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(54) **DENTAL IMPRESSION TRAY WITH ABSORBENT BARRIERS**

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2,043,294	A *	6/1936	Louis	433/47
2,183,624	A *	12/1939	Schwartz et al.	433/71
2,598,927	A *	6/1952	May	433/47
2,634,500	A *	4/1953	McAdoo	433/38
3,064,354	A *	11/1962	Pos	433/71
3,468,029	A *	9/1969	Moore	433/38
3,501,837	A *	3/1970	Clark	433/38
4,204,323	A *	5/1980	Neubert et al.	433/38
D266,269	S *	9/1982	Werrin	D24/181
4,449,927	A *	5/1984	Taylor et al.	433/38
4,472,140	A *	9/1984	Lustig	433/38
4,530,662	A *	7/1985	Andersson et al.	433/37
4,531,914	A *	7/1985	Spinello	433/136
4,619,610	A *	10/1986	Pelerin	433/41
4,689,010	A *	8/1987	Wolfe	433/38
4,867,680	A *	9/1989	Hare et al.	433/37

(Continued)

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(56) **References Cited**

**U.S. PATENT DOCUMENTS**

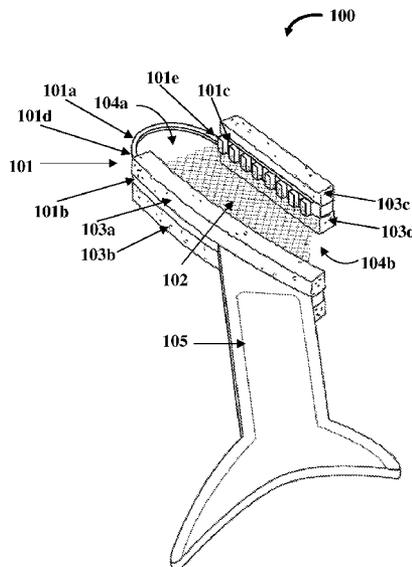
1,234,958	A *	7/1917	Supplee et al.	433/48
1,517,197	A *	11/1924	Vincent	433/48
1,778,293	A *	10/1930	Galasso	433/37
1,979,493	A *	11/1934	Salvio	433/38
2,011,860	A *	8/1935	Louis	433/48

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(57) **ABSTRACT**

A dental impression apparatus for obtaining a patient's dental impression is provided. The dental impression apparatus includes a support frame of a predefined shape, a partially permeable membrane mounted on the support frame, and absorbent barrier members. The support frame includes a distal member, a buccal edge member, and a lingual edge member. The absorbent barrier members mounted to the buccal edge member and the lingual edge member of the support frame define opposing troughs separated by the partially permeable membrane. The opposing troughs receive the patient's mandibular teeth and maxillary teeth. The opposing troughs are deposited with a first impression material and/or a second impression material for obtaining the dental impression of the patient. The absorbent barrier members confine a flow of the first impression material and the second impression material within the opposing troughs, when the patient applies a biting force within the opposing troughs.

**4 Claims, 14 Drawing Sheets**



(56)

References Cited

U.S. PATENT DOCUMENTS

4,978,298	A *	12/1990	Eliasz	433/213	6,835,065	B1 *	12/2004	Wise	433/38
4,995,540	A *	2/1991	Colin et al.	222/132	6,843,652	B2 *	1/2005	Xie et al.	433/90
5,011,407	A *	4/1991	Pelerin	433/48	6,902,398	B1 *	6/2005	Segal	433/38
5,190,457	A *	3/1993	Schreinemakers	433/214	6,913,461	B2 *	7/2005	Gittleman	433/38
5,266,031	A *	11/1993	Marigza	433/71	7,021,929	B2 *	4/2006	DiMarino et al.	433/38
5,297,960	A *	3/1994	Burns	433/41	7,101,179	B2 *	9/2006	Liddle	433/38
5,370,533	A *	12/1994	Bushnell	433/36	7,137,813	B1 *	11/2006	Roetzer	433/37
5,503,552	A *	4/1996	Diesso	433/37	7,220,123	B1 *	5/2007	Karapetyan	433/37
5,582,517	A *	12/1996	Adell	433/6	7,234,933	B2 *	6/2007	Bergersen	433/6
5,636,985	A *	6/1997	Simmen et al.	433/37	7,270,540	B2 *	9/2007	Skinner	433/43
5,676,543	A *	10/1997	Dragan	433/136	2002/0064753	A1 *	5/2002	Philp, Jr.	433/32
5,718,577	A *	2/1998	Oxman et al.	433/37	2003/0044748	A1 *	3/2003	Tucker et al.	433/38
5,718,586	A *	2/1998	Sharp et al.	433/214	2003/0138754	A1 *	7/2003	DiMarino et al.	433/37
5,722,832	A *	3/1998	White	433/214	2003/0180680	A1 *	9/2003	Burgio et al.	433/37
5,733,118	A *	3/1998	Pankuch et al.	433/38	2003/0224319	A1 *	12/2003	Liddle	433/38
5,807,100	A *	9/1998	Thornton	433/48	2004/0023185	A1 *	2/2004	Gittleman	433/34
5,820,372	A *	10/1998	Jones	433/38	2004/0043353	A1 *	3/2004	Detje	433/37
5,846,082	A *	12/1998	Thornton	433/215	2004/0096800	A1 *	5/2004	Tucker et al.	433/38
6,017,217	A *	1/2000	Wittrock	433/37	2004/0096801	A1 *	5/2004	Tucker et al.	433/38
6,116,905	A *	9/2000	Hoos	433/214	2004/0096802	A1 *	5/2004	Gittleman	433/71
6,201,038	B1 *	3/2001	Waller et al.	523/109	2004/0101803	A1 *	5/2004	Tucker et al.	433/38
6,247,926	B1 *	6/2001	Thornton	433/48	2004/0110112	A1 *	6/2004	Xie et al.	433/89
6,379,147	B1 *	4/2002	Georgakis et al.	433/37	2004/0219475	A1 *	11/2004	DiMarino et al.	433/38
6,450,808	B1 *	9/2002	Pelerin	433/38	2005/0095553	A1 *	5/2005	Gittleman	433/37
D464,138	S *	10/2002	Werrin	D24/181	2006/0172253	A1 *	8/2006	Pumphrey et al.	433/37
6,561,807	B2 *	5/2003	Hare	433/214	2006/0269904	A1 *	11/2006	Suchan et al.	433/213
6,726,477	B2 *	4/2004	Gittleman	433/34	2007/0037116	A1 *	2/2007	Knutson	433/68
6,817,861	B1 *	11/2004	Roetzer	433/37	2007/0054237	A1 *	3/2007	Neuschafer	433/37
					2007/0259313	A1 *	11/2007	Dragan et al.	433/136
					2008/0096158	A1 *	4/2008	Dorfman et al.	433/37
					2008/0280249	A1 *	11/2008	Choi	433/38

\* cited by examiner

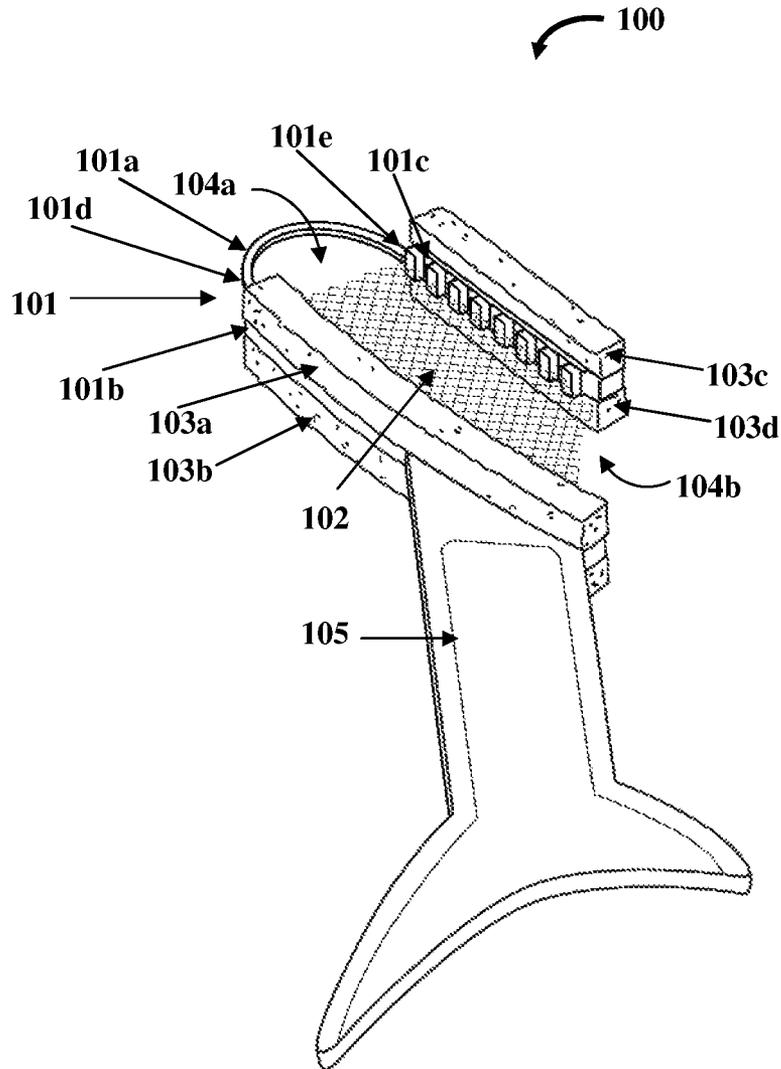


FIG. 1A

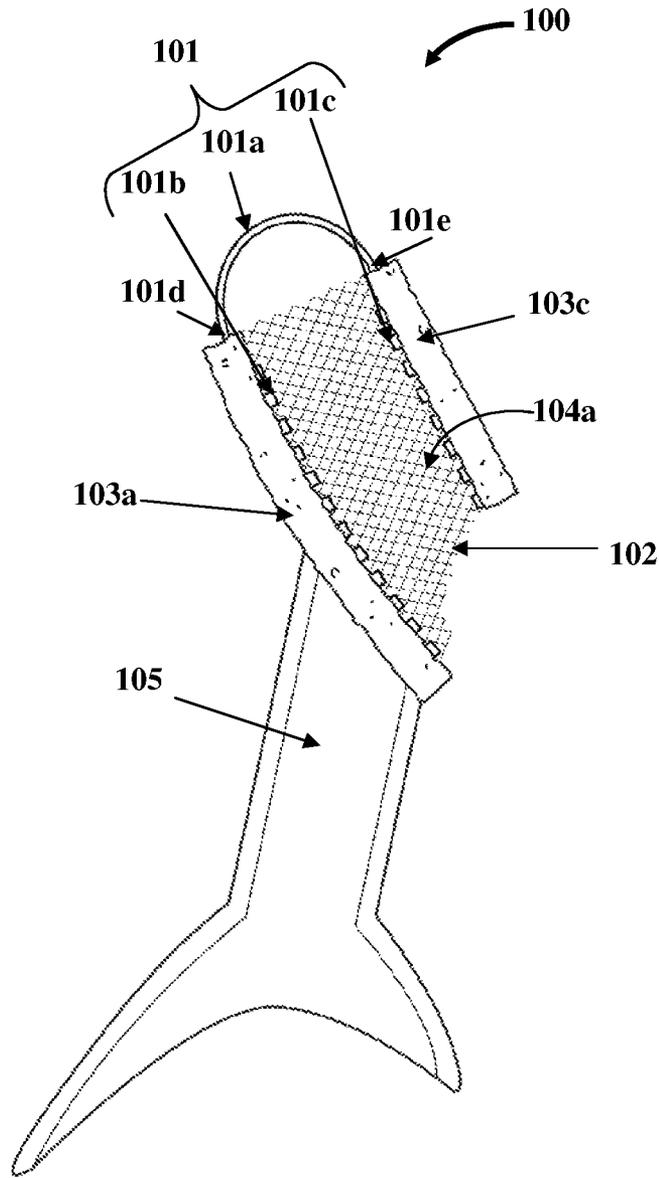


FIG. 1B

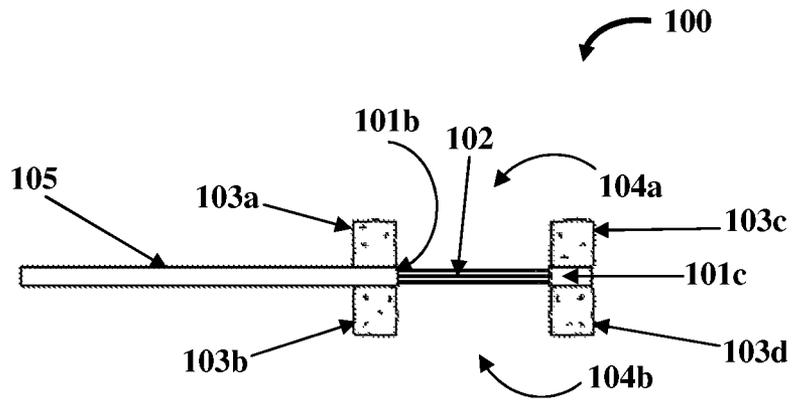


FIG. 2

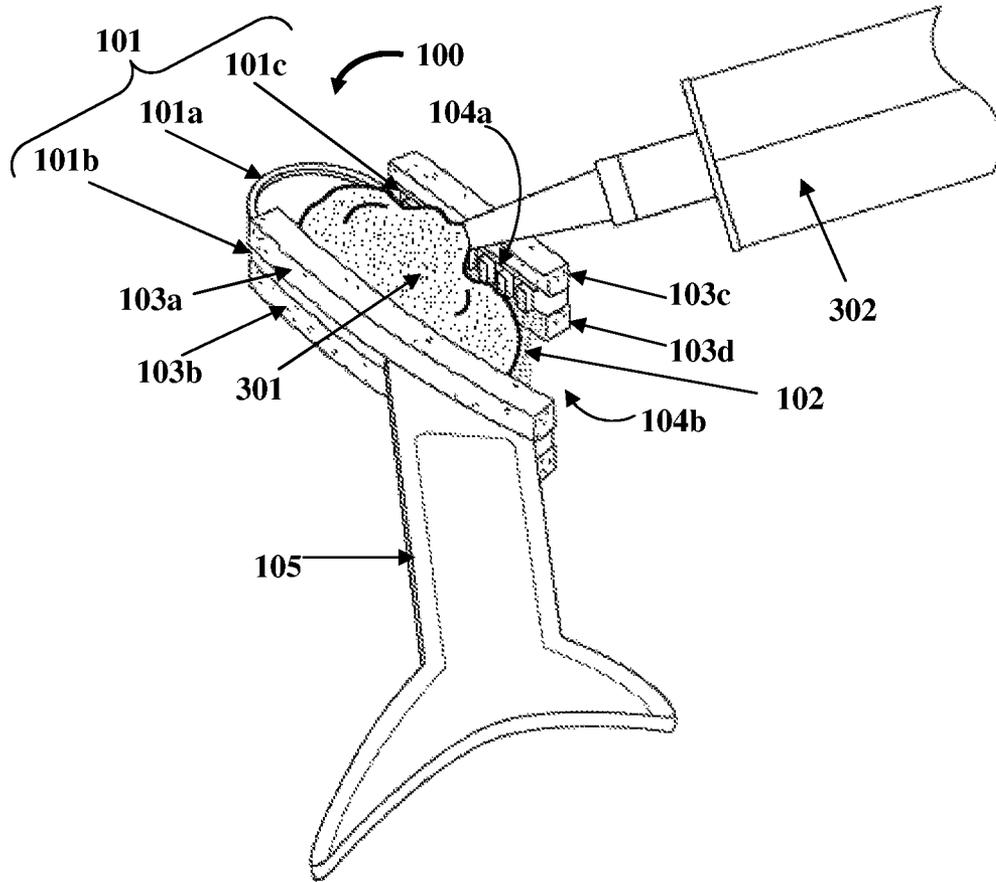


FIG. 3A

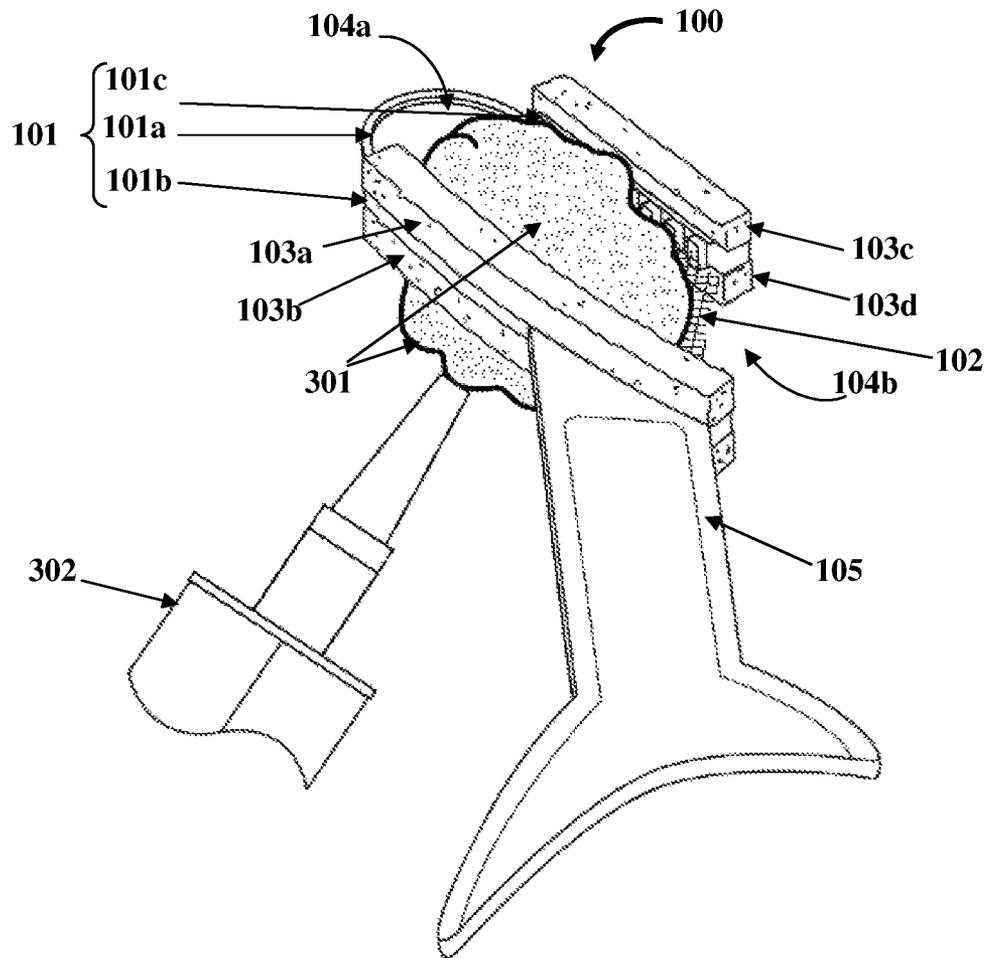


FIG. 3B

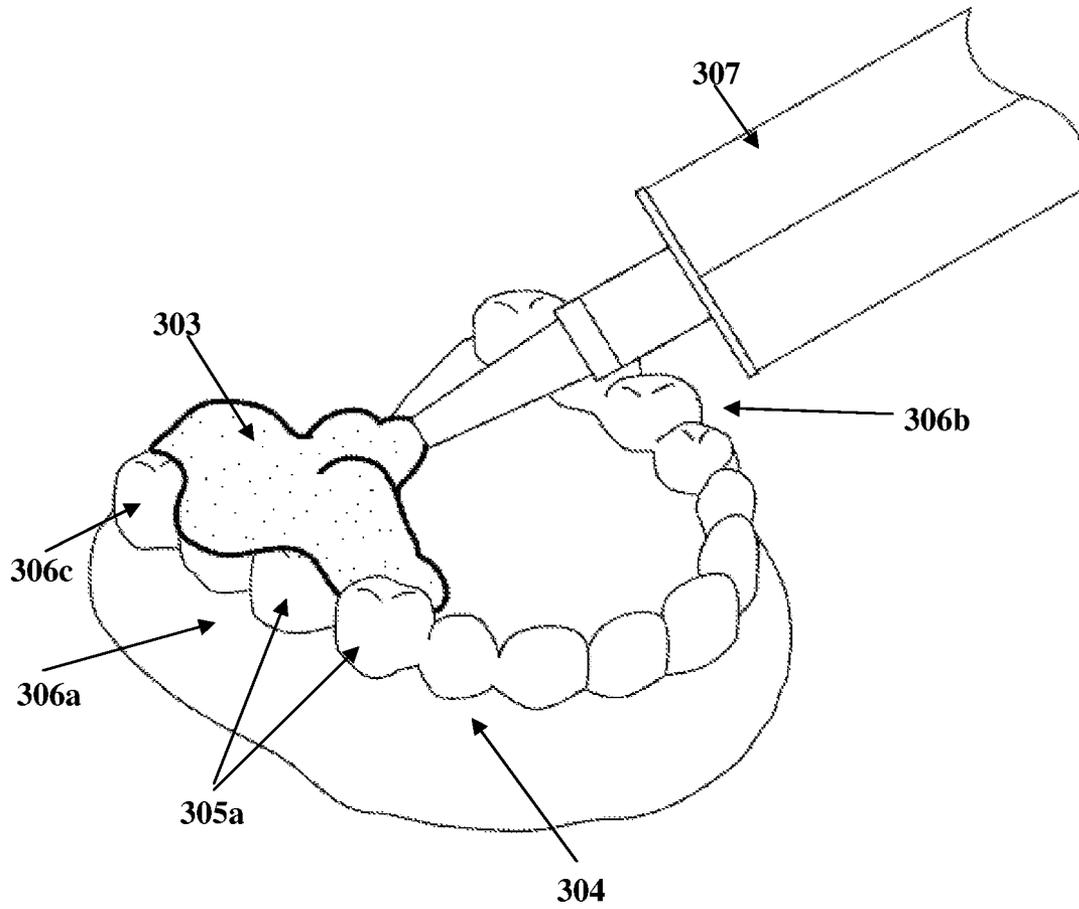


FIG. 3C

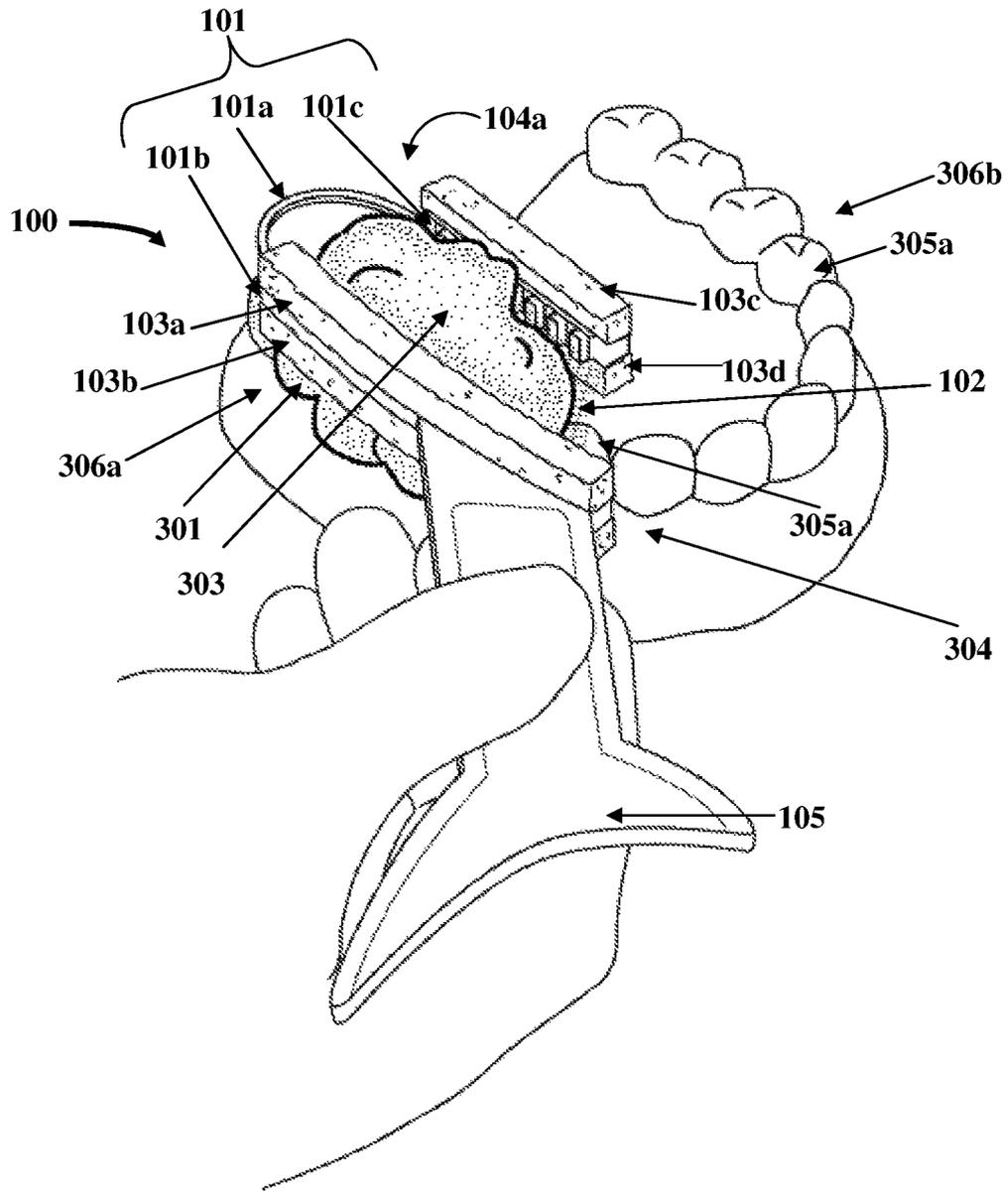


FIG. 4

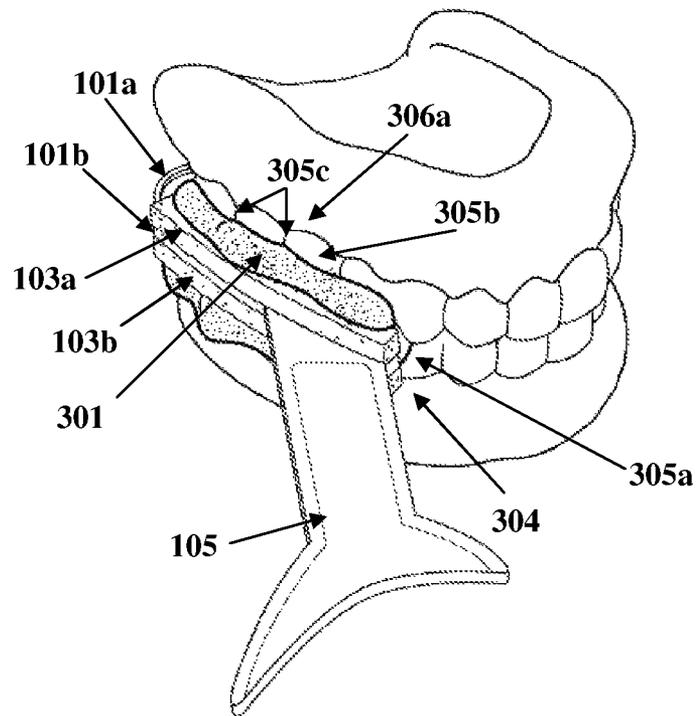


FIG. 5

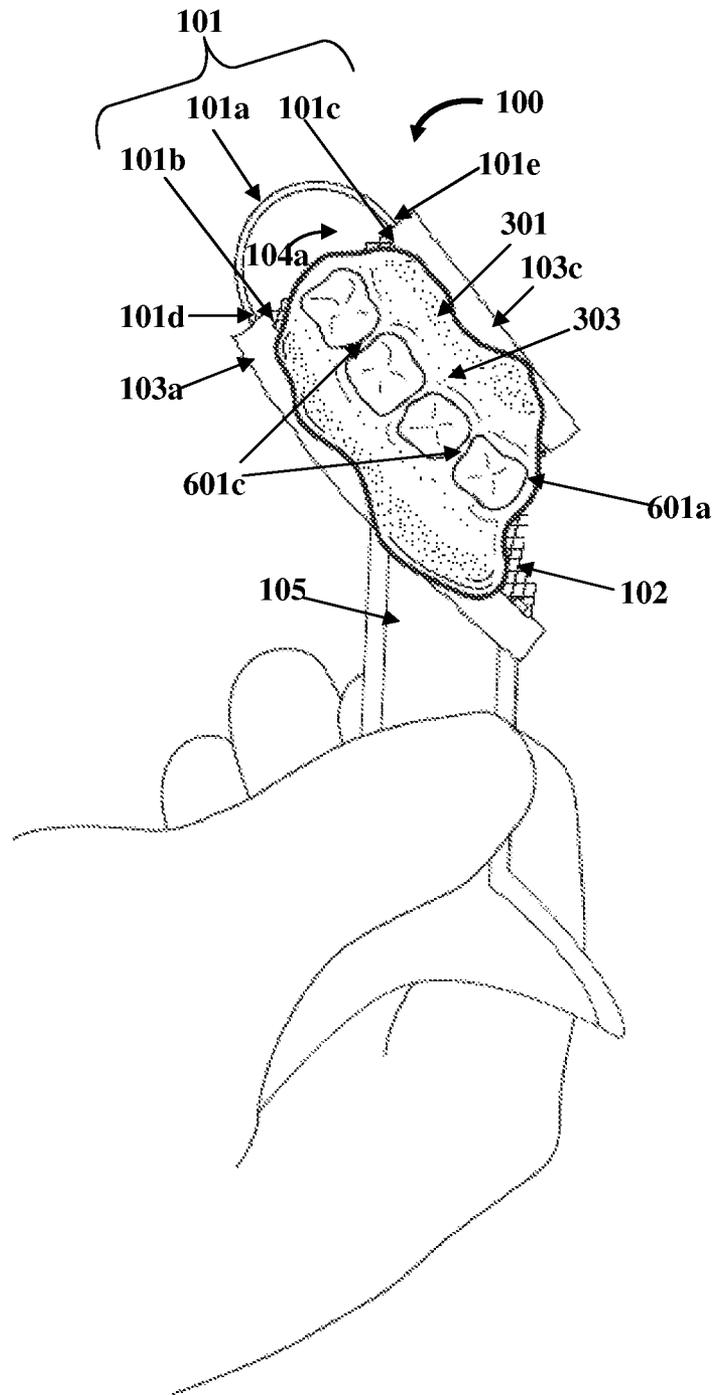


FIG. 6A

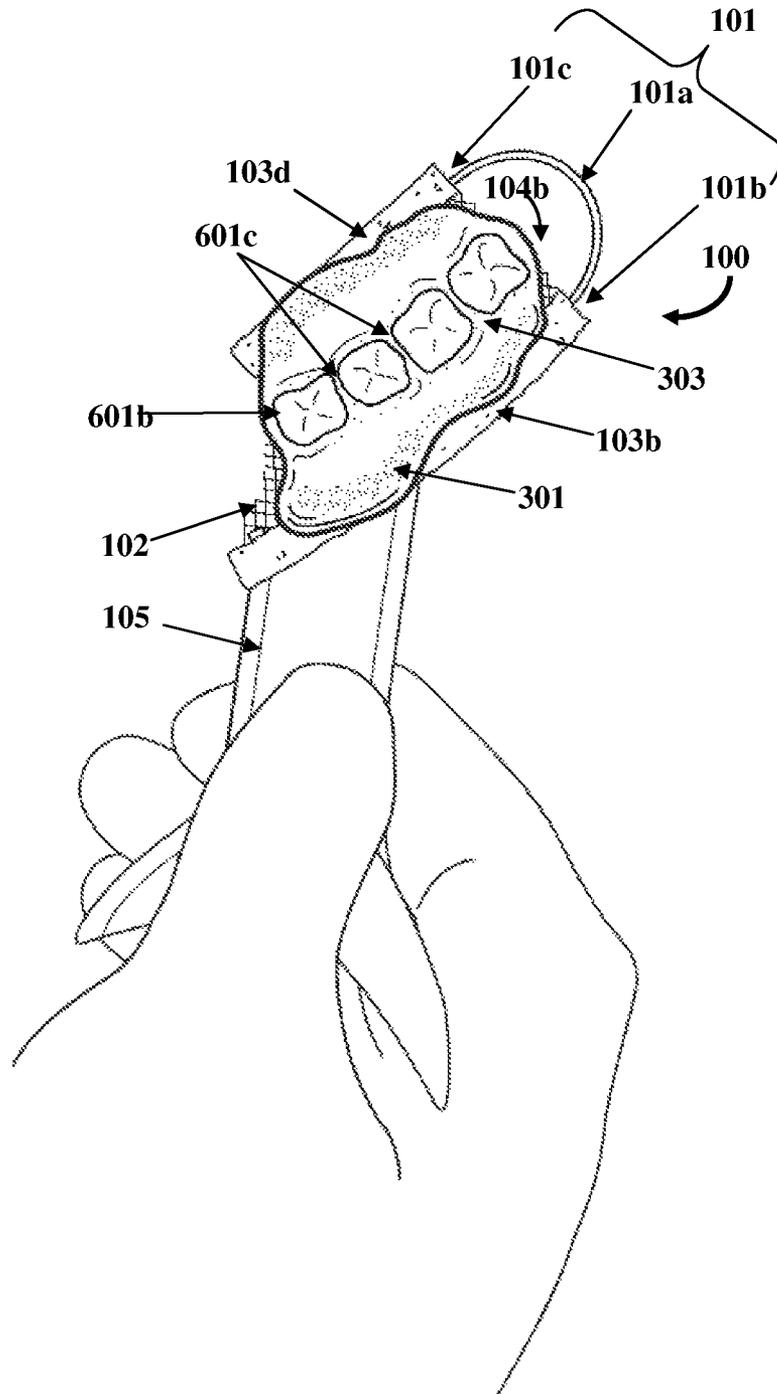


FIG. 6B

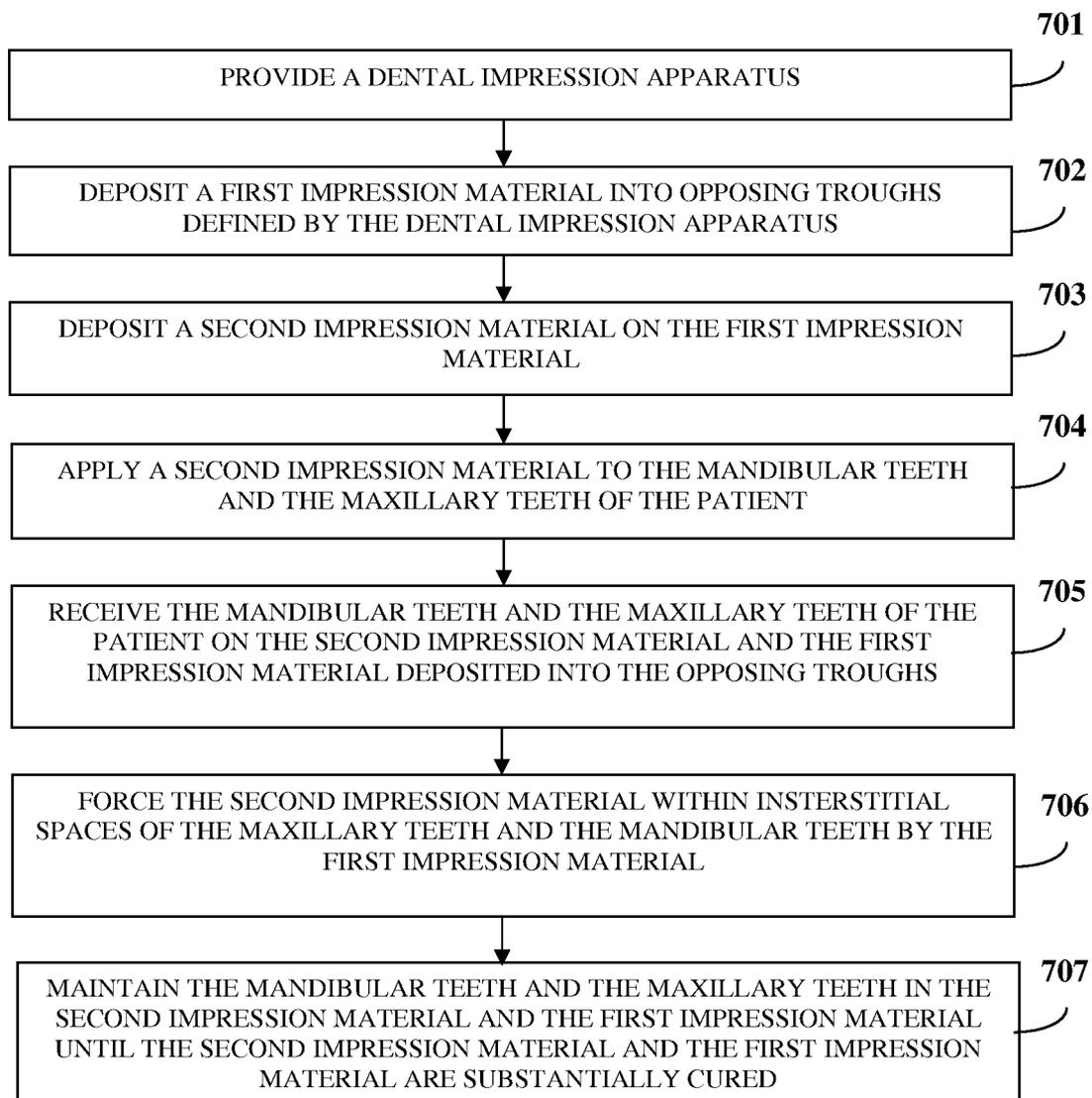


FIG. 7

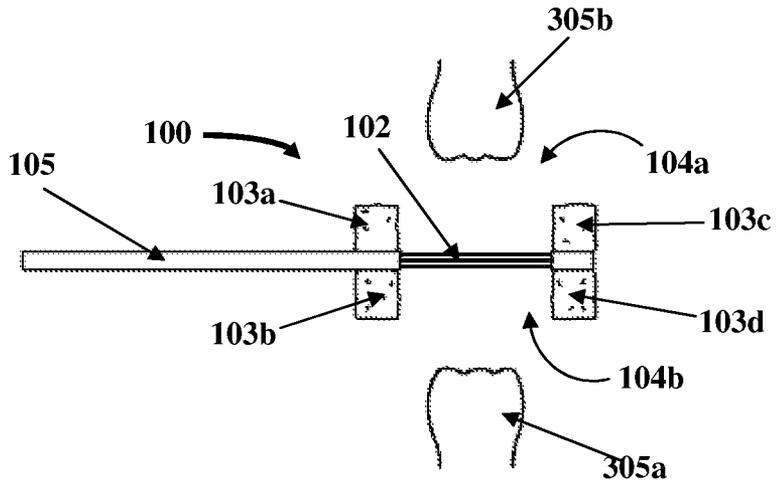


FIG. 8A

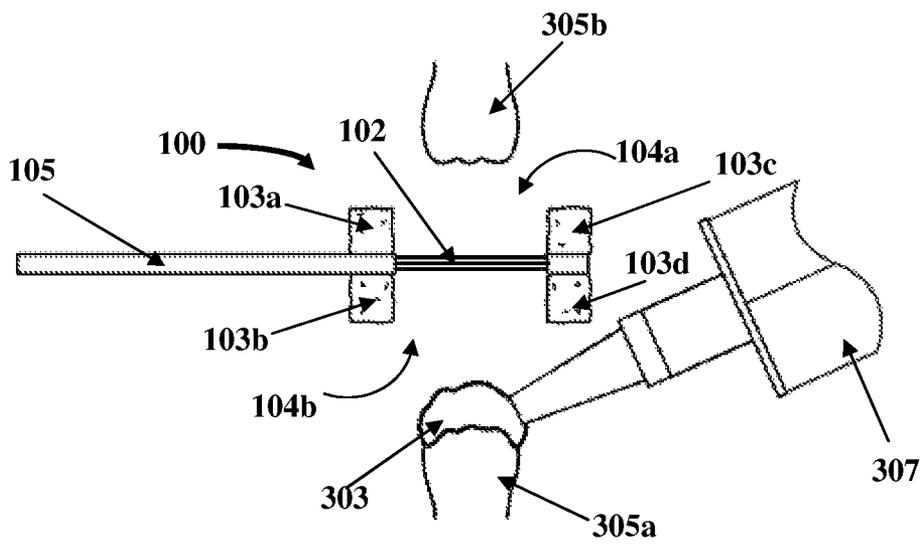


FIG. 8B

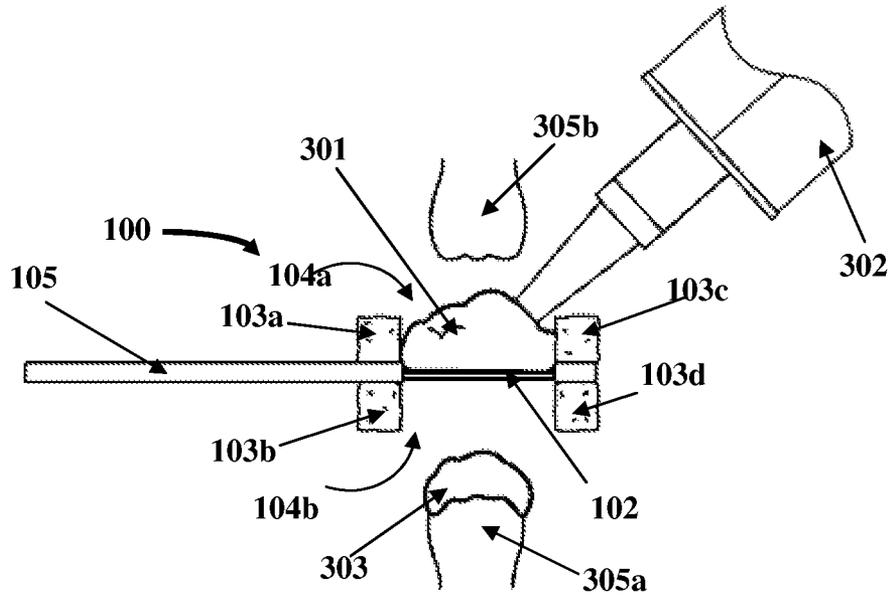


FIG. 8C

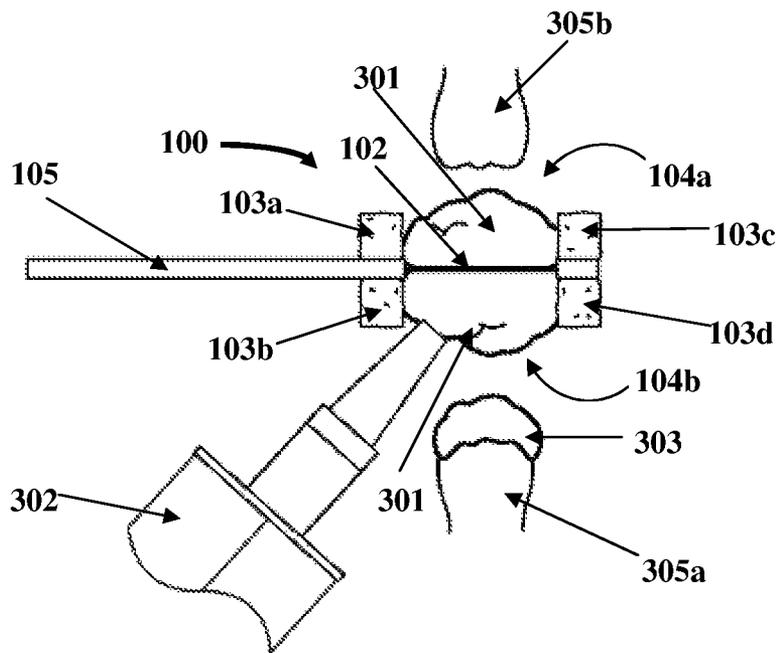


FIG. 8D

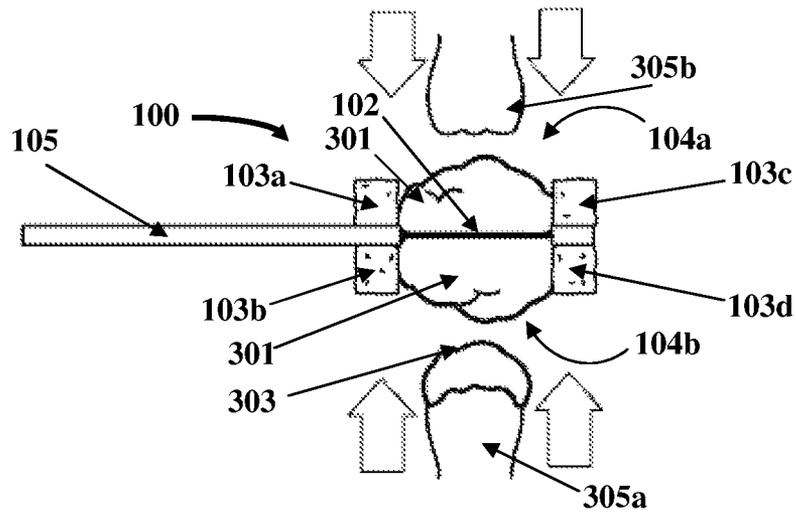


FIG. 8E

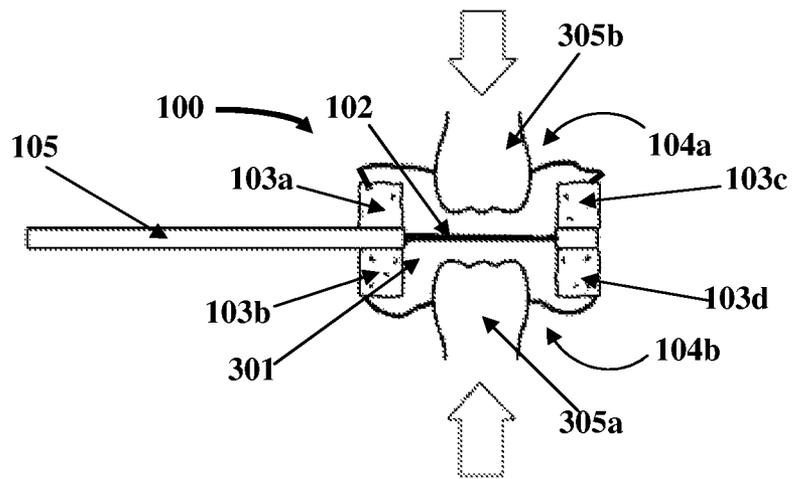


FIG. 8F

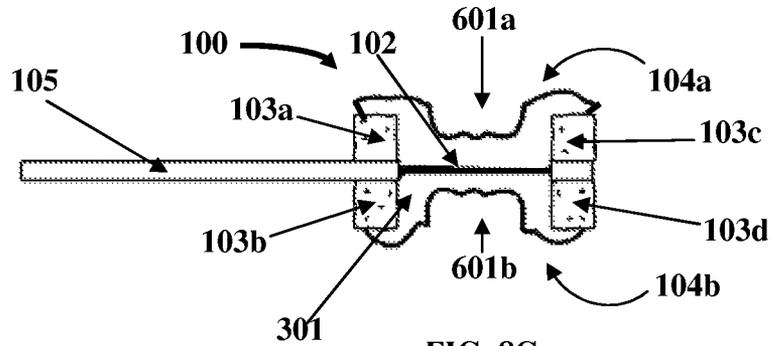


FIG. 8G

## DENTAL IMPRESSION TRAY WITH ABSORBENT BARRIERS

### BACKGROUND

To fabricate a dental prosthesis for a patient, a dental impression of a dentition of the patient is required. At present, a sequence of steps is followed to obtain the dental impression. The impression of prepared teeth such as maxillary teeth and mandibular teeth of a desired dental arch is obtained. The impression of the opposing dental arch is then obtained. A bite registration is then fabricated to interdigitate each impression to enable a dental practitioner to fabricate the dental prosthesis. During this procedure, a dental practitioner must perform retraction of free tissues such as tongue, cheek, lips, etc., retraction of attached tissues such as gingival margins around an individual tooth, control of moisture, saliva, blood, etc., and monitor the patient to prevent gagging. Performing each of these functions sequentially is time consuming and difficult.

Although, current impression devices allow a dental practitioner to capture both the dental arches at once, these devices lack techniques or construction to manage the free tissues, the attached tissues, and/or the moisture contaminants of an oral cavity. Current practices involve auxiliary steps for the management of tissues, for example, mechanical retraction, altered tissue dynamics using laser, electrosurge, etc., or chemical alteration. Hence, there is a need for an apparatus that expedites the procedure for obtaining a dental impression by minimizing the sequence of steps currently followed. There is also a need for an apparatus that effectively employs dental impression materials around the teeth of interest for obtaining an accurate dental impression of the patient.

Therefore, there is a long felt but unresolved need for a dental impression apparatus that accurately obtains a dental impression of a patient with a minimum number of steps. Furthermore, there is a need for a dental impression apparatus that effectively employs the dental impression materials to accurately obtain the dental impression of the patient, while preventing contamination of the dental impression by moisture, saliva, blood, etc.

### SUMMARY OF THE INVENTION

This summary is provided to introduce a selection of concepts in a simplified form that are further described in the detailed description of the invention. This summary is not intended to identify key or essential inventive concepts of the claimed subject matter, nor is it intended for determining the scope of the claimed subject matter.

The dental impression apparatus and method disclosed herein address the above stated needs for accurately obtaining a dental impression of a patient with a minimum number of steps by effectively employing dental impression materials around teeth of interest, while preventing contamination of the dental impression by moisture, saliva, blood, etc.

The dental impression apparatus disclosed herein comprises a support frame of a predefined shape, a partially permeable membrane, and absorbent barrier members. The support frame comprises a distal member, a buccal edge member and a lingual edge member extending from the opposing ends of the distal member. The buccal edge member and the lingual edge member of the support frame are attached to the opposing ends of the distal member of the support frame. In an embodiment, the predefined shape of the support frame conforms to a dental arch of one or more molar and premolar regions of the mandibular teeth and the maxillary teeth of the

patient. The distal member of the support frame is positioned around one of the posterior molar teeth of the patient when obtaining the dental impression of the patient. The partially permeable membrane is mounted between the buccal edge member and the lingual edge member of the support frame.

The pair of absorbent barrier members is mounted onto each of the buccal edge member and the lingual edge member of the support frame. The absorbent barrier members mounted to the buccal edge member and the lingual edge member define opposing troughs separated by the partially permeable membrane. As used herein, each of the troughs refers to a channel of space defined by the partially permeable membrane and the upper absorbent barrier members mounted on the buccal edge member and the lingual edge member or the lower absorbent barrier members mounted on the buccal edge member and the lingual edge member. The opposing troughs are configured to receive mandibular teeth and maxillary teeth of the patient. The dental impression apparatus further comprises a handle attached to and extending outwardly from the buccal edge member of the support frame for holding the dental impression apparatus.

The opposing troughs defined by the dental impression apparatus disclosed herein are deposited with one or more of a first impression material and a second impression material for obtaining the dental impression of the patient. The first impression material is, for example, of a substantially higher viscosity than the second impression material. The first impression material of a substantially higher viscosity than the second impression material forces the second impression material within interstitial spaces of the maxillary teeth and the mandibular teeth. The absorbent barrier members confine a flow of the first impression material and the second impression material within the opposing troughs of the dental impression apparatus, when the patient applies a biting force within the opposing troughs. Furthermore, the absorbent barrier members absorb moisture, saliva, blood, etc., within the patient's oral cavity and prevent contamination of the dental impression during the procedure. The dental impression of each of the mandibular teeth and the maxillary teeth is obtained on the second impression material and the first impression material. The dental impression apparatus and method disclosed herein reduces chair time, is more comfortable for the patient, and allows capture of a more accurate centric occlusion of the patient.

### BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of the invention, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, exemplary constructions of the invention are shown in the drawings. However, the invention is not limited to the specific methods and instrumentalities disclosed herein.

FIG. 1A exemplarily illustrates a perspective view of a dental impression apparatus.

FIG. 1B exemplarily illustrates a top orthogonal view of the dental impression apparatus.

FIG. 2 exemplarily illustrates a front orthogonal view of the dental impression apparatus.

FIG. 3A exemplarily illustrates a perspective view of the dental impression apparatus, showing application of a first impression material having a high viscosity on an upper trough of the dental impression apparatus.

FIG. 3B exemplarily illustrates a perspective view of the dental impression apparatus, showing application of a first

impression material having a high viscosity on a lower trough of the dental impression apparatus.

FIG. 3C exemplarily illustrates application of a second impression material having a low viscosity to mandibular teeth of a patient.

FIG. 4 exemplarily illustrates a perspective view of the dental impression apparatus for obtaining a dental impression of mandibular teeth of the patient.

FIG. 5 exemplarily illustrates a perspective view of the dental impression apparatus for obtaining a dental impression of the mandibular teeth and maxillary teeth of the patient.

FIG. 6A exemplarily illustrates an orthogonal view of the dental impression apparatus, showing a dental impression of the maxillary teeth of the patient.

FIG. 6B exemplarily illustrates an orthogonal view of the dental impression apparatus showing a dental impression of the mandibular teeth of the patient.

FIG. 7 illustrates a method for obtaining dental impressions of a patient.

FIG. 8A exemplarily illustrates an upper trough and a lower trough of the dental impression apparatus configured to receive the maxillary teeth and the mandibular teeth respectively.

FIG. 8B exemplarily illustrates the application of a second dental impression material to the mandibular teeth using a dispensing tube.

FIG. 8C exemplarily illustrates the application of a first dental impression material on the upper trough of the dental impression apparatus using a dispensing tube.

FIG. 8D exemplarily illustrates application of the first dental impression material on the lower trough of the dental impression apparatus using a dispensing tube.

FIG. 8E exemplarily illustrates application of biting force into the upper trough and the lower trough on the dental impression apparatus.

FIG. 8F exemplarily illustrates receipt of maxillary teeth on second impression material and receipt of the mandibular teeth on the first impression material on the dental impression apparatus.

FIG. 8G exemplarily illustrates the dental impression of the maxillary teeth retained on the first impression material and the dental impression of mandibular teeth on the second impression material respectively.

#### DETAILED DESCRIPTION OF THE INVENTION

FIG. 1A and FIG. 1B exemplarily illustrate a perspective and a top orthogonal view of a dental impression apparatus 100 respectively, for obtaining a dental impression of a patient. The term “dental impression” refers to an accurate representation of a part or all of a patient’s dentition comprising, for example, maxillary teeth 305b and mandibular teeth 305a as exemplarily illustrated in FIG. 5. The dental impression apparatus 100 disclosed herein comprises a support frame 101, a partially permeable membrane 102, absorbent barrier members 103a, 103b and 103c, 103d mounted on the support frame 101, and a handle 105. The support frame 101 is of a predefined shape as disclosed in the detailed description of FIGS. 4-5. The support frame 101 comprises a distal member 101a, a buccal edge member 101b and a lingual edge member 101c extending from the distal member 101a. The distal member 101a of the support frame 101 is substantially semi-circular in shape.

The buccal edge member 101b and the lingual edge member 101c of the support frame 101 extend from and are attached to the opposing ends 101d and 101e of the distal member 101a of the support frame 101. As used herein, the

buccal edge member 101b refers to a lateral edge of the dental impression apparatus 100 that is disposed proximal to a cheek of the patient. As used herein, the lingual edge member 101c refers to a lateral edge of the dental impression apparatus 100 that is disposed proximal to the tongue of the patient. Materials used for constructing the support frame 101 comprise, for example, one or more of metal alloys, stainless steel, high density polyethylene, etc.

The partially permeable membrane 102 is, for example, a mesh that allows limited passage of one or more substances, for example, dental impression materials 301 and 303, contaminants, etc. As exemplarily illustrated in FIG. 1A, the partially permeable membrane 102 is mounted between the buccal edge member 101b and the lingual edge member 101c of the support frame 101. The partially permeable membrane 102 is made from materials such as cotton fabric, a nylon mesh, a polyethylene screen, etc. The absorbent barrier members 103a, 103b and 103c, 103d mounted to the buccal edge member 101b and the lingual edge member 101c of the support frame 101 respectively are disclosed in the detailed description of FIG. 2. The absorbent barrier members 103a, 103b and 103c, 103d are of a uniform height and about the length of an exposed portion of the mandibular teeth 305a and maxillary teeth 305b surface over an entire length of said absorbent barrier members.

The handle 105 of the dental impression apparatus 100 is attached to the buccal edge member 101b of the support frame 101 for holding the dental impression apparatus 100. The handle 105 extends outwardly from the buccal edge member 101b of the support frame 101. The handle 105 is shaped to resemble, for example, a sword fish tail as exemplarily illustrated in FIGS. 1A-1B, FIGS. 3A-3B, and FIGS. 4-5. The handle 105 is made from materials comprising, for example, one or more of metal alloys, stainless steel, high density polyethylene, etc.

FIG. 2 exemplarily illustrates a front orthogonal view of the dental impression apparatus 100. A pair of absorbent barrier members 103a, 103b and 103c, 103d of the dental impression apparatus 100 is mounted onto the buccal edge member 101b and the lingual edge member 101c of the support frame 101 respectively. The absorbent barrier members 103a, 103b and 103c, 103d mounted to the buccal edge member 101b and the lingual edge member 101c define opposing troughs 104a and 104b separated by the partially permeable membrane 102 of the dental impression apparatus 100. The opposing troughs 104a and 104b comprise an upper trough 104a and a lower trough 104b. As used herein, the upper trough 104a refers to a channel of space defined by the partially permeable membrane 102 and the absorbent barrier members 103a and 103c mounted on the buccal edge member 101b and the lingual edge member 101c respectively. Also, as used herein, the lower trough 104b refers to a channel of space defined by the partially permeable membrane 102 and the absorbent barrier members 103b and 103d mounted on the buccal edge member 101b and the lingual edge member 101c respectively.

The opposing troughs 104a and 104b, that is the upper trough 104a above the partially permeable membrane 102 and the lower trough 104b below the partially permeable membrane 102, are configured to receive maxillary teeth 305b and mandibular teeth 305a of the patient respectively as exemplarily illustrated in FIGS. 4-5 and FIGS. 8A-8F. The maxillary teeth 305b refer to the upper teeth in the upper jaw or maxilla of the patient. The mandibular teeth 305a refer to the lower teeth in the lower jaw or mandible of the patient. In an embodiment, the absorbent barrier members 103a, 103b and 103c, 103d are mounted along a length of the buccal edge

member **101b** and the lingual edge member **101c** respectively. The absorbent barrier members **103a**, **103b** and **103c**, **103d** absorb moisture, saliva, blood, etc., within the patient's oral cavity and prevent contamination of a dental impression obtained by the dental impression apparatus **100**. The absorbent barrier members **103a**, **103b** and **103c**, **103d** are made from materials comprising, for example, one or more of low density polyethylene foam, a cotton sponge, a cotton polyethylene blend, etc. Hence, the absorbent barrier members **103a**, **103b**, **103c** and **103d** are soft and configured for comfort to the patient using the dental impression apparatus.

The opposing troughs **104a** and **104b** are configured to receive the mandibular teeth **305a** as disclosed in the detailed description of FIG. 4 and the maxillary teeth **305b** as disclosed in the detailed description of FIG. 5. The opposing troughs **104a** and **104b** are deposited with a first impression material **301** and/or a second impression material **303**, as exemplarily illustrated in FIGS. 3A-3B and FIG. 4, for obtaining the dental impression of the patient as disclosed in the detailed description of FIGS. 4-5. The absorbent barrier members **103a**, **103b** and **103c**, **103d** confine a flow of the first impression material **301** and the second impression material **303** within the opposing troughs **104a** and **104b**, when the patient applies a biting force within the opposing troughs **104a** and **104b** as exemplarily illustrated in FIG. 5.

FIG. 3A and FIG. 3B exemplarily illustrate perspective views of the dental impression apparatus **100**, showing application of the first dental impression material **301** having a high viscosity on an upper trough **104a** and a lower trough **104b** of the dental impression apparatus **100** respectively. The dental impression apparatus **100** disclosed herein comprises the support frame **101** having the distal member **101a**, the buccal edge member **101b** and the lingual edge member **101c**, the partially permeable membrane **102**, the absorbent barrier members **103a**, **103b** and **103c**, **103d**, and the handle **105** as disclosed in the detailed description of FIGS. 1A-1B and FIG. 2. The first dental impression material **301** having a high viscosity is applied to the upper trough **104a** defined by the partially permeable membrane **102** and the absorbent barrier members **103a** and **103c** mounted on the buccal edge member **101b** and the lingual edge member **101c** respectively as exemplarily illustrated in FIG. 3A. The first dental impression material **301** having a high viscosity is also applied to the lower trough **104b** defined by the partially permeable membrane **102** and the absorbent barrier members **103b** and **103d** mounted on the buccal edge member **101b** and the lingual edge member **101c** respectively as exemplarily illustrated in FIG. 3B. A dispensing tube **302** containing the first dental impression material **301** is used for dispensing the first dental impression material **301**, having a high viscosity, onto the troughs **104a** and **104b** defined by the dental impression apparatus **100**. A dispensing tube **307** containing the second dental impression material **303** is used for dispensing the second dental impression material **303**, having a low viscosity, as a thin layer on top of the first dental impression material **301**.

FIG. 3C exemplarily illustrates application of a second dental impression material **303** onto the mandibular teeth **305a** of a patient. The second dental impression material **303** has a viscosity substantially lower than the viscosity of the first dental impression material **301** exemplarily illustrated in FIGS. 3A-3B. The first dental impression material **301** is of a substantially higher viscosity than the second dental impression material **303**. FIG. 3C also illustrates a dental arch **304**, and one or more molar and premolar regions **306a** and **306b** of the mandibular teeth **305a**. A second dispensing tube **307** containing the second dental impression material **303** is used

for dispensing and depositing the second dental impression material **303** having a low viscosity at ambient temperature onto the mandibular teeth **305a** of the patient.

In an embodiment, the first impression material **301** shown by dense shading in FIGS. 3A-3B and the second impression material **303** shown by sparse shading in FIG. 3C are both deposited in the troughs **104a** and **104b** as exemplarily illustrated in FIG. 4. The second impression material **303** is applied as a thin layer over the first impression material **301** in the troughs **104a** and **104b**. The first impression material **301** and the second impression material **303** comprise, for example, polymers of different viscosities selected based on curing characteristics required for the dental impression or according to needs or preferences of a dental practitioner. Examples of the first impression material **301** and the second impression material **303** comprise vinyl polysiloxanes (VPS), polyethers, hydrocolloids, etc. The first impression material **301** having a high viscosity confines and drives the second impression material **303** having a low viscosity deeper and tighter around the maxillary teeth **305b** and the mandibular teeth **305a** of the patient.

FIG. 4 exemplarily illustrates a perspective view of the dental impression apparatus **100** for obtaining a dental impression of the mandibular teeth **305a** of the patient. The dental impression apparatus **100** comprises the support frame **101**, the partially permeable membrane **102**, and the absorbent barrier members **103a**, **103b** and **103c**, **103d** as disclosed in the detailed description of FIGS. 1A-1B and FIG. 2. In an embodiment, the predefined shape of the support frame **101** conforms to a dental arch **304** of one or more molar regions **306a** and **306b** of the mandibular teeth **305a** and the maxillary teeth **305b** of the patient. In another embodiment, the predefined shape of the support frame **101** conforms to a dental arch **304** of one or more molar and premolar regions **306a** and **306b** of the mandibular teeth **305a** and the maxillary teeth **305b** of the patient. The dental impression apparatus **100** with the deposited first impression material **301** and second impression material **303** in the troughs **104a** and **104b** is positioned in the patient's mouth to receive the maxillary teeth **305b** and the mandibular teeth **305a**. The distal member **101a** of the support frame **101** is positioned around one of the patient's posterior molar teeth **306c**, when obtaining the dental impression of the patient.

FIG. 5 exemplarily illustrates a perspective view of the dental impression apparatus **100** for obtaining a dental impression of the mandibular teeth **305a** and the maxillary teeth **305b** of the patient. The dental impression apparatus **100** comprising the support frame **101**, the partially permeable membrane **102**, the absorbent barrier members **103a**, **103b** and **103c**, **103d**, and the handle **105** as disclosed in the detailed description of FIGS. 1A-1B and FIG. 2 is inserted in the patient's mouth to receive the maxillary teeth **305b** and the mandibular teeth **305a**. The support frame **101** is of a predefined shape that conforms to the dental arch **304** of one or more molar and premolar regions **306a** and **306b** of the mandibular teeth **305a** and the maxillary teeth **305b** of the patient. FIG. 5 exemplarily illustrates the confinement of the first impression material **301** within the opposing troughs **104a** and **104b** by the absorbent barrier members **103a**, **103b** and **103c**, **103d**, when the patient applies a biting force within the opposing troughs **104a** and **104b** exemplarily illustrated in FIG. 2.

The first impression material **301** deposited in the opposing troughs **104a** and **104b** is of a substantially higher viscosity than the second impression material **303** deposited on the first impression material **301** in the opposing troughs **104a** and **104b**. The absorbent barrier members **103a**, **103b** and **103c**,

**103d** attached to the buccal edge member **101b** and the lingual edge member **101c** of the support frame **101** respectively restrict lateral expansion of the first impression material **301** having a high viscosity. The restriction of the lateral expansion of the first impression material **301** having a high viscosity drives the second impression material **303** having a low viscosity deeper into and tighter around the mandibular teeth **305a** and the maxillary teeth **305b**, thereby creating an accurate dental impression of the patient on the first impression material **301** and the second impression material **303**. When the lateral expansion of the first impression material **301** is restricted, the first impression material **301** forces the second impression material **303** deeper into the interstitial spaces **305c** of the maxillary teeth **305b** and the mandibular teeth **305a** to obtain high precision dental impressions **601a** and **601b** respectively as exemplarily illustrated in FIGS. 6A-6B. With pressure dynamics exhibited by the lateral absorbent barrier members **103a**, **103b** and **103c**, **103d**, the need for mechanical retraction, altered tissue dynamics, or chemical alteration is substantially reduced or eliminated.

FIG. 6A and FIG. 6B exemplarily illustrate orthogonal views of the dental impression apparatus **100**, showing dental impressions **601a** and **601b** of the maxillary teeth **305b** in the upper trough **104a** and the mandibular teeth **305a** in the lower trough **104b** respectively. The second impression material **303** having a low viscosity shown by sparse shading obtains a finer impression **601a** and **601b** of the teeth **305b** and **305a** of the patient, specifically the interstitial spaces **305c** between the teeth **305b** and **305a** when the second impression material **303** is cured. The first impression material **301** having a high viscosity shown by dense shading may obtain a coarser impression **601a** and **601b** of the teeth **305b** and **305a** around the second impression material **303**, depending on the viscosity of the first impression material **301**.

The curing times of both the first impression material **301** and the second impression material **303** ranges, for example, from about 2.5 minutes to about 5 minutes. The second impression material **303**, that is, the initial light body material is syringed around the prepared teeth area first, while the first impression material **301**, that is, the heavy body impression material is filled in one or both the opposing troughs **104a** and **104b** defined by the dental impression apparatus **100**. Working times may decrease once the dental impression apparatus **100** is placed in the patient's oral cavity. In an embodiment, a medium body impression material is used instead of the heavy and/or light body impression material depending on the preference or needs of the dental practitioner.

FIG. 7 illustrates a method for obtaining dental impressions **601a** and **601b** of a patient. A dental impression apparatus **100**, as disclosed in the detailed description of FIGS. 1A-1B and FIG. 2, is provided **701**. The dental impression apparatus **100** disclosed herein comprises the support frame **101** of a predefined shape, the partially permeable membrane **102** mounted on the support frame **101**, and the absorbent barrier members **103a**, **103b** and **103c**, **103d** mounted to the buccal edge member **101b** and the lingual edge member **101c** of the support frame **101** to define opposing troughs **104a** and **104b** separated by the partially permeable membrane **102**. The absorbent barrier members **103a**, **103b** and **103c**, **103d** absorb moisture, saliva, blood, etc., within the patient's oral cavity. The opposing troughs **104a** and **104b** are configured to receive the maxillary teeth **305b** and the mandibular teeth **305a** of the patient respectively. The distal member **101a** of the support frame **101** is positioned around one of the patient's posterior molar teeth **306c** when obtaining the dental impressions **601a** and **601b** of the patient.

A first impression material **301** having a high viscosity is deposited **702** into the opposing troughs **104a** and **104b** defined by the dental impression apparatus **100**. A second impression material **303** having a low viscosity is deposited **703** on the first impression material **301**. The second impression material **303** may also be applied **704** on the mandibular teeth **305a** and the maxillary teeth **305b** of the patient. The mandibular teeth **305a** and the maxillary teeth **305b** of the patient are received **705** on the second impression material **303** and the first impression material **301** deposited into the opposing troughs **104a** and **104b**. The absorbent barrier members **103a**, **103b** and **103c**, **103d** confine a flow of the first impression material **301** and the second impression material **303** within the opposing troughs **104a** and **104b**, when the patient applies a moderate biting force within the opposing troughs **104a** and **104b**. The first impression material **301** having a higher viscosity than the second impression material **303** forces **706** the second impression material **303** within the interstitial spaces **305c** of the maxillary teeth **305b** and the mandibular teeth **305a**, as exemplarily illustrated in FIG. 5, to obtain a finer impression **601c** of the interstitial spaces **305c** of the maxillary teeth **305b** and the mandibular teeth **305a**. The maxillary teeth **305b** and the mandibular teeth **305a** are maintained **707** in the second impression material **303** and the first impression material **301** until the second impression material **303** and the first impression material **301** are substantially cured. When the first impression material **301** and the second impression material **303** are cured, the dental impressions **601a** and **601b** of the maxillary teeth **305b** and the mandibular teeth **305a** are retained by the first impression material **301** and the second impression material **303** as exemplarily illustrated in FIGS. 6A-6B.

FIGS. 8A-8G exemplarily illustrate a sequence of procedural steps for obtaining dental impressions **601a** and **601b** of a patient using the dental impression apparatus **100** disclosed herein. With reference to FIGS. 8A-8G, consider an example where the dental impression apparatus **100**, as disclosed in the detailed description of FIG. 1A-1B and FIG. 2, is employed for obtaining the dental impressions **601a** and **601b** of the maxillary teeth **305b** and the mandibular teeth **305a** of the patient. As exemplarily illustrated in FIG. 8A, the opposing troughs **104a** and **104b** are configured to receive and conform in shape to the maxillary teeth **305b** and the mandibular teeth **305a** of the patient respectively, where the upper trough **104a** receives the maxillary teeth **305b** and the lower trough **104b** receives the mandibular teeth **305a**. A second impression material **303** having a low viscosity is applied to the mandibular teeth **305a** of the patient using the dispensing tube **307** as exemplarily illustrated in FIG. 8B. A first impression material **301** having a substantially higher viscosity than the second impression material **303** is deposited into the opposing troughs **104a** and **104b** using the dispensing tube **302** as exemplarily illustrated in FIGS. 8C-8D. The second impression material **303** may also be deposited on the first impression material **301** in the opposing troughs **104a** and **104b**.

When the patient is instructed to bite into the troughs **104a** and **104b** by applying a biting force as exemplarily illustrated in FIG. 8E, the patient's maxillary teeth **305b** and mandibular teeth **305a** are received on the second impression material **303** and the first impression material **301** deposited into the opposing troughs **104a** and **104b** respectively as illustrated in FIG. 8F. At this step, the absorbent barrier members **103a**, **103b** and **103c**, **103d** confine the flow of the first impression material **301** and the second impression material **303** within the opposing troughs **104a** and **104b**, such that the first impression material **301** having a higher viscosity than the second impression material **303** forces or drives the second

impression material **303** deeper into the interstitial spaces **305c** of the maxillary teeth **305b** and mandibular teeth **305a** to obtain high precision dental impressions **601a** and **601b**.

The patient is instructed to maintain the maxillary teeth **305b** and the mandibular teeth **305a** in the second impression material **303** and the first impression material **301** until the second impression material **303** and the first impression material **301** are substantially cured. As exemplarily illustrated in FIG. 8F, the absorbent barrier members **103a**, **103b** and **103c**, **103d** isolate the teeth **305a** and **305b** of interest and the impression materials **301** and **303** from the soft tissues, saliva, blood, etc., within the oral cavity of the patient, and prevent contamination of the dental impressions **601a** and **601b** during the procedure. When the first impression material **301** and the second impression material **303** are cured, the dental impressions **601a** and **601b** of the maxillary teeth **305b** and the mandibular teeth **305a** respectively are retained on the first impression material **301** and the second impression material **303** as exemplarily illustrated in FIG. 8G.

The first dental impression material and said second dental impression material are configured to simultaneously capture a dental impression of the maxillary teeth, the mandibular teeth and a centric occlusion of the maxillary teeth and the mandibular teeth when a biting force is applied by said patient into said first and second troughs.

The foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention disclosed herein. While the invention has been described with reference to various embodiments, it is understood that the words, which have been used herein, are words of description and illustration, rather than words of limitation. Further, although the invention has been described herein with reference to particular means, materials and embodiments, the invention is not intended to be limited to the particulars disclosed herein; rather, the invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims. Those skilled in the art, having the benefit of the teachings of this specification, may affect numerous modifications thereto and changes may be made without departing from the scope and spirit of the invention in its aspects.

We claim:

**1.** A dental impression apparatus for obtaining a dental impression and a bite registration of maxillary and mandibular teeth, comprising:

- a lingual edge member comprising a top surface, a bottom surface and an inner edge;
- a buccal edge member comprising a top surface, a bottom surface and an inner edge;
- a distal member, said buccal edge member and said lingual edge members being elongated and generally parallel and extending from the opposing ends of said distal member, said distal, lingual and buccal members in combination defining a support frame, said support frame conforming to a dental arch of a patient;
- a handle extending obliquely from said buccal edge member;
- a partially permeable membrane, said partially permeable membrane extending from said inner edge of said buccal edge member to said inner edge of said lingual edge member;
- a first trough defined by said partially permeable membrane, a first absorbent barrier member and a second absorbent barrier member, wherein said partially permeable membrane defines a base of said first trough, wherein said first absorbent barrier member defines a

first wall of said first trough, and wherein said second absorbent barrier member defines a second wall opposite to said first wall of said first trough;

a second trough disposed below said first trough, said second trough defined by said partially permeable membrane, a third absorbent barrier member and a fourth absorbent barrier member, wherein said partially permeable membrane defines said base of said second trough, wherein said third absorbent barrier member defines a first wall of said second trough, wherein said fourth absorbent barrier member defines a second wall opposite to said first wall of said second trough;

said first and third absorbent barrier members extend from a top side and a bottom side of said buccal edge member along an entire length of said buccal edge member;

said second and fourth absorbent barrier members extend from a top side and a bottom side of said lingual edge member along an entire length of said lingual edge member;

wherein said first trough is configured to receive one or more of the maxillary teeth of a patient and said second trough is configured to simultaneously receive one or more of the mandibular teeth of said patient;

wherein all of said first wall and said second wall of said first trough are absorbent and all of said first wall and said second wall of said second trough are absorbent; wherein said support frame is composed of metal alloy, stainless steel or high density polyethylene.

**2.** The dental impression apparatus of claim **1**, wherein said partially permeable membrane comprises one of a cotton fabric, a nylon mesh, and a polyethylene screen.

**3.** The dental impression apparatus of claim **1**, wherein each of said first, second, third and fourth absorbent barrier members is composed of one of a low density polyethylene foam, a cotton sponge, and a cotton polyethylene blend.

**4.** A method for obtaining a dental impression of maxillary and mandibular teeth of a patient, comprising:

- providing a dental impression tray comprising:
  - a lingual edge member comprising a top surface, a bottom surface and an inner edge;
  - a buccal edge member comprising a top surface, a bottom surface and an inner edge;
  - a distal member, said buccal edge member and said lingual edge member being generally parallel and extending from the opposing ends of said distal member, said distal, lingual and buccal members in combination defining a support frame, said support frame conforming to a dental arch of a patient;
  - a handle extending obliquely from said buccal edge member;
  - a partially permeable membrane, said partially permeable membrane extending from said inner edge of said buccal edge member to said inner edge of said lingual edge member;

a first trough defined by said partially permeable membrane, a first absorbent barrier member and a second absorbent barrier member, wherein said partially permeable membrane defines a base of said first trough, wherein said first absorbent barrier member defines a first wall of said first trough, and wherein said second absorbent barrier member defines a second wall opposite to said first wall of said first trough;

a second trough disposed below said first trough, said second trough defined by said partially permeable membrane, a third absorbent barrier member and a fourth absorbent barrier member, wherein said partially permeable membrane defines said base of said second trough,

wherein said third absorbent barrier member defines a  
first wall of said second trough, wherein said fourth  
absorbent barrier member defines a second wall oppo-  
site to said first wall of said second trough;  
said first and third absorbent barrier members extend from 5  
a top side and a bottom side of said buccal edge member  
along an entire length of said buccal edge member;  
said second and fourth absorbent barrier members extend  
from a top side and a bottom side of said lingual edge 10  
member along an entire length of said lingual edge  
member;  
wherein said first trough is configured to receive one or  
more of the maxillary teeth of a patient and said second  
trough is configured to simultaneously receive one or 15  
more of the mandibular teeth of said patient;  
wherein all of said first wall and said second wall of said  
first trough are absorbent and all of said first wall and  
said second wall of said second trough are absorbent;  
wherein said support frame is composed of metal alloy,  
stainless steel or high density polyethylene. 20  
placing a dental impression material into said upper and  
said lower troughs;  
receiving a biting force from the teeth of a patient in said  
first trough and said second trough;  
curing said dental impression material. 25

\* \* \* \* \*