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

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(54) TEETH VIEWING SYSTEM	5,474,448	12/1995	Andreiko et al.	433/24
	5,528,735 *	6/1996	Strasnick et al.	395/127
(75) Inventors: Muhammad Ziaullah Khan Chishti, Sunnyvale; Phillips Alexander Benton, Mountain View, both of CA (US)	5,533,895	7/1996	Andreiko et al.	433/24
	5,549,476	8/1996	Stern	433/223
	5,587,912	12/1996	Andersson et al.	364/468.04
	5,605,459	2/1997	Kuroda et al.	433/214
(73) Assignee: Align Technology, Inc., Santa Clara, CA (US)	5,607,305	3/1997	Andersson et al.	433/223
	5,645,421	7/1997	Slotsky	433/6

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

- (21) Appl. No.: **09/313,290**
- (22) Filed: **May 13, 1999**
- (51) **Int. Cl.**⁷ **A61C 3/00**
- (52) **U.S. Cl.** **433/24; 433/213; 433/215**
- (58) **Field of Search** 433/24, 213, 215
- (56) **References Cited**

U.S. PATENT DOCUMENTS

3,660,900	5/1972	Andrews	433/24
3,860,803	1/1975	Levine	235/151.1
4,755,139	7/1988	Abbatte et al.	433/6
4,798,534	1/1989	Breads	433/6
4,856,991	8/1989	Breads et al.	433/6
4,936,862	6/1990	Walker et al.	623/23
5,011,405	4/1991	Lemchen	433/6
5,035,613	7/1991	Breads et al.	433/6
5,055,039	10/1991	Abbatte et al.	433/24
5,059,118	10/1991	Breads et al.	433/6
5,139,419	8/1992	Andreiko et al.	433/24
5,186,623	2/1993	Breads et al.	433/6
5,273,429	12/1993	Rekow	433/215
5,338,198	8/1994	Wu et al.	433/213
5,340,309	8/1994	Robertson	433/69
5,342,202	8/1994	Deshayes	434/270
5,368,478	11/1994	Andreiko et al.	433/24
5,382,164	1/1995	Stern	433/223
5,395,238	3/1995	Andreiko et al.	433/24
5,431,562	7/1995	Andreiko et al.	433/24
5,447,432	9/1995	Andreiko et al.	433/24
5,452,219	9/1995	Dehoff et al.	364/474.05
5,454,717	10/1995	Andreiko et al.	433/24

OTHER PUBLICATIONS

- Biostar Operation & Training Manual, Great Lakes Orthodontics, Ltd. 199 Fire Tower Drive, Tonawanda, New York, 14150-5890, 20 pgs.
- Chiappone, "constructing the gnathologic setup and positioner," J. Clin. Orthod., 1980, 14:121-133.
- Cottingham, "Gnathologic clear plastic positioner," Am.J.Orthod. 1969, 55:23-31.
- Cureton, "Correcting malaligned mandibular incisors with removable retainers," J.Clin. Orthod. 1996. 30:390-395.
- Elsasser, "Some observations on the history and uses of the Kesling positioner," Am. J. Orthod. 1950, 36:368-374.
- Kamada et al., "Case reports on tooth positioners with LTV vinyl silicone rubber and some case reports," J. Nihon University School of Dentistry 1982, 24(1):1-27.
- Kesling, "The philosophy of the tooth positioning appliance," Am. J. Orthod. Oral. Surg. 1945, 31(6):297-304.
- Kesling, "Coordinating the predetermined pattern and tooth positioner with conventional treatment," Am. J. Orthod. Oral. Surg. 1946, 32:285-293.
- Kleman et al., "The speed positioner," J. Clin. Orthod. 1996, 30:673-680.

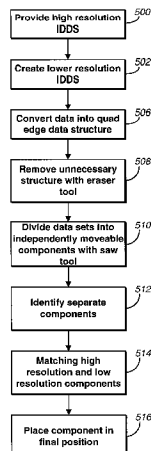
(List continued on next page.)

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(57) **ABSTRACT**

A computer is used to create a plan for repositioning an orthodontic patient's teeth. The computer receives a digital data set representing the patient's teeth and uses the data sets to generate one or more orthodontic views of the patient's teeth.

38 Claims, 6 Drawing Sheets



OTHER PUBLICATIONS

- Kuroda et al., "Three-dimensional dental cast analyzing system using laser scanning," *Am. J. Orthod. Dentofac. Orthop.* 1996 110:365-369.
- Nishiyama et al., "A new construction of tooth repositioner by LTV vinyl silicone rubber," *J. Nihon Univ. School of Dentistry* 1977. 19(2):93-102.
- Nippon Dental Review, "New orthodontic device-dynamic positioner (D.P.)-I Approach to the proposal of D.P. and transparent silicone rubber," 1980, 452:61-74.
- Nippon Dental Review, "New orthodontic device-dynamic positioner (D.P.)-II, Practice application and construction of D.P. and transparent silicone rubber," 1980, 454:107-130.
- Nippon Dental Review, "New orthodontic device-dynamic positioner (D.P.)-III, Case reports of reversed occlusion," 457:146-164.
- Nippon Dental Review, "New orthodontic device-dynamic positioner (D.P.)-Case reports of reversed occlusion," 1980,458:112-129.
- Raintree Essix & ARS Materials, Inc., Raintree Essix, Technical Magazine Table of contents and Essix Appliances, <http://www.essix.com/magazine/default.html> Aug. 13, 1997, 7 pgs.
- Shilliday, "Minimizing finishing problems with the mini-positioner," *Am J. Orthod.* 1971, 59:596-599.
- Warunek et al., "Physical and mechanical properties of elastomers in orthodontic positioners," *Am. J. Orthod. Dentofac. Orthop.* 1989, 95:388-400.
- Wells, "Application of the positioner appliance in orthodontic treatment" *Am. J. Orthodont.* 1970, 58:351-366.
- Lawrence F. Andrews, D.D.S., "The six to normal occlusion," *Am. J. Orthod.* 9/1972, 269-308.
- Lawrence F. Andrews, D.D.S., "Straight Wire, The Concept and Appliance," *The Six Keys to Optimal Occlusion*, 15-24.
- Kamada et al., "Construction of Tooth Positioners with LTV Vinyl Silicone Rubber and Some Case Reports," *J. Nihon University School of Dentistry* 3/1982, 24(1):1-26.
- Schroeder et al., "Algorithms I," *The Visualization Toolkit* chapter 6-9.9, 1996.
- Warunek et al., "Clinical Use of Silicone Elastomer Appliances," *JCO* 10/1989, 694-700.

* cited by examiner

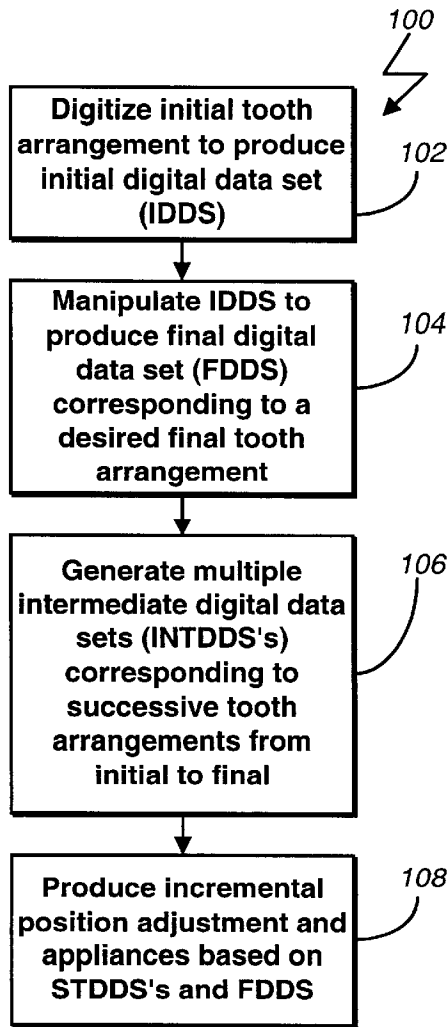


FIG._1

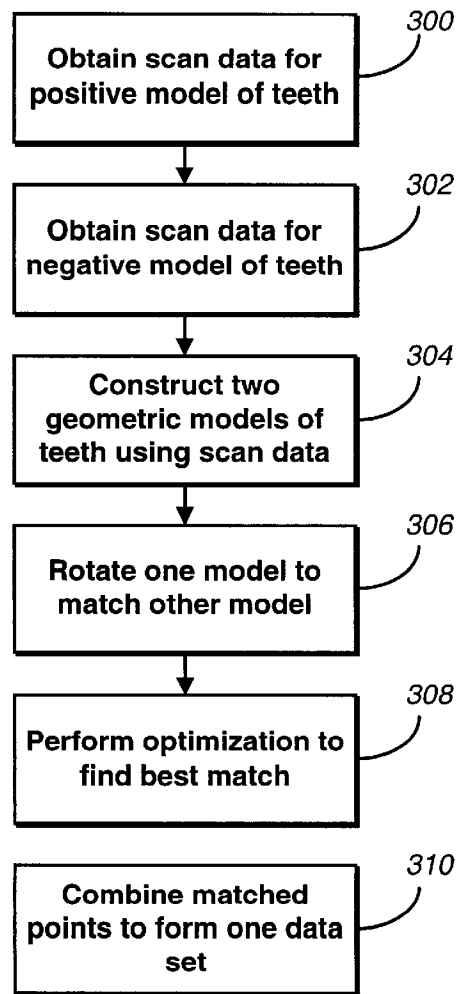


FIG._2

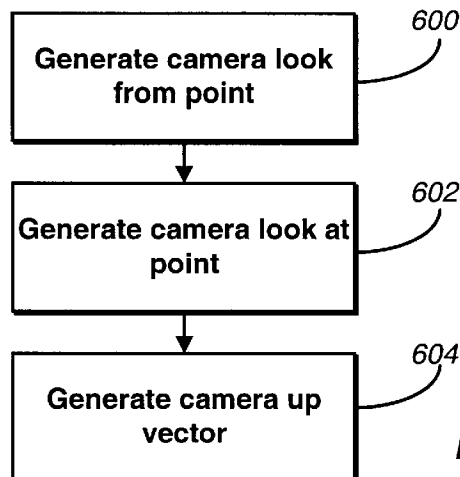


FIG._6

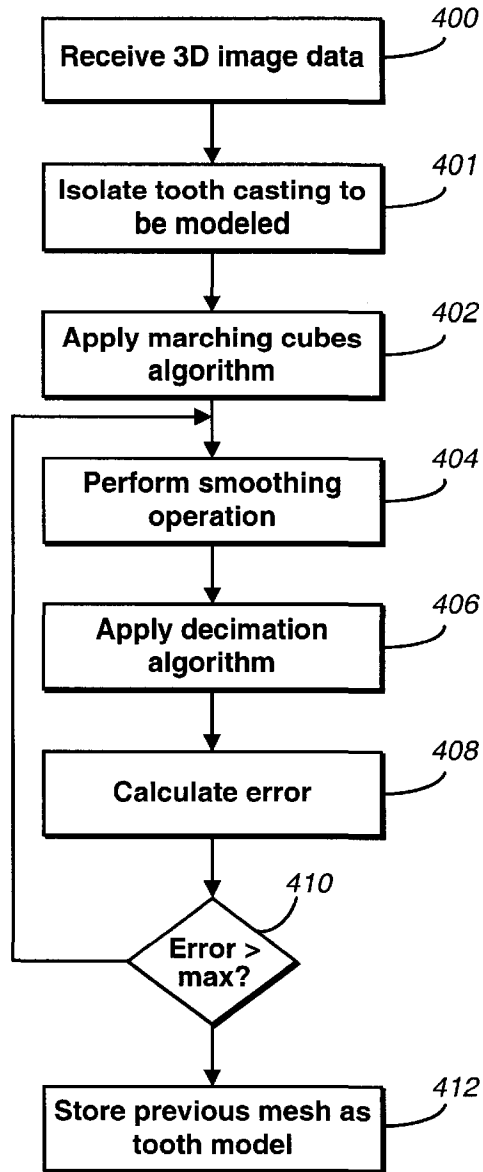


FIG._3

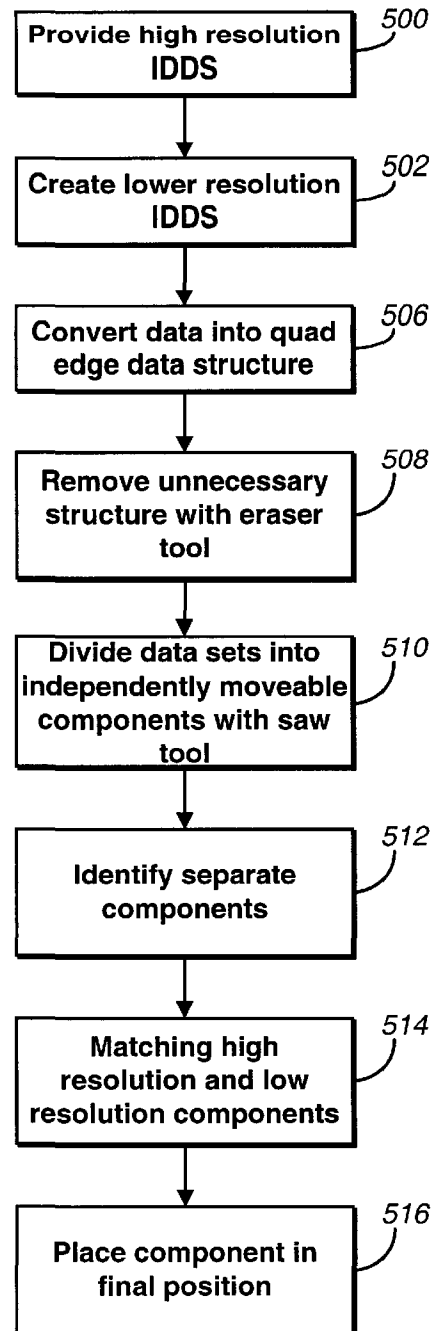


FIG._4

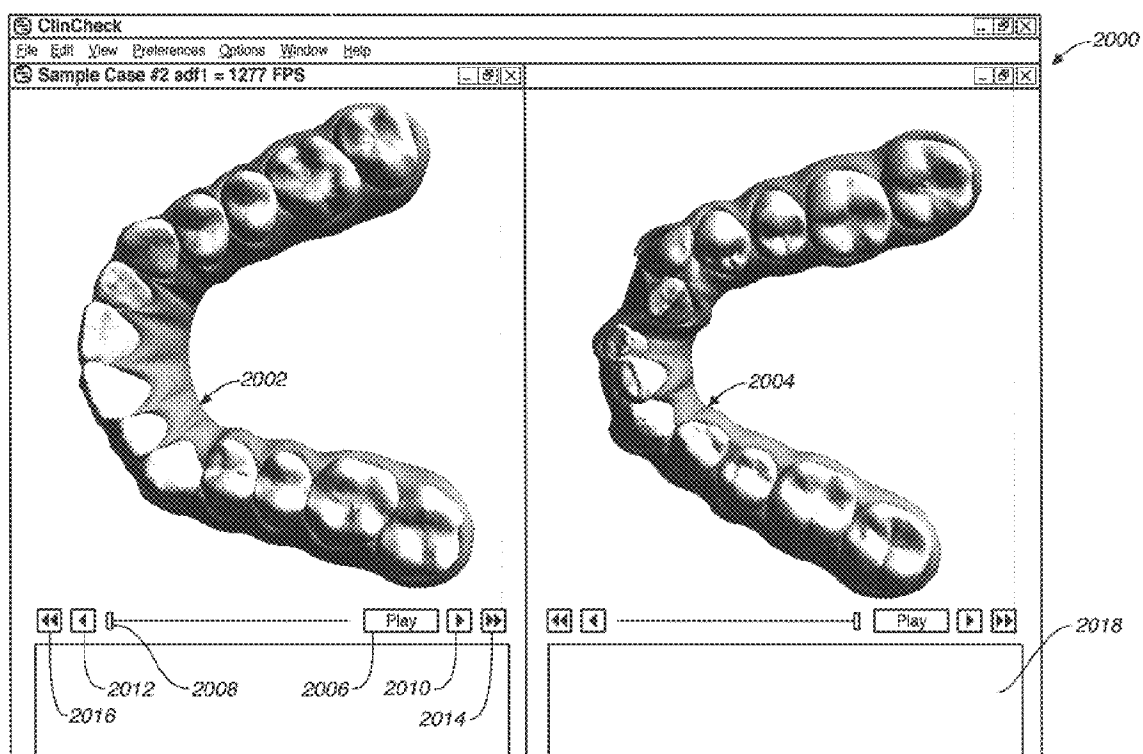


FIG. 5

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