDA A APONTE/ Examiner.Art Unit 3732

ClearCorrect Exhibit 1002, Page 312 of 391

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/834,608	Kitching et al.
	Examiner	Art Unit
	MIRAYDA A APONTE	3772

Search Notes		
Search Notes	**Date**	**Examiner**
EAST search	3/24/2018	MA
Word search on orthodontic and (((move movement) near tooth) same$4 stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system, dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code) and ((thermo temperature) same form$3 mold$3) and polymer$3, ((thermo$4 temperature) same (form$3 mold$3)) and polymer$3 and orthodontic	3/24/2018	MA
Updated search and dental and ("round-tripping" staggering), dental and (delaying with movement) and computer, dental and orthodontic and (move movement) and stagger$4 and "round-tripping" and (computer program code), dental and orthodontic and move$4 and stagger$4, dental and orthodontic and move$4 and stagger$4 and (digital computer), dental and orthodontic and (move$4 same (delay$4 stagger$4)) and (digital computer), dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth)) and (digital computer), dental and orthodontic and (move$4 with (delay$4 stagger$4) same (teeth tooth)), dental and orthodontic and (move$4 with (delay$4 stagger$4 hold$3 " slow down" wait) same (teeth tooth)), dental and orthodontic and (move $4 with (delay$4 stagger$4 "slow down" wait) same (teeth tooth)), orthodontic and (((move movement) near tooth) same stagger$4 same " round-tripping") and (colli$3 obstruct$3), orthodontic and (((move movement) near tooth) same (colli$3 obstruct$3)), orthodontic and (((move movement) near tooth) same (colli$3 obstruct$3)) and (computer digital), orthodontic and (((move movement) near tooth) same (delay colli $3 obstruct$3)) and (computer digital)	10/27/2018	MA
Word search on dental and ((move movement) near tooth) and " round-tipping" and (collision obstruction) and (computer program code) and computer and word search under class 700	02/13/2019	MA
Updated search	05/07/2019	MA

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
A61C7	002,00	05/07/2019	MA
A61C3	00	05/07/2019	MA

	/MIRAYDA A APONTE/ Examiner.Art Unit 3732

Bibliographic Data

Application No: 15/834,608

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /MIRAYDA A APONTE/ (Examiner's Signature) | (Initials)

Title: AUTOMATED TREATMENT STAGING FOR TEETH

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/07/2017	433	3772	22773-774.304
RULE			

APPLICANTS

ALIGN TECHNOLOGY, INC., San Jose, CA, UNITED STATES

INVENTORS

Ian Kitching Saratoga, CA, UNITED STATES

Alexander Dmitriev Moscow, RUSSIAN FEDERATION

Alexey Vishnevskiy Moscow, RUSSIAN FEDERATION

CONTINUING DATA

This application is a CON of 15086491 03/31/2016

15086491 is a CON of 13209276 08/12/2011 PAT 9326830

13209276 is a CON of 11848172 08/30/2007 PAT 8038444

11848172 has PRO of 60824024 08/30/2006

11848172 has PRO of 60824022 08/30/2006

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

12/27/2017

STATE OR COUNTRY

UNITED STATES

ADDRESS

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

FILING FEE RECEIVED

$6,960

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	10086	(A61C7/002 or A61C7/00 or A61C3/00).cpc. or (433/24,213,214).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 11:16
L4	8	1 and dental and (((move movement) near tooth) same stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 11:56
L2	114	1 and dental and ((move movement) near tooth) same (stagger$4 "round-tripping") and (collision obstruction) and (computer program code)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 11:56
L5	811	orthodontic and (((move movement) near tooth) same$4 stagger$4 same "round-tripping") and (collision obstruction) and (computer program code) and system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 11:58
L8	0	7 and (dental and ((move movement) near tooth) and "round-tipping" and (collision obstruction) and (computer program code))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 12:06
L7	160718	(700/$)".ccls" and (dental and ((move movement) near tooth) and "round-tipping" and (collision obstruction) and (computer program code))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 12:06
L9	0	1 and (dental and ((move movement) near tooth) and "round-tipping" and (collision obstruction) and (computer program code))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	ON	2019/05/07 12:07

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L11	0	10 and dental and ((move movement) near tooth) and "round-tipping" and (collision obstruction) and (computer program code)	USPAT	OR	ON	2019/05/07 12:08
L10	1467	(A61C7/002 or A61C7/00 or A61C3/00).cpc.	USPAT	OR	ON	2019/05/07 12:08

5/ 7/ 2019 12:10:41 PM
C:\ Users\ maponte\ Documents\ EAST\ Workspaces\ 15834608.wsp

To: patentdocket@wsgr.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 107046

Jun 12, 2019 03:38:05 AM

Dear PAIR Customer:

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 107046 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	NOA	06/12/2019	22773-774.304
	INTV.SUM.APP	06/12/2019	22773-774.304

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 08/07/2019
WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER	
APONTE, MIRAYDA ARLENE	

ART UNIT	PAPER NUMBER
3772	

NOTIFICATION DATE	DELIVERY MODE
08/07/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 15834608
Applicant : Kitching
Filing Date : 12/07/2017
Date Mailed : 08/07/2019

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Joseph Boris/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 15834608 **Drawings filed: 12/07/2017**

IDENTIFICATION OF DRAWING DEFICIENCIES

- [ ] There is a hole or the image thereof within the illustration. FIG(s)
- [ ] The illustration is penetrated or traversed by a solid or broken line that is not intended to be part of the drawing, such as a dark line caused by a flaw in the copying process. FIG(s)
- [ ] An ink stamp or the image thereof obscures part of the illustration. FIG(s)
- [ ] The drawing is marred by black smudges, obliterations, or fax/copier marks (for example, speckles or dots in a substantial portion of the drawing). FIG(s)
- [ ] Figure numbers are duplicated or missing. FIG(s)
- [ ] Drawing sheet or figure is missing. FIG(s)
- [ ] Numbers, letters, or reference characters in the drawing have been crossed out or are illegibly handwritten. FIG(s)
- [ ] The character of the lines, numbers, and letters is poor. FIG(s)
- [ ] The drawing's background shows that the original drawing was made on graph paper or other paper with a pattern or decoration. FIG(s)
- [ ] The FIG. number label is placed in a location that causes the drawing to be read upside down. FIG(s)
- [X] Data, a reference number, or part of the drawing is truncated or missing, or a lead line has no reference number. FIG(s) 2a
- [ ] The drawing and/or the FIG. label contain(s) foreign language. FIG(s)
- [ ] This utility application contains a photograph of a view that is capable of being illustrated as a line drawing. FIG(s)
- [ ] A petition under 37 CFR 1.84(a)(2) to accept color drawings has been granted, but the brief description of the drawings in the specification does not contain (or has not been amended to contain) the paragraph required by 37 CFR 1.84(a)(2)(iii).
- [ ] This reissue application contains added and/or amended drawings that are not labeled as “New” or “Amended” or “Canceled” as required by 37 CFR 1.173(b)(3). FIG(s)
- [ ] This Design reissue application contains a drawing that is labeled as “Canceled” but is not surrounded by brackets, or a drawing that is surrounded by brackets but is not labeled as “Canceled.” See 37 CFR 1.173(b)(3). FIG(s)
- [ ] OTHER:
- [ ] COMMENTS:

To: patentdocket@wsgr.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 107046

Aug 07, 2019 03:25:05 AM

Dear PAIR Customer:

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 107046 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Application	Document	Mailroom Date	Attorney Docket No.
15834608	M327	08/07/2019	22773-774.304
	M327	08/07/2019	22773-774.304

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/834,608	12/07/2017	Ian Kitching	22773-774.304	1210

107046 7590 08/12/2019

WSGR / Align Technology , Inc.
650 Page Mill Road
Palo Alto, CA 94304

EXAMINER
APONTE, MIRAYDA ARLENE

ART UNIT	PAPER NUMBER
3772	

NOTIFICATION DATE	DELIVERY MODE
08/12/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

PTOL-90A (Rev. 04/07)

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
15/834,608	12/07/2017	Kitching et al.	22773-774.304

	EXAMINER	
WSGR / Align Technology , Inc. 650 Page Mill Road Palo Alto, CA 94304	MIRAYDA A APONTE	
	ART UNIT	PAPER
	3772	20190806

DATE MAILED: _____

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The present communication responses to a request from the attorney for consideration of the NPLs submitted in the information disclosure statement (IDS) filed in 7 December 2017, see attached document. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIRAYDA ARLENE APONTE whose telephone number is (571)270-1933. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cris Rodriguez can be reached on 571-272-4964. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/Cris L. Rodriguez/ Supervisory Patent Examiner, Art Unit 3772

PTO-90C (Rev.04-03)

Applicant-Initiated Interview Summary	**Application No.** 15/834,608	**Applicant(s)** Kitching et al.	
	Examiner MIRAYDA A APONTE	**Art Unit** 3772	**AIA (FITF) Status** No

All participants (applicant, applicants representative, PTO personnel):

(1) MIRAYDA ARLENE APONTE.

(2) CHARLES HAGEDORN (Attorney).

(3) CRIS RODRIGUEZ (SPE).

(4) _____.

Date of Interview: 25 July 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☑Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: _____.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/MIRAYDA A APONTE/ Examiner, Art Unit 3772	/Cris L. Rodriguez/ Supervisory Patent Examiner, Art Unit 3772

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: The attorney requested the consideration of all NPLs listed in IDS received on 7 December 2017. It was agreed that the examiner will consider the NPLs listed.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	001	US-RE35169	03-05-1996	LEMCHEN; Marc S. et al.	
	002	US-2467432	04-19-1949	KESLING; Harold D.	
	003	US-3407500	10-29-1968	KESLING; Peter C.	
	004	US-3600808	08-24-1971	JAMES; Jackson Reeve	
	005	US-3660900	05-09-1972	LAWRENCE; F. Andrews	
	006	US-3683502	08-15-1972	MELVIN; Wallshein	
	007	US-3738005	06-12-1973	COHEN; Mus et al.	
	008	US-3860803	01-14-1975	LEVINE; Richard Carl	
	009	US-3916526	11-04-1975	SCHUDY; Fred Frank	
	010	US-3922786	12-02-1975	LAVIN; Joseph L.	
	011	US-3950851	04-20-1976	BERGERSEN; Earl O.	
	012	US-3983628	10-05-1976	ACEVEDO; Raul	
	013	US-4014096	03-29-1977	DELLINGER; Eugene L.	
	014	US-4195046	03-25-1980	KESLING; Peter C.	
	015	US-4253828	03-03-1981	COLES; Donna C. et al.	
	016	US-4324546	04-13-1982	HEITLINGER; Paul et al.	
	017	US-4324547	04-13-1982	ARCAN; Mircea et al.	
	018	US-4348178	09-07-1982	KURZ; Craven H.	
	019	US-4478580	10-23-1984	BARRUT; Luc P.	
	020	US-4500294	02-19-1985	LEWIS; William D.	
	021	US-4504225	03-12-1985	YOSHII; Osamu	
	022	US-4505673	03-19-1985	YOSHII; Osamu	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	08/06/2019

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Sheet 2 of 30

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	023	US-4526540	07-02-1985	DELLINGER; Eugene L.	
	024	US-4575330	03-11-1986	HULL; Charles W.	
	025	US-4575805	03-11-1986	MOERMANN; Werner H. et al.	
	026	US-4591341	05-27-1986	ANDREWS; Lawrence F.	
	027	US-4609349	09-02-1986	CAIN; Steve B.	
	028	US-4611288	09-09-1986	DURET; Francois et al.	
	029	US-4656860	04-14-1987	ORTHUBER; Wolfgang et al.	
	030	US-4663720	05-05-1987	DURET; Francois et al.	
	031	US-4664626	05-12-1987	KESLING; Peter C.	
	032	US-4676747	06-30-1987	KESLING; Christopher K.	
	033	US-4742464	05-03-1988	DURET; Francois et al.	
	034	US-4755139	07-05-1988	ABBATTE; Gerard P. et al.	
	035	US-4763791	08-16-1988	HALVERSON; George E. et al.	
	036	US-4793803	12-27-1988	MARTZ; Martin G.	
	037	US-4798534	01-17-1989	BREADS; Peter R.	
	038	US-4836778	06-06-1989	BAUMRIND; Sheldon et al.	
	039	US-4837732	06-06-1989	BRANDESTINI; Marco et al.	
	040	US-4850864	07-25-1989	DIAMOND; Michael K.	
	041	US-4850865	07-25-1989	NAPOLITANO; John R.	
	042	US-4856991	08-15-1989	BREADS; Peter R. et al.	

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Sheet 3 of 30

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First Named Inventor	KITCHING; Ian
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	043	US-4877398	10-31-1989	KESLING; Peter C.	
	044	US-4880380	11-14-1989	MARTZ; Martin G.	
	045	US-4889238	12-26-1989	BATCHELOR; Jay A.	
	046	US-4890608	01-02-1990	STEER; Peter L.	
	047	US-4935635	06-19-1990	O'HARRA; Dale G.	
	048	US-4936862	06-26-1990	WALKER; Peter S. et al.	
	049	US-4937928	07-03-1990	VAN DER ZEL; Joseph M.	
	050	US-4941826	07-17-1990	LORAN; William et al.	
	051	US-4964770	10-23-1990	STEINBICHLER; Hans et al.	
	052	US-4975052	12-04-1990	SPENCER; William et al.	
	053	US-4983334	01-08-1991	ADELL; Loren S.	
	054	US-5011405	04-30-1991	LEMCHEN; Marc S.	
	055	US-5017133	05-21-1991	MIURA; Fujio	
	056	US-5027281	06-25-1991	REKOW; Elizabeth D. et al.	
	057	US-5035613	07-30-1991	BREADS; Peter R. et al.	
	058	US-5055039	10-08-1991	ABBATTE; Gerard P. et al.	
	059	US-5059118	10-22-1991	BREADS; Peter R. et al.	
	060	US-5100316	03-31-1992	WILDMAN; Alexander J.	
	061	US-5121333	06-09-1992	RILEY; Donald R. et al.	
	062	US-5125832	06-30-1992	KESLING; Peter C.	
	063	US-5128870	07-07-1992	ERDMAN; Arthur G. et al.	
	064	US-5130064	07-14-1992	SMALLEY; Dennis R. et al.	

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Sheet 4 of 30

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Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	065	US-5131843	07-21-1992	HILGERS; James J. et al.	
	066	US-5131844	07-21-1992	MARINACCIO; Paul J. et al.	
	067	US-5139419	08-18-1992	ANDREIKO; Craig A. et al.	
	068	US-5145364	09-08-1992	MARTZ; Martin G. et al.	
	069	US-5176517	01-05-1993	TRUAX; Lloyd H.	
	070	US-5184306	02-02-1993	ERDMAN; Arthur G. et al.	
	071	US-5186623	02-16-1993	BREADS; Peter R. et al.	
	072	US-5257203	10-26-1993	RILEY; Donald R. et al.	
	073	US-5273429	12-28-1993	REKOW; Dianne et al.	
	074	US-5278756	01-11-1994	LEMCHEN; Marc S. et al.	
	075	US-5328362	07-12-1994	WATSON; Sherman L. et al.	
	076	US-5338198	08-16-1994	WU; Chuang-Jy et al.	
	077	US-5340309	08-23-1994	ROBERTSON; James G.	
	078	US-5342202	08-30-1994	DESHAYES; Marie-Josephe	
	079	US-5368478	11-29-1994	ANDREIKO; Craig A. et al.	
	080	US-5382164	01-17-1995	STERN; Sylvan S.	
	081	US-5395238	03-07-1995	ANDREIKO; Craig A. et al.	
	082	US-5431562	07-11-1995	ANDREIKO; Craig A. et al.	
	083	US-5440326	08-08-1995	QUINN; Thomas J.	
	084	US-5440496	08-08-1995	ANDERSSON; Matts et al.	
	085	US-5447432	09-05-1995	ANDREIKO; Craig A. et al.	
	086	US-5452219	09-19-1995	DEHOFF; Barry D. et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	08/06/2019

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Sheet 5 of 30

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	087	US-5454717	10-03-1995	ANDREIKO; Craig A. et al.	
	088	US-5456600	10-10-1995	ANDREIKO; Craig A. et al.	
	089	US-5474448	12-12-1995	ANDREIKO; Craig A. et al.	
	090	US-5518397	05-21-1996	ANDREIKO; Craig A. et al.	
	091	US-5528735	06-18-1996	STRASNICK; Steven L. et al.	
	092	US-5533895	07-09-1996	ANDREIKO; Craig A. et al.	
	093	US-5542842	08-06-1996	ANDREIKO; Craig A. et al.	
	094	US-5549476	08-27-1996	STERN; Sylvan S.	
	095	US-5562448	10-08-1996	MUSHABAC; David R.	
	096	US-5587912	12-24-1996	ANDERSSON; Matts et al.	
	097	US-5605459	02-25-1997	KURODA; Takayuki et al.	
	098	US-5607305	03-04-1997	ANDERSSON; Matts et al.	
	099	US-5614075	03-25-1997	ANDRE SR., LARRY E.	
	100	US-5621648	04-15-1997	CRUMP; Craig D.	
	101	US-5645420	07-08-1997	BERGERSEN; Earl O.	
	102	US-5645421	07-08-1997	SLOOTSKY; Gary Lee	
	103	US-5655653	08-12-1997	CHESTER; Bruce E.	
	104	US-5683243	11-04-1997	ANDREIKO; Craig A. et al.	
	105	US-5692894	12-02-1997	SCHWARTZ; Dann A. et al.	
	106	US-5725376	03-10-1998	POIRIER; Michel	
	107	US-5725378	03-10-1998	WANG; Hong-Chi	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	08/06/2019

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	108	US-5733126	03-31-1998	ANDERSSON; Matts et al.	
	109	US-5740267	04-14-1998	ECHERER; Scott J. et al.	
	110	US-5742700	04-21-1998	YOON; Douglas C. et al.	
	111	US-5799100	08-25-1998	CLARKE; Laurence P. et al.	
	112	US-5800174	09-01-1998	ANDERSSON; Matts	
	113	US-5823778	10-20-1998	SCHMITT; Stephen M. et al.	
	114	US-5848115	12-08-1998	LITTLE; Francis H. et al.	
	115	US-5857853	01-12-1999	VAN; Nifterick Willem Frederick et al.	
	116	US-5866058	02-02-1999	BATCHELDER; John Samuel et al.	
	117	US-5879158	03-09-1999	DOYLE; Walter A. et al.	
	118	US-5880961	03-09-1999	CRUMP; Craig D.	
	119	US-5880962	03-09-1999	ANDERSSON; Matts et al.	
	120	US-5934288	08-10-1999	AVILA; Ricardo Scott et al.	
	121	US-5957686	09-28-1999	ANTHONY; Wayne L.	
	122	US-5964587	10-12-1999	SATO; Mikio	
	123	US-5971754	10-26-1999	SONDHI; Anoop et al.	
	124	US-5975893	11-02-1999	CHISHTI; Muhammad et al.	
	125	US-6015289	01-18-2000	ANDREIKO; Craig A. et al.	
	126	US-6044309	03-28-2000	HONDA; Kenichi	
	127	US-6049743	04-11-2000	BABA; Masami	
	128	US-6062861	05-16-2000	ANDERSSON; Matts	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 7 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	129	US-6068482	05-30-2000	SNOW; Michael Desmond	
	130	US-6099314	08-08-2000	KOPELMAN; Avi et al.	
	131	US-6123544	09-26-2000	CLEARY; James D.	
	132	US-6152731	11-28-2000	JORDAN; Russell A. et al.	
	133	US-6183248	02-06-2001	CHISHTI; Muhammad et al.	
	134	US-6190165	02-20-2001	ANDREIKO; Craig A. et al.	
	135	US-6217325	04-17-2001	CHISHTI; Muhammad et al.	
	136	US-6217334	04-17-2001	HULTGREN; Bruce Willard	
	137	US-6244861	06-12-2001	ANDREIKO; Craig A. et al.	
	138	US-6309215	10-30-2001	PHAN; Loc X. et al.	
	139	US-6315553	11-13-2001	SACHDEVA; Rohit et al.	
	140	US-6318994	11-20-2001	CHISHTI; Muhammad Ziaullah Khan et al.	
	141	US-6322359	11-27-2001	JORDAN; Russell A. et al.	
	142	US-6350120	02-26-2002	SACHDEVA; Rohit et al.	
	143	US-6382975	05-07-2002	POIRIER; Michel	
	144	US-6398548	06-04-2002	MUHAMMAD; Chishti et al.	
	145	US-6402707	06-11-2002	ERNST; Maurice M.	
	146	US-6409504	06-25-2002	JONES; Timothy N. et al.	
	147	US-6471511	10-29-2002	CHISHTI; Muhammad et al.	
	148	US-6482298	11-19-2002	BHATNAGAR; Parijat	
	149	US-6514074	02-04-2003	CHISHTI; Muhammad et al.	

Examiner Signature	/MIRAYDA A APONTE/	Date Considered	08/06/2019

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Sheet 8 of 30

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Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	150	US-6524101	02-25-2003	PHAN; Loc X. et al.	
	151	US-6554611	04-29-2003	CHISHTI; Muhammad et al.	
	152	US-6572372	06-03-2003	PHAN; Loc X. et al.	
	153	US-6629840	10-07-2003	CHISHTI; Muhammad et al.	
	154	US-6682346	01-27-2004	CHISHTI; Muhammad et al.	
	155	US-6705863	03-16-2004	PHAN; Loc X. et al.	
	156	US-6722880	04-20-2004	CHISHTI; Muhammad et al.	
	157	US-6729876	05-04-2004	MUHAMMAD; Chishti et al.	
	158	US-7063532	06-20-2006	JONES; Timothy N. et al.	
	159	US-7331783	02-19-2008	CHISHTI; Muhammad et al.	
	160	US-7377778	05-27-2008	CHISHTI; Muhammad Ziaullah Khan et al.	
	161	US-7435083	10-14-2008	CHISHTI; Muhammad et al.	
	162	US-7578674	08-25-2009	CHISHTI; Muhammad et al.	
	163	US-7637740	12-29-2009	KNOPP; Peter G.	
	164	US-7658610	02-09-2010	KNOPP; Peter G.	
	165	US-7819659	10-26-2010	WEN; Huafeng	
	166	US-7844356	11-30-2010	MATOV; Vadim et al.	
	167	US-7844429	11-30-2010	MATOV; Vadim et al.	
	168	US-7904307	03-08-2011	ABOLFATHI; Amir et al.	
	169	US-8038444	10-18-2011	KITCHING; Ian et al.	
	170	US-9326830	05-03-2016	KITCHING; Ian et al.	

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Sheet 9 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	171	US-20020006597	01-17-2002	ANDREIKO; Craig A. et al.	
	172	US-20030009252	01-09-2003	PAVLOVSKAIA; Elena et al.	
	173	US-20030139834	07-24-2003	NIKOLSKIY; Sergey et al.	
	174	US-20030224311	12-04-2003	CRONAUER; Edward A.	
	175	US-20040128010	07-01-2004	PAVLOVSKAIA; Elena et al.	
	176	US-20040137400	07-15-2004	CHISHTI; Muhammad et al.	
	177	US-20050055118	03-10-2005	NIKOLSKIY; Sergey et al.	
	178	US-20060275736	12-07-2006	WEN; Huafeng et al.	
	179	US-20120035901	02-09-2012	KITCHING; Ian et al.	
	180	US-20160206402-A1	07-21-2016	IAN; Kitching et al.	

FOREIGN PATENT DOCUMENTS

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	001	AU-3031677-A	05-10-1979	SUYEHIRO H.		☐
	002	AU-517102-B2	07-09-1981	HITO SUYEHIRO.		☐
	003	AU-5598894-A	06-08-1994	ORMCO CORP.		☐

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	004	CA-1121955-A	04-20-1982	SUYEHIRO HITO.		☐
	005	DE-2749802-A1	05-11-1978	SUYEHIRO HITO.		☒
	006	DE-69327661-T2	07-20-2000	ORMCO CORP [US]		☒
	007	EP-0091876-A1	10-19-1983	DURET FRANCOIS [FR], et al.		☒
	008	EP-0299490-A2	01-18-1989	STEINBICHLER HANS [DE]		☒
	009	EP-0376873-A2	07-04-1990	SHAFIR AARON [IL], et al.		☐
	010	EP-0490848-A2	06-17-1992	NOBELPHARMA AB [SE]		☐
	011	EP-0541500-A1	05-12-1993	NOBELPHARMA AB [SE]		☐
	012	EP-0667753-B1	01-19-2000	ORMCO CORP [US]		☐
	013	EP-0731673-B1	05-30-2001	NOBEL BIOCARE AB [SE]		☐

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Sheet 11 of 30

Complete if Known	
Application Number	15834608
Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
Attorney Docket Number	22773-774.304

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	014	EP-0774933-B1	12-06-2000	SANDVIK AB [SE], et al.		☐
	015	ES-463897-A1	01-01-1980	HITO SUYEHIRO D [US]		☒
	016	FR-2369828-A1	06-02-1978	SUYEHIRO HITO [US]		☒
	017	FR-2652256-A1	03-29-1991	JOURDA GERARD., et al.		☒
	018	GB-1550777-A	08-22-1979	SUYEHIRO H.		☒
	019	JP-H0428359-A	01-30-1992	MITSUBISHI PETROCHEMICAL CO.		☒
	020	JP-H08508174-A	09-03-1996			☒
	021	JP-S5358191-A	05-25-1978			☒
	022	WO-9008512-A1	08-09-1990	DOLPHIN IMAGING SYSTEMS INC [US]		☐
	023	WO-9104713-A1	04-18-1991	JOURDA GERARD [FR], et al.		☒

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Sheet 12 of 30

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Filing Date	12-07-2017
First Named Inventor	KITCHING; Ian
Art Unit	3732
Examiner Name	Not yet assigned
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	025	WO-9832394-A1	07-30-1998	HULTGREN BRUCE WILLARD [US]		☐
	026	WO-9844865-A1	10-15-1998	NOBEL BIOCARE AB [SE], et al.		☐
	027	WO-9858596-A1	12-30-1998	ALIGN TECHNOLOGY INC [US], et al.		☐

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