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May 17, 2023

BY FEDERAL EXPRESS

Ascentcare Dental, Inc.
c/o Austin Ritter, Founder and CEO
335 North Griffin Street
Grand Haven, MI 49417

RE: **Notice of Infringement of U.S. Patent Nos. 11,589,969, 11,589,970, D962,438, D962,439**

Dear Mr. Ritter:

We represent Solmetex, LLC ("Solmetex") in connection with intellectual property matters and write regarding Ascentcare Dental Product's infringing Vaculux isolation mouthpieces (the "Unauthorized Products"). If Ascentcare will be represented by counsel in connection with this matter, please direct future communications to my attention through your represented counsel.

Solmetex is the sole owner of all rights and title to U.S. Patent Nos. 11,589,969 ("the '696 patent"), 11,589,970 ("the '970 patent"), D962,438 ("the '438 patent"), and D962,439 ("the '439 patent") (collectively, the "Solmetex Patents") and other intellectual property rights.[1] Copies of the Solmetex Patents are attached hereto as Exhibits A-D.

Ascentcare's Unauthorized Products infringe one or more claims of each of the Solmetex Patents. Claim charts exemplifying Ascentcare's infringement of the Solmetex Patents are attached hereto as Exhibits E-H. These claim charts are provided by way of example only and without limitation to any other positions or arguments by Solmetex.

Ascentcare's past and continuing infringement renders it liable to Solmetex, which is entitled to injunctive relief and damages, including disgorgement and treble damages for intentional infringement, and attorney fees pursuant to 35 United States Code §§ 271, 283, 284, 285, and 289. With respect to the '969 and '970 utility patents, Solmetex is entitled to "damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs." 35 U.S.C. § 284. With respect to the '438 and '439 design patents, 35 U.S.C. § 289 provides that Solmetex may recover Ascentcare's "total profit" for selling "any colorable imitation" of Solmetex's patented designs.

Solmetex values its intellectual property rights and takes the matter seriously. Accordingly, Solmetex demands that Ascentcare immediately comply with the following:

[1] Additional Solmetex patents relevant to this matter include U.S. Patent Nos. 8,911,232, 9,788,924, 11,576,764, D734,851, D809,660, D876,627, and other pending applications.

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1. Cease and desist all making, using selling or offering to sell, and importing the Unauthorized Products, and any other infringing products in all channels, including through Ascentcare's website, within the United States; and

2. Provide an accounting of all sales, offers to sell, uses, installations or other transactions in order to understand the quantum of customers, uses, revenue or proceeds associated with the Unauthorized Products in the United States.

Please confirm in writing by June 2, 2023, that Ascentcare has complied with the above and further provide the requested information by that date.

Ascentcare is now on notice of Solmetex's patent rights and the manner of Ascentcare's infringement of the same. Any further making, using, selling, offering to sell, and/or importing of the Unauthorized Products will be deemed to constitute willful infringement.

This letter is not intended to be, and should not be construed as, a full recitation of all outstanding and legal issues, and nothing in this letter is meant or should be construed to waive or limit any rights, claims, or defenses, all of which are expressly and formally reserved. We appreciate your attention to this matter and look forward to hearing from you and your immediate compliance with the above-mentioned demands.

Regards,

Daniel J. Burnham

Daniel J. Burnham
Partner

Cc: Lauren Nagel, Solmetex, Inc., Chief Operating Officer

EXHIBIT A

US011589969B2

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

(10) **Patent No.: US 11,589,969 B2**
(45) **Date of Patent: *Feb. 28, 2023**

(54) **INTRAORAL DEVICE WITH MESH**

(71) Applicant: **SOLMETEX, LLC**, Northborough, MA (US)

(72) Inventors: **Thien Nguyen**, Santa Ana, CA (US); **Tam Thanh Pham**, San Francisco, CA (US)

(73) Assignee: **SOLMETEX, LLC**, Northborough, MA (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/228,046**

(22) Filed: **Mar. 27, 2014**

(65) **Prior Publication Data**

US 2014/0212837 A1 Jul. 31, 2014

Related U.S. Application Data

(63) Continuation of application No. 14/100,323, filed on Dec. 9, 2013, now Pat. No. 8,911,232.
(Continued)

(51) **Int. Cl.**
A61C 17/02 (2006.01)
A61C 17/08 (2006.01)

(52) **U.S. Cl.**
CPC ***A61C 17/0208*** (2013.01); ***A61C 17/08*** (2019.05)

(58) **Field of Classification Search**
CPC A61C 17/043; A61C 17/046; A61C 17/04; A61C 17/0208; A61C 17/08
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

50,461 A 10/1865 Dibble
1,471,207 A * 10/1923 Riddle A61C 17/043 138/109
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2851861 2/2016
CA 3139689 11/2020
(Continued)

OTHER PUBLICATIONS

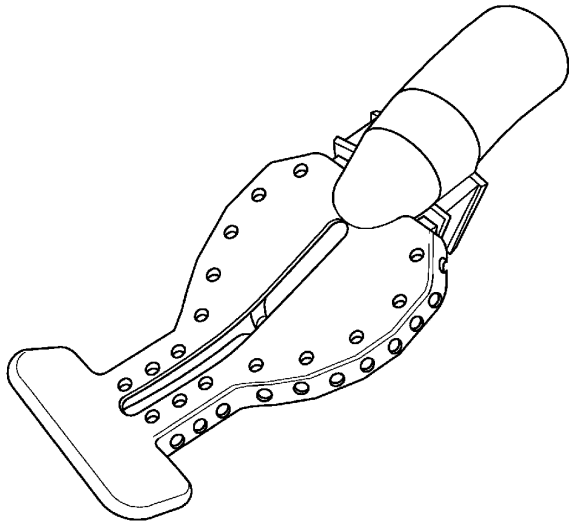
U.S. Appl. No. 14/100,323; Final Office Action dated Oct. 24, 2014.
(Continued)

Primary Examiner — Nicholas D Lucchesi
Assistant Examiner — Hao D Mai
(74) *Attorney, Agent, or Firm* — Polsinelli LLP

(57) **ABSTRACT**

A dental mouthpiece is provided that may be attached to a high-suction dental adapter for the purpose of assisting the dental staff during dental procedures through chair-side, hands-free suction, and isolation. Such mouthpiece may include a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded in one piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

19 Claims, 11 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 61/734,939, filed on Dec. 7, 2012.

(58) **Field of Classification Search**
USPC 433/93
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,731,322	A	10/1929	Riddle	
2,019,612	A *	11/1935	Langhans	H01J 35/16 313/242
2,937,445	A	5/1960	Erickson	
3,090,122	A	5/1963	Erickson	
3,453,735	A	7/1969	Burt et al.	
3,516,160	A	6/1970	Leffler et al.	
3,768,477	A	10/1973	Anders et al.	
3,802,081	A	4/1974	Rogers	
3,857,181	A	12/1974	Rappaport	
3,877,691	A	4/1975	Foster	
3,924,333	A	12/1975	Erickson	
4,017,975	A	4/1977	Johnson	
4,024,642	A	5/1977	Zorovich	
4,083,115	A *	4/1978	McKelvey	A61C 17/043 433/96
4,167,814	A	9/1979	Schubert	
4,192,071	A	3/1980	Erickson	
D267,586	S	1/1983	Hatlen	
4,511,329	A	4/1985	Diamond	
4,718,662	A	1/1988	North	
4,802,851	A	2/1989	Rhoades	
4,822,278	A	4/1989	Oliva et al.	
4,975,057	A	12/1990	Dyfvermark	
5,037,298	A	8/1991	Hickham	
5,078,602	A	1/1992	Honoshofsky	
5,460,524	A	10/1995	Anderson	
D364,456	S	11/1995	Solnit et al.	
5,516,286	A	5/1996	Kushner	
5,720,275	A	2/1998	Patil et al.	
5,730,599	A	3/1998	Pak	
5,762,496	A	6/1998	Albertsson et al.	
5,890,899	A	4/1999	Sclafani	
6,022,214	A	2/2000	Hirsch et al.	
6,213,772	B1	4/2001	Costello	
6,267,591	B1	7/2001	Barstow	
6,338,627	B2	1/2002	Hirsch et al.	
6,575,746	B2	6/2003	Hirsch et al.	
6,652,276	B2	11/2003	Fischer et al.	
6,655,960	B2	12/2003	Fischer	
6,672,305	B2	1/2004	Parker	
6,716,029	B2	4/2004	Fischer et al.	
D495,799	S	9/2004	Hirsch et al.	
D497,426	S	10/2004	Hirsch et al.	
6,908,308	B2	6/2005	Hirsch et al.	
6,974,321	B2	12/2005	Hirsch et al.	
7,287,981	B2	10/2007	Hirsch	
7,293,990	B2	11/2007	Hirsch et al.	
7,611,354	B2	11/2009	Hirsch et al.	
D615,203	S	5/2010	Hirsch et al.	
7,748,981	B2	7/2010	Hirsch et al.	
8,029,280	B2	10/2011	Black et al.	
8,057,227	B2	11/2011	Hirsch et al.	
8,057,228	B2	11/2011	Hirsch et al.	
8,075,310	B2	12/2011	Hirsch et al.	
D663,831	S	7/2012	Sidhu et al.	
8,297,973	B2	10/2012	Hirsch et al.	
8,529,256	B2	9/2013	Hirsch et al.	
8,535,056	B2	9/2013	Dragan et al.	
D696,779	S	12/2013	Hirsch et al.	
8,911,232	B2	12/2014	Nguyen	
D734,851	S	7/2015	Nguyen	
9,084,656	B2	7/2015	Hirsch	
9,089,389	B2	7/2015	Hirsch et al.	
9,358,086	B2	6/2016	Hirsch	
9,788,924	B2	10/2017	Nguyen	
D809,660	S	2/2018	Nguyen	
10,390,734	B2	8/2019	Johnson et al.	
10,390,916	B1	8/2019	Rassibi	
D876,627	S	2/2020	Nguyen	
10,939,979	B2	3/2021	Lombardi	
D962,438	S	8/2022	Nguyen	
D962,439	S	8/2022	Nguyen	
2001/0008752	A1	7/2001	Hirsch et al.	
2003/0134253	A1	7/2003	Hirsch et al.	
2004/0033468	A1	2/2004	Fischer et al.	
2006/0063126	A1	3/2006	Aloise et al.	
2006/0063129	A1	3/2006	Hirsch	
2006/0084031	A1	4/2006	Hirsch et al.	
2008/0166684	A1	7/2008	Kanas	
2008/0318183	A1	12/2008	Suzman	
2009/0123886	A1	5/2009	Vaska	
2009/0274991	A1	11/2009	Black et al.	
2011/0207076	A1	8/2011	Hirsch et al.	
2011/0311942	A1	12/2011	Black et al.	
2012/0015317	A1	1/2012	Milo	
2012/0015320	A1	1/2012	Koo	
2012/0237894	A1 *	9/2012	Maycher	A61C 17/043 433/95
2013/0095450	A1	4/2013	Ames	
2013/0252193	A1	9/2013	Bowman et al.	
2014/0004478	A1	1/2014	Hirsch et al.	
2014/0162209	A1	6/2014	Nguyen	
2014/0212838	A1	7/2014	Nguyen	
2014/0212839	A1	7/2014	Nguyen	
2014/0212840	A1	7/2014	Nguyen	
2014/0212841	A1	7/2014	Nguyen	
2014/0349249	A1	11/2014	Reyes	
2015/0305842	A1	10/2015	Hirsch et al.	
2015/0335409	A1	11/2015	Hirsch	
2017/0156831	A1	6/2017	Reyes	
2017/0156832	A1	6/2017	Reyes	
2017/0156833	A1	6/2017	Reyes	
2018/0153637	A1	6/2018	Al-Shawi et al.	
2020/0155284	A1	5/2020	Baker	
2020/0352680	A1	11/2020	Nguyen	
2020/0383560	A1	12/2020	Day	

FOREIGN PATENT DOCUMENTS

CN	102026587	4/2011	
CN	102247140	11/2011	
CN	104490483	4/2015	
CN	105578986 A	5/2016	
EP	2903557	8/2015	
EP	3184076	6/2017	
EP	3965637	3/2022	
FR	2992161 A1	12/2013	
GB	2 170 106	7/1986	
JP	2022-533276	7/2022	
KR	100654392 B1	12/2006	
TW	202108088	3/2021	
WO	WO 1999/037238	7/1999	
WO	0042939 A1	7/2000	
WO	0061031 A1	10/2000	
WO	WO 2011014952 A1 *	2/2011	A61C 17/043
WO	WO 2015/088577	6/2015	
WO	2018126150 A1	7/2018	
WO	WO 2020/231864	11/2020	

OTHER PUBLICATIONS

U.S. Appl. No. 14/100,323; Office Action dated May 6, 2014.
U.S. Appl. No. 29/491,367, Thien Nguyen, Dental Mouthpiece, filed May 20, 2014.
U.S. Appl. No. 29/477,887, Thien Nguyen, Bridge Structure for Dental Mouthpiece, filed Dec. 27, 2013.
U.S. Appl. No. 29/477,088, Thien Nguyen, Cheek Retractor for Dental Mouthpiece, filed Dec. 27, 2013.
PCT Application No. PCT/US2014/032892 International Search Report and Written Opinion dated dated Sep. 4, 2014.
Australian Patent Application No. 2014202637; AU Examination Report dated Jan. 23, 2015.

(56) **References Cited**

OTHER PUBLICATIONS

European Patent Application No. 14721736.8; Extended European Search Report dated Oct. 20, 2015.
U.S. Appl. No. 14/228,050; Office Action dated Nov. 6, 2015.
U.S. Appl. No. 14/228,054; Office Action dated Dec. 3, 2015.
U.S. Appl. No. 14/228,057; Office Action dated Nov. 20, 2015.
U.S. Appl. No. 14/228,061; Office Action dated Dec. 4, 2015.
U.S. Appl. No. 29/477,887 Office Action dated Nov. 127, 2015.
U.S. Appl. No. 29/477,888 Office Action dated Dec. 2, 2015.
Canadian Patent Application No. 2,919,142; CA Examination Report dated May 31, 2016.
U.S. Appl. No. 14/228,050; Final Office Action dated May 20, 2016.
U.S. Appl. No. 14/228,057; Final Office Action dated Jun. 7, 2016.
U.S. Appl. No. 14/228,061; Final Office Action dated Jun. 30, 2016.
U.S. Appl. No. 29/477,887 Final Office Action dated Jun. 1, 2016.
U.S. Appl. No. 29/477,888 Final Office Action dated Jun. 1, 2016.
U.S. Appl. No. 14/228,050; Office Action dated Nov. 4, 2016.
U.S. Appl. No. 14/228,054; Final Office Action dated Apr. 24, 2017.
U.S. Appl. No. 14/228,057; Office Action dated Apr. 13, 2017.
U.S. Appl. No. 14/228,061; Office Action dated Apr. 12, 2017.
Chinese Patent Application No. 201480039991.2 First Office Action dated Dec. 29, 2016.
U.S. Appl. No. 14/228,054; Final Office Action dated Nov. 2, 2017.
U.S. Appl. No. 14/228,057; Final Office Action dated Nov. 2, 2017.
U.S. Appl. No. 14/228,061; Final Office Action dated Oct. 20, 2017.
U.S. Appl. No. 14/228,057; Final Office Action dated Mar. 22, 2019.
U.S. Appl. No. 14/228,057; Office Action dated Sep. 7, 2018.
U.S. Appl. No. 14/228,061; Office Action dated Oct. 4, 2018.
U.S. Appl. No. 14/228,054; Office Action dated Nov. 29, 2018.
European Patent Application No. 17150671.0; Extended European Search Report dated May 19, 2017.
U.S. Appl. No. 14/228,054; Final Office Action dated Aug. 8, 2019.
U.S. Appl. No. 14/228,061; Final Office Action dated Jul. 11, 2019.
PCT Application No. PCT/US2020/032228 International Search Report and Written Opinion dated Aug. 12, 2020.
U.S. Appl. No. 14/228,054; Office Action dated Nov. 13, 2020.
U.S. Appl. No. 14/228,061; Final Office Action dated Jan. 10, 2020.
Brazilian Patent Application No. BR1120140116377 Preliminary Office Action dated Jan. 7, 2020.
U.S. Appl. No. 14/228,057; Final Office Action dated May 19, 2020.
U.S. Appl. No. 14/228,057; Office Action dated Oct. 7, 2019.
U.S. Appl. No. 29/491,367 Final Office Action dated Mar. 4, 2015.
U.S. Appl. No. 29/491,367 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 29/477,887 Final Office Action dated May 1, 2015.
U.S. Appl. No. 29/477,887 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 29/477,888 Final Office Action dated May 1, 2015.
U.S. Appl. No. 29/477,888 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 14/100,323, Thien Nguyen, Intraoral Dental Suction and Isolation System, filed Dec. 9, 2013.
U.S. Appl. No. 14/228,050, Thien Nguyen, Intraoral Device With Bridge, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,054, Thien Nguyen, Intraoral Device With Stability Start, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,057, Thien Nguyen, Intraoral Device With Slit, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,061, Thien Nguyen, Intraoral Device With Detachable Mouth Prop, filed Mar. 27, 2014.
U.S. Appl. No. 16/870,745, Thien Nguyen, Dental Mouthpiece, filed May 8, 2020.
PCT Application No. PCT/US2014/032892 International Preliminary Report on Patentability dated Jun. 14, 2016.
U.S. Appl. No. 14/228,054; Office Action dated Jun. 25, 2021.
U.S. Appl. No. 14/228,054; Final Office Action dated Dec. 22, 2020.
U.S. Appl. No. 14/228,061; Office Action dated Nov. 27, 2020.
U.S. Appl. No. 29/477,888 Office Action dated Mar. 21, 2017.
U.S. Appl. No. 14/228,057; Office Action dated Sep. 2, 2022.
PCT Application No. PCT/US2020/032228 International Preliminary Report on Patentability dated Nov. 16, 2021.
U.S. Appl. No. 16/870,745 Final Office Action dated May 12, 2022.
U.S. Appl. No. 29/782,644 Final Office Action dated May 11, 2022.
U.S. Appl. No. 29/782,643 Final Office Action dated May 11, 2022.
U.S. Appl. No. 14/228,054; Final Office Action dated Jan. 3, 2022.
U.S. Appl. No. 14/228,061; Non-Final Office Action dated Dec. 8, 2021.
U.S. Appl. No. 16/870,745 Non-Final Office Action dated Dec. 3, 2021.
U.S. Appl. No. 14/228,057; Final Office Action dated Nov. 12, 2021.
U.S. Appl. No. 29/782,645; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,638; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,644; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,643; Non-Final Office Action dated Oct. 4, 2021.
Dryshield brochure. Dryshield.com. Publish date: May 2019. Retrieval date: Sep. 15, 2021. Retrieved from internet: https:// dryshield.com/ds/Brochure_May2019.pdf (Year: 2019).
"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: Oct. 27, 2014. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).
"Dryshield (single-use) vs Zryis/Isolite (single-use) mouthpieces" posted by Mark Frias, RDH. Youtube. Posting date: Jan. 18, 2020. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=uKX9XahO6EY (Year: 2020).
"Dryshield Tutorial—Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: Apr. 15, 2015. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).

* cited by examiner

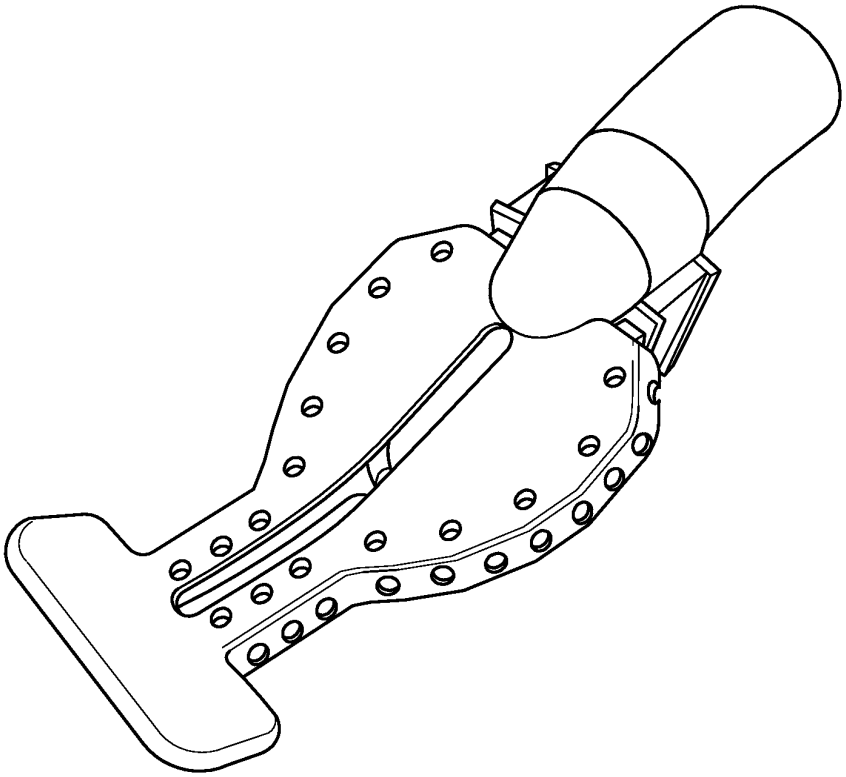


FIG. 1A

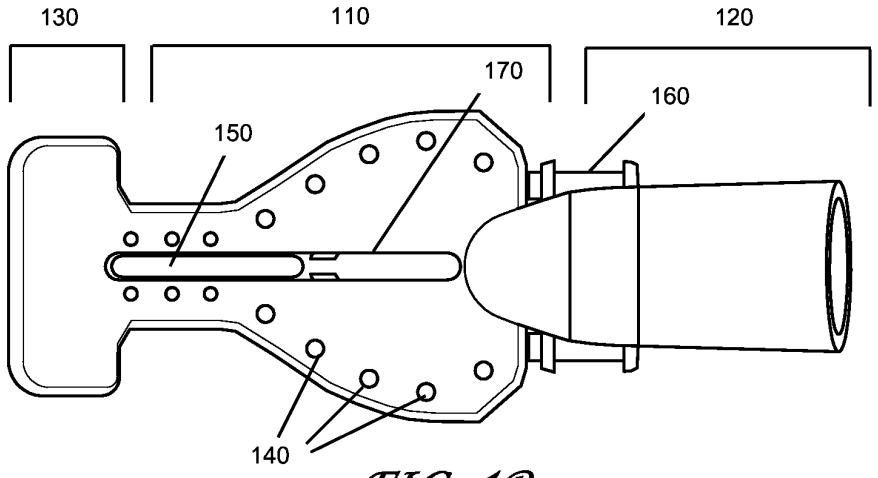


FIG. 1B

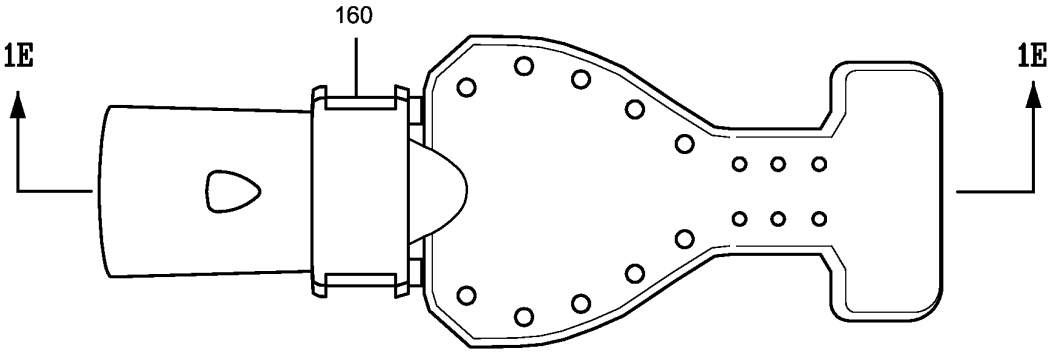


FIG. 1C

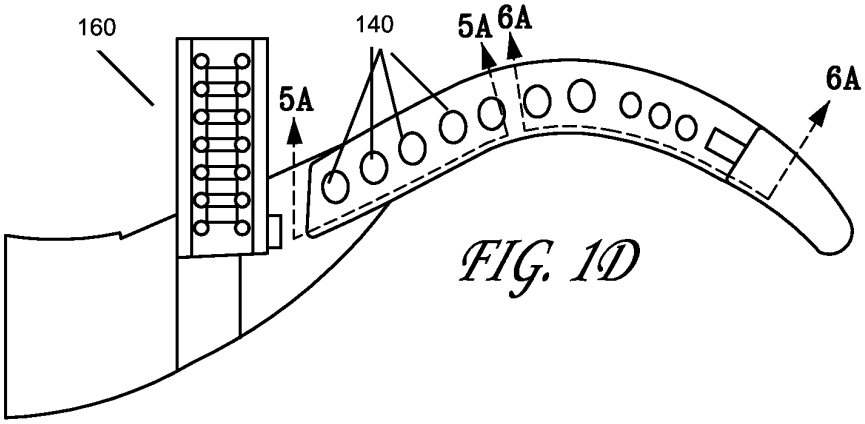


FIG. 1D

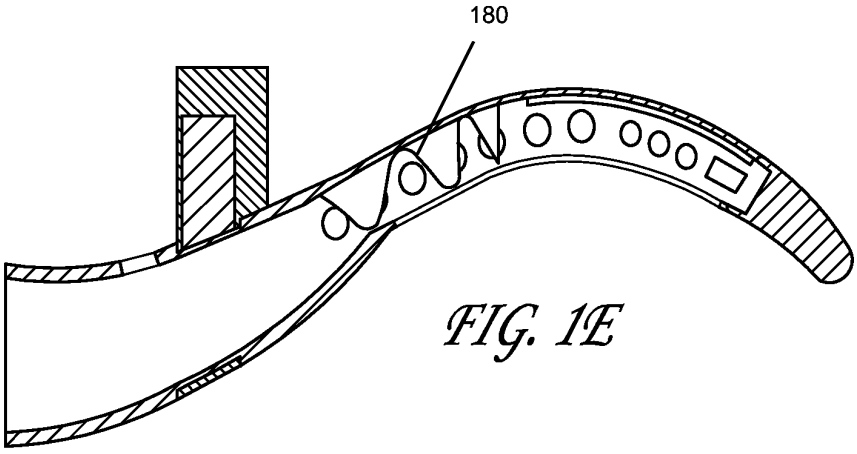


FIG. 1E

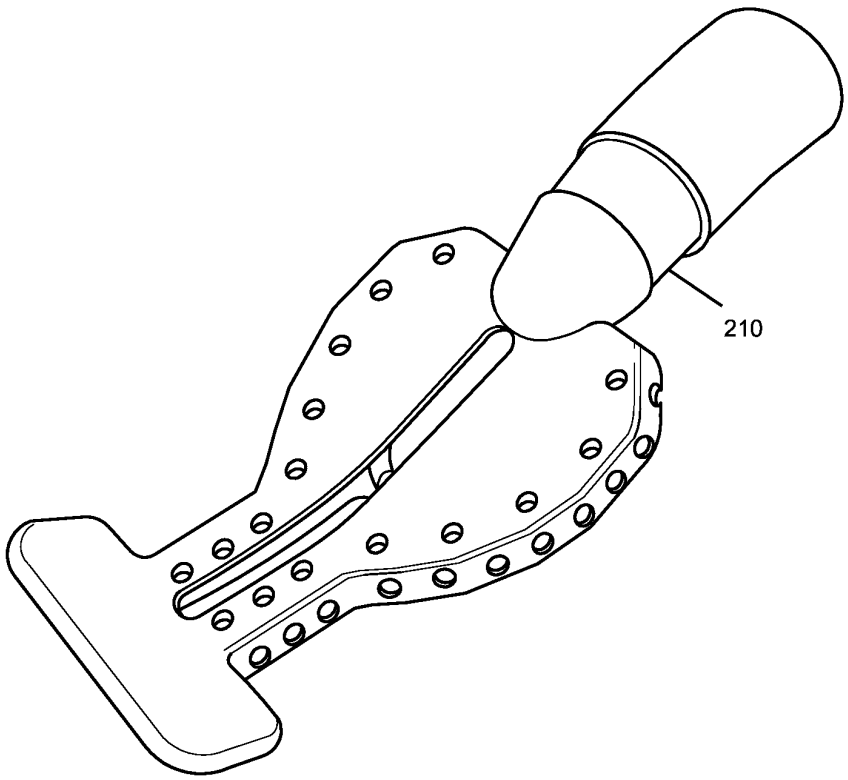


FIG. 2A

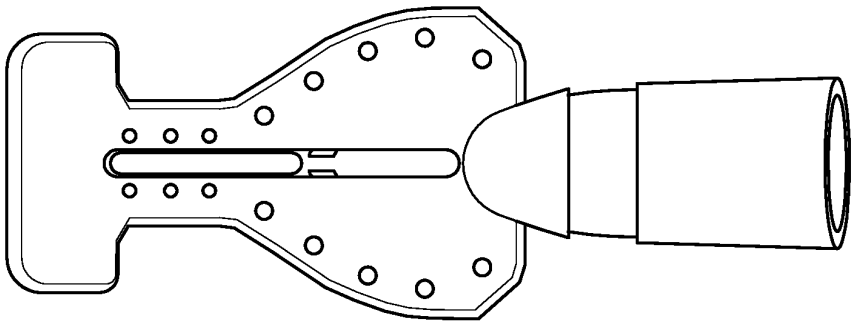


FIG. 2B

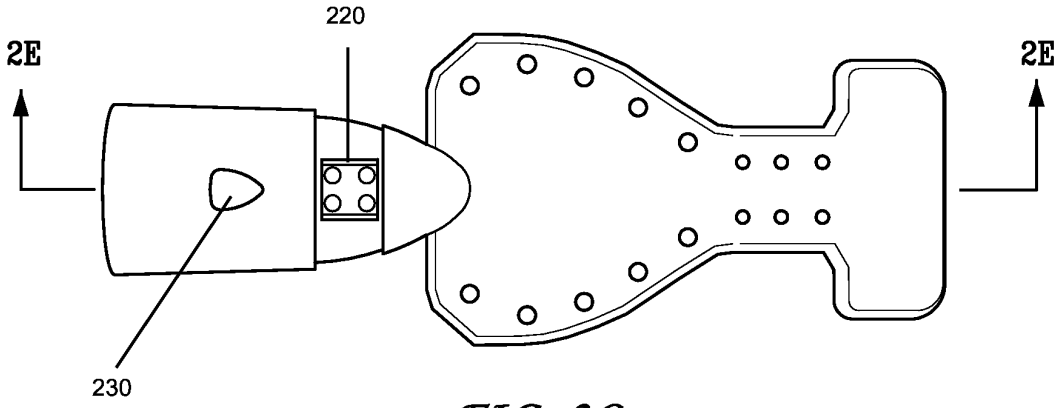


FIG. 2C

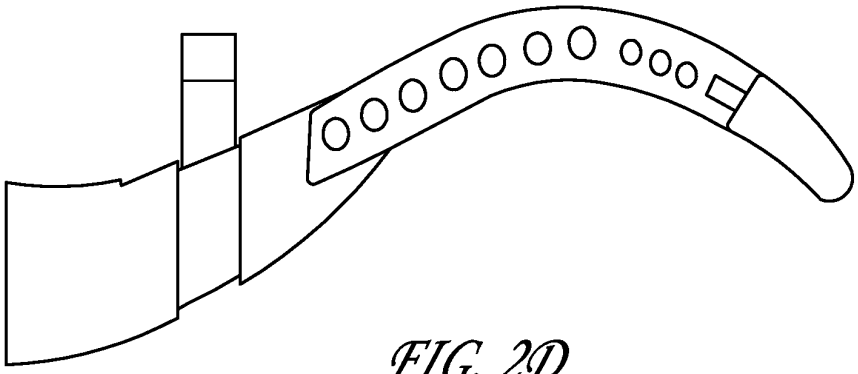


FIG. 2D

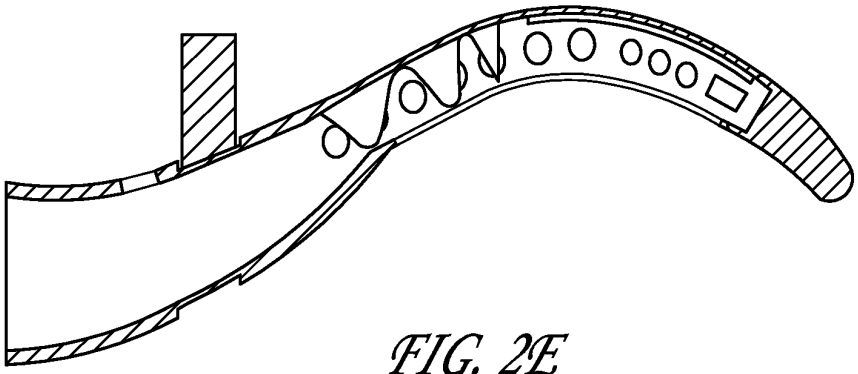


FIG. 2E

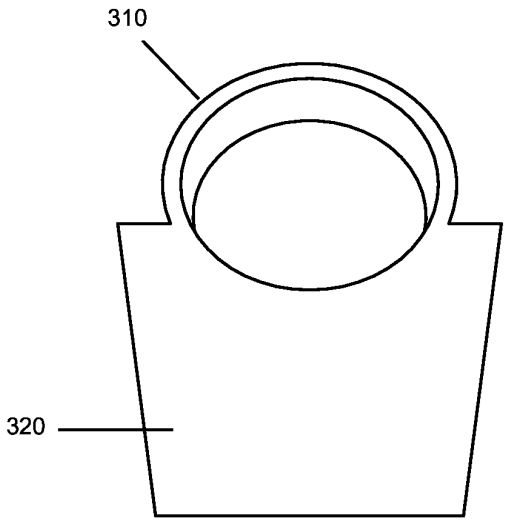


FIG. 3A

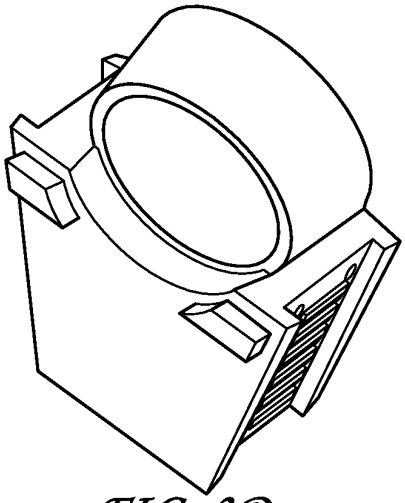


FIG. 3D

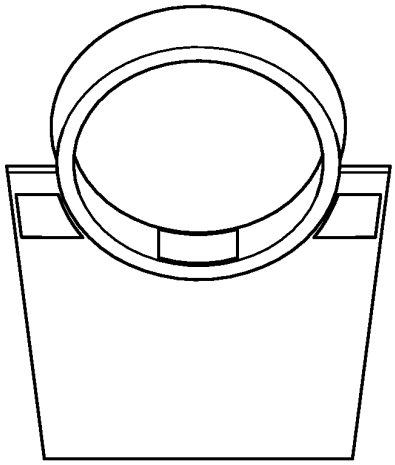


FIG. 3B

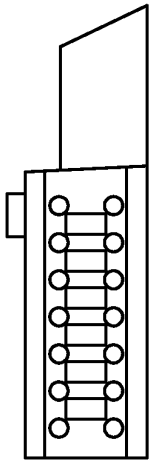


FIG. 3E

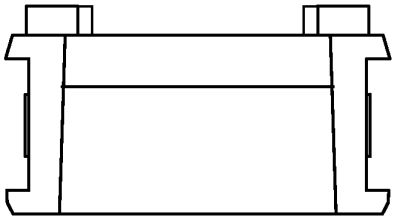


FIG. 3C

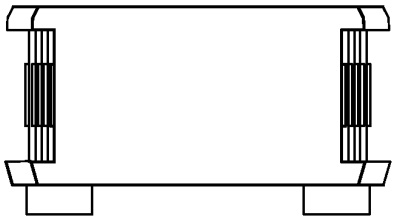


FIG. 3F

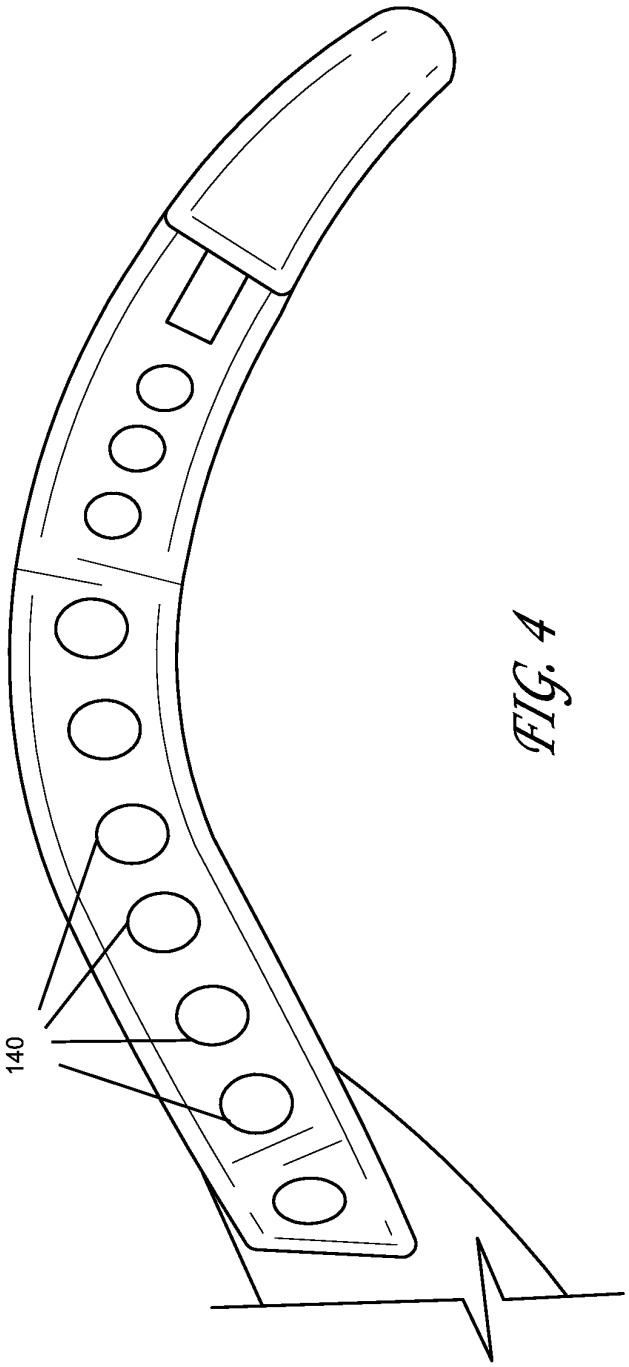


FIG. 4

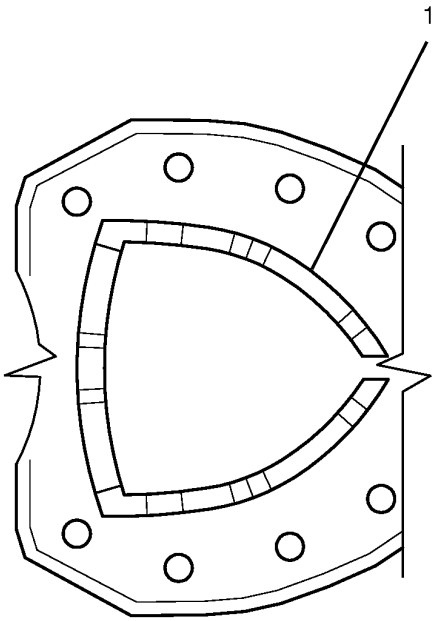


FIG. 5

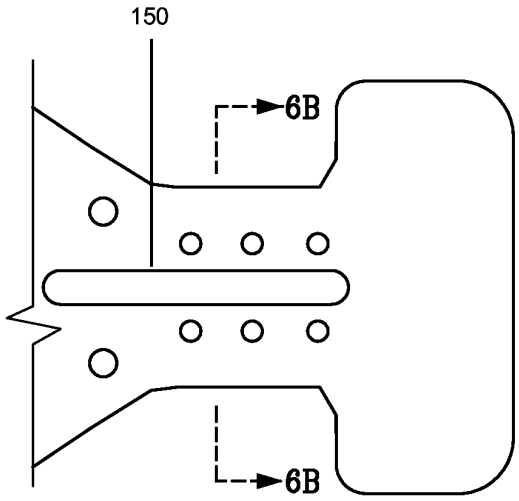


FIG. 6A

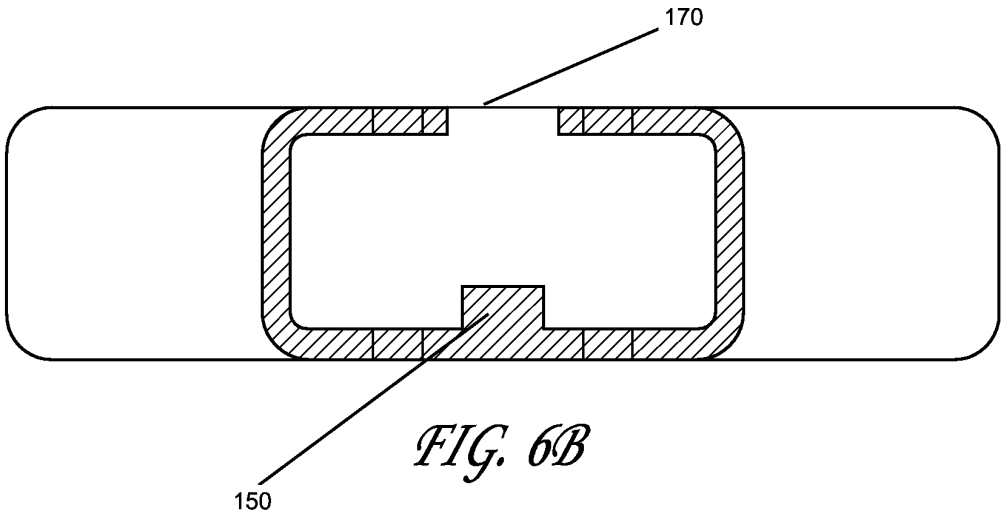


FIG. 6B

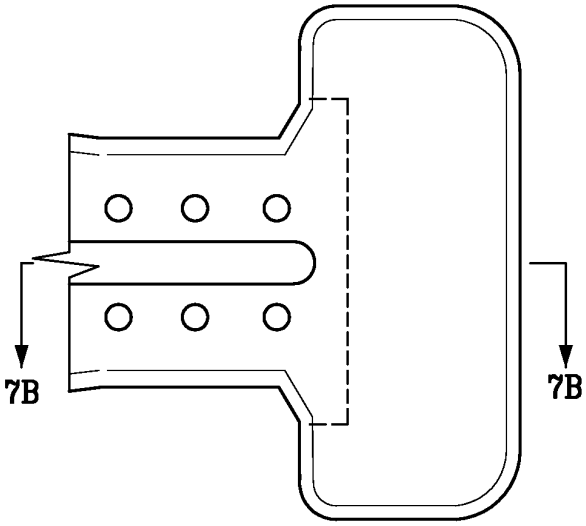


FIG. 7A

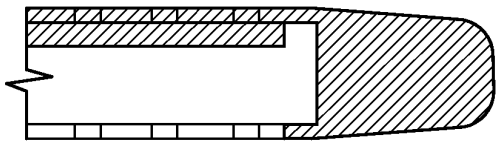


FIG. 7B

INTRAORAL DEVICE WITH MESH

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation and claims the priority benefit of U.S. patent application Ser. No. 14/100,323 filed Dec. 9, 2013, which claims the priority benefit of U.S. provisional patent application No. 61/734,939 filed Dec. 7, 2012, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to the field of dental mouthpieces. More specifically, the present invention relates to intraoral dental suction and isolation mouthpieces.

2. Description of Related Art

Various mouthpieces are currently used by dental health professionals, dental hygienists, and dental assistants in the field of dentistry. In the past, a dental patient has been treated by a traditional two-person team that comprises a dental professional and a dental assistant. Further, dental treatment may be provided by the team using many different types of dental equipment and materials. Such dental equipment and materials may include such items as an intraoral mirror, a bite block, a slow speed suction ejector, a high speed suction ejector, gauzes, cotton rolls, and dry angles. Each item of dental equipment may be used for different purposes, though some may be used in combination for some types of dental services. As such, a dental professional seeking to provide such dental services may need to use multiple items of such dental equipment. An important role of the dental assistant is therefore to assist the dental professional in coordinating the use of these multiple items of different equipment and materials.

There is, therefore, a need in the art for improved systems and methods of providing dental services in a more efficient, comfortable, and safe manner to the dental patient.

SUMMARY OF THE CLAIMED INVENTION

Embodiments of the present invention may include a mouthpiece that may be attached to a high-suction dental adapter for the purpose of assisting the dental staff during dental procedures through chair-side, hands-free suction, and isolation. Such a mouthpiece may comprise a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded in one piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of a high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

The main body portion may comprise an enclosed pocket made up of an anterior wall, a posterior wall, and a side wall in between the anterior and posterior walls. The side wall may be perforated with a plurality of perforations. Such perforations may constitute a mesh. Additional perforations may be located on the anterior and posterior walls. The main body portion may further include a slit along a longitudinal, central axis on the anterior wall. Such openings (e.g., perforations and slit) allow for suction of air, fluids, and small debris from the patient's mouth, through the openings into the interior portion, and into the suction connector portion towards a suction source. Because the mouthpiece is made of a flexible and resilient material (e.g., silicone), the mouthpiece may be bent when placed in a patient's mouth to conform to the shape of the mouth. When properly positioned, the suction connector portion may protrude from one side of the patient's mouth, while the main body lies against the back of the patient's mouth, and the cheek retractor presses against the patient's cheek on the opposite side of the patient's mouth.

The main body may further include an protruding bridge structure on the interior surface of the posterior wall. Such a bridge structure may protrude from the interior surface in a wave shape with crests and troughs. The crests provide a plurality of contact points with the anterior wall to keep the anterior wall separated from the posterior wall during suction. Meanwhile, the troughs provide gaps that allow for suction of air, fluids, and small debris through the bridge structure.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1**A is a perspective view of an exemplary mouthpiece with a detachable mouth prop.

FIG. **1**B is a top view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**C is a bottom view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**D is a side view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**E is a cross-sectional view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **2**A is a perspective view of the exemplary mouthpiece of FIG. **1**A where the detachable mouth prop has been detached.

FIG. **2**B is a top view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**C is a bottom view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**D is a side view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**E is a cross-sectional view of the exemplary mouthpiece of FIG. **2**A.

FIG. **3**A is a front view of an exemplary mouth prop.

FIG. **3**B is a back view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**C is a bottom view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**D is a perspective view of the exemplary mouth prop of FIG. **3**A .

FIG. **3**E is a side view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**F is a top view of the exemplary mouth prop of FIG. **3**A.

FIG. **4** is a close-up view of exemplary mesh sides in an exemplary mouthpiece.

FIG. **5** is a close-up view of an internal bridge in an exemplary mouthpiece.

FIG. **6**A is a close-up view of an exemplary reinforcing bar in an exemplary mouthpiece.

FIG. **6**B is a cross-sectional view of the exemplary reinforcing bar of FIG. **6**A.

FIG. **7**A is a close-up view of an exemplary cheek retractor portion in an exemplary mouthpiece.

FIG. **7**B is a cross-sectional view of the exemplary cheek retractor portion of FIG. **7**A.

DETAILED DESCRIPTION

Embodiments of the present invention provide for a mouthpiece comprising a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded as one-piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of a high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

FIGS. **1**A-E are different views of an exemplary mouthpiece with an attachable mouth prop **160**, while FIGS. **2**A-E are different views of the exemplary mouthpiece of FIG. **1**A where the attachable mouth prop **160** has been detached. Such a mouthpiece may include a main body portion **110**, a suction connector portion **120**, and a cheek retractor portion **130**.

The main body portion **110** may include mesh or perforations **140**, a stability bar **150**, an open slit **170**, and an internal bridge **180**. The main body potion **110** may connect to a suction connector portion **120** on one end and a cheek retractor portion **130** at the other end. Such a cheek retractor portion **130** may be configured to press against and retract a patient's cheek away from the patient's teeth. When placed in a patient's mouth, the suction connector portion **120** may protrude from one side of the patient's mouth, while the main body portion **110** lies against the back of the patient's mouth, and the cheek retractor portion **130** retracts the patient's cheek on the opposite side of the patient's mouth. The flexibility of the material used to form the mouthpiece allows for some bending when placed in the patient's mouth. The material is, however, resilient enough that the cheek retractor portion presses against the inside of the patient's cheek with such pressure being sufficient to move the cheek away from the patient's teeth.

An exemplary main body portion **110**, when placed in a mouth, may include an anterior wall facing the front of the mouth (e.g., the side with slit **170**) and a posterior wall facing the back of the mouth. The two walls may connect at a superior wall and an inferior wall forming a body that is at least partially enclosed.

Superior may be used herein to refer to the side that rests against a roof of a patient's mouth when placed therein, and inferior may be used to refer to the side that rests against the floor of the patient's mouth. The superior and inferior sides may be formed identically, which may allow for the mouthpiece to change orientation such that the superior side may appear as the inferior side and vice versa, in the new orientation. When in use, the respective sides of the main body portion **110** may serve to protect and separate the top of the mouth and the bottom of the mouth/tongue. In addition, the main body portion **110** may also serve to protect the back of the mouth (e.g., throat and airway) from falling debris.

Much of the main body portion **110** of the mouthpiece may be shaped as a straight-line arrowhead or shield whose base generally conforms to the intraoral shape of a patient's mouth. Differently-sized mouthpieces may be provided for differently-sized mouths of adults and children. Part of the base side of the arrowhead may be formed with thicker walls than the rest of the main body. Such thickening may provide additional stability.

In addition, the main body portion **110** of the mouthpiece may include a plurality of holes **140** distributed along the superior and inferior sides of the anterior and posterior walls to assist in suctioning of water, saliva and debris from the oral cavity. In some embodiments, a set of holes may also form a mesh along the walls of the superior and inferior edges. FIG. **4** is a close-up view of an exemplary mesh wall in an exemplary mouthpiece.

At the narrow end of the arrowhead that connects to the cheek retractor portion **130**, the main body portion **110** may include a rectangular portion. Narrower than the base of the arrowhead, the rectangle may additionally include a reinforcing bar (or stability bar) **150** (described in further detail below) and may be at least partially crossed by a slit **170** (described in further detail below) into the interior of the pocket of the main body portion **110**.

Stability bar **150** may be a protrusion or otherwise a thickened area that reinforces the stability of the rectangular portion and assist in shaping this region to the intraoral posterior shape of a patient's mouth. FIG. **6**A is a close-up view of an exemplary stability bar **150** of an exemplary mouthpiece. FIG. **6**B is a cross-sectional view of the exemplary reinforcing bar in the cheek retractor connector portion of FIG. **6**A.

In some embodiments, the internal, rectangular-shaped reinforcing or stability bar **150** may be located distally to the internal wavelike bridge structure **180** and attached to both the interior side of the posterior surface of the main body and the rectangular portion. Such a stability bar **150** may be located in the area where a positioned mouthpiece begins to wrap from the lingual side of the most posterior mandibular tooth, around the distal side of the most posterior tooth, and to anterior side of the most posterior mandibular tooth, thereby assisting in shaping the mouthpiece to the general intraoral shape of a patient's mouth.

Various embodiments of the mouthpiece may further include a longitudinal, open slit **170** extending over approximately two-thirds of the main body on the anterior surface. Running along the center of the main body across the rectangle and most of the arrowhead, such a slit **170** may assist in capture and suction of water, saliva and debris, as well as assisting in cleaning and maintenance.

Additionally, the main body of the mouthpiece may include a bridge structure **180** on an interior surface to ensure that the anterior and posterior surfaces remain separated during suction. FIG. **1**E is a cross-sectional view of the mouthpiece in which the bridge structure **180** is illustrated. FIG. **5** is a close-up view of the bridge structure **180** without the surrounding walls of the main body portion. Such a bridge structure **180** may be formed as an wave-like protrusion that generally corresponds to the distance between the anterior and posterior walls extending substantially (e.g., within 1 mm) the full distance at its crest and substantially flush to the surface at its trough. In some embodiments, the bridge structure **180** may be centrally-located in the main body portion **110** of the mouthpiece. The gaps (or troughs) between the waves of the bridge structure **180** assist in the suction-driven transfer of water and saliva to the suction connector portion **120** and ultimately, into a central suction vacuum. In some embodiments, the bridge structure **180** may follow the shape of a logo (e.g., an arrowhead or shield).

The suction connector portion **120** may be oval-shaped and also attached to the main body portion **110**. The suction

connector portion **120** may be formed with thicker walls than the main body portion **110** and configured to attach to a high-suction vacuum adapter and to assist in transferring water, saliva, and debris from the oral cavity to the external adapter for removal. The suction connector portion **120** may also include an internal stop to assist in sliding the mouthpiece onto the adapter to a desired depth. The suction connector portion **120** may additionally have an external, concave, notched region **210** that corresponds to a removable strap such that when the strap is in place, the external walls of the strap and the rest of the connector portion may be flush.

The cheek retractor portion **130** is illustrated as a hammerhead distal region, which may be attached to the main body portion **110**. FIG. **7**A is a close-up view of an exemplary cheek retractor portion **130** in an exemplary mouthpiece. FIG. **7**B is a cross-sectional view of the exemplary cheek retractor portion **130** of FIG. **7**A.

The mouthpiece may be used with a mouth prop **160**, as illustrated in FIGS. **1** (with a mouth prop **160**) and FIGS. **2** (illustrated without the mouth prop **160**). FIGS. **3**A-E provide different close-up views of an exemplary mouth prop **160**. The removable strap **310** may be attached to mouth prop **160**, which may be used to prop open a patient's mouth and teeth. In this regard, the suction connector portion **120** may additionally have an external plug **220** (FIG. **2**C) protruding from the posterior side of the suction connector portion **120**. Such a plug **220** may correspond to and serve to connect with an opening in the mouth prop **160**. The mouth prop **160** may be reinforced by the presence of the plug **220** in the opening, thereby resulting in a more crush-resistant, nearly incompressible, and stable mouth prop **160**. In some embodiments, the suction connector portion **120** may further have a cutout **230** (e.g., which may be shaped as a logo) providing extra interlocking with a corresponding protrusion (e.g., which may also be shaped as a logo) on an external high-suction vacuum adapter.

The mouth prop **160** may be made of thickened silicone material injection molded in a single piece with an elastic strap corresponding to the circumference of the suction connector portion. The mouth prop **160** has an internal, rectangular-shaped female slot designed to fit snugly with the external, rectangular-shaped male plug **220** of the suction connector portion **120** of the mouthpiece. Mouth props may be made in different sizes for differently sized mouths. Because the mouth prop and mouthpiece are detachable from each other, different sizes of each may be mixed and matched as needed for a particular patient's mouth.

The mouthpiece as described herein may be used with a one-piece, autoclavable, high-suction vacuum adapter. Such a high-suction vacuum body adapter may be made of a single homogenous material. Having a single lever design, such a vacuum adapter may function in the same manner as all the current high-suction vacuum evacuators and saliva ejectors in controlling the removal of water, saliva, and debris from the oral cavity to the outside vacuum source. The single lever may be designed to control the removal of water, saliva, and debris from the at least partially enclosed so main body through a single, large evacuation conduit within the suction connector portion.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. The descriptions are not intended to limit the scope of the invention to the particular forms set forth herein. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described exemplary embodiments. It should be understood that the above description is illustrative and not restrictive. To the contrary, the present descriptions are intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims and otherwise appreciated by one of ordinary skill in the art. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

What is claimed is:

1. A dental mouthpiece comprising:

a main body portion, configured as a pocket having a plurality of perforations in communication with an interior open space, the pocket having a first end that is narrower than a second end, the pocket is defined by:

a first wall having a shape defined by an exterior edge, wherein the first wall includes an opening to the interior open space of the pocket,

a second wall having a shape corresponding to the defined shape of the first wall, wherein an exterior edge of the second wall shape corresponds to the exterior edge of the first wall, and

a side wall connecting the exterior edge of the first wall to the corresponding edge of the second wall;

the second wall comprising a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall and extending a span between the first wall and the second wall, wherein the bridge structure is not attached to the first wall, wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs and wherein the span between the first and the second wall is less than a width of the first and the second wall, wherein a shape of the interior open space of the pocket spans between the defined shape of the first wall and the corresponding shape of the second wall, and

the pocket including a transition portion at the first end and that flexibly connects to a cheek retractor, wherein the plurality of perforations comprise one or more perforations at the transition portion.

2. The dental mouthpiece of claim **1**, wherein the plurality of perforations are spaced to comprise a mesh.

3. The dental mouthpiece of claim **1**, wherein the plurality of perforations further comprise one or more perforations in the second wall.

4. The dental mouthpiece of claim **3**, wherein the one or more perforations on the second wall are spaced to comprise a mesh.

5. The dental mouthpiece of claim **1**, wherein an opening from the first wall of the main body portion to the pocket includes a slit along a longitudinal axis of the main body.

6. The dental mouthpiece of claim **1**, further comprising a suction connector that connects to the interior open space of the pocket, the suction connector configured to connect to a vacuum source that provides suction of fluids through one or more of the plurality of the perforations of the pocket into the interior open space of the pocket towards the suction connector.

7. The dental mouthpiece of claim **1**, wherein the plurality of protrusions of the bridge structure collectively provide spaced contact points that keep the first wall separated from the second wall during suction.

8. The dental mouthpiece of claim 7, wherein spaces between the plurality of protrusions of the bridge structure allow fluids within the interior open space of the pocket to be drawn therethrough towards a vacuum source that provides suction.

9. The dental mouthpiece of claim 1, wherein the cheek retractor has a surface that applies pressure when the dental mouthpiece is bent, wherein the pressure is based on resilience of a material from which the cheek retractor is formed.

10. The dental mouthpiece of claim 9, further comprising a stability bar protruding from the interior surface of the second wall along a longitudinal axis of the main body and extending through at least part of the cheek retractor, wherein a thickness of the stability bar corresponds to resilience by which the cheek retractor portion applies pressure during bending.

11. The dental mouthpiece of claim 1, wherein the main body portion is formed by injection-molding as one piece.

12. The dental mouthpiece of claim 1, wherein a material from which the main body is formed is a flexible, translucent, high heat-resistant, autoclavable silicone-based material.

13. The dental mouthpiece of claim 1, wherein the first wall of the main body portion and the second wall of the main body portion have different thicknesses.

14. The dental mouthpiece of claim 1, further comprising a mouth prop, the mouth prop is injection-molded in one piece.

15. The dental mouthpiece of claim 14 wherein the mouth prop comprises a bite block portion that includes an opening corresponding to a plug connected to the main body.

16. A dental mouthpiece comprising:

a cheek retractor;

a main body portion having a first end connected to the cheek retractor, the main body portion configured as a pocket having a plurality of perforations in communication with an interior open space, the pocket is defined by:

a first wall having a shape defined by an exterior edge, wherein the first wall includes an opening to the interior open space of the pocket,

a second wall having a shape corresponding to the defined shape of the first wall, wherein an exterior edge of the second wall shape corresponds to the exterior edge of the first wall, and

a side wall connecting the exterior edge of the first wall to the corresponding edge of the second wall;

the second wall comprising a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall and extending a span between the first wall and the second wall, wherein the bridge structure is not attached to the first wall, wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs;

the pocket including a transition portion at the first end that flexibly connects to the cheek retractor;

a suction connector portion connected to a second end of the main body portion, the suction connector configured to connect a vacuum source to the interior open space of the pocket within the main body portion.

17. The dental mouthpiece of claim 16, wherein the plurality of perforations further comprise one or more perforations in the first wall.

18. The dental mouthpiece of claim 17, wherein the one or more perforations on the first wall are spaced to comprise a mesh.

19. A dental mouthpiece comprising:

a main body portion configured as a pocket at least partially enclosing an interior space, the pocket defined by:

a first wall that includes one or more perforations in communication with the interior space of the pocket, the first wall having a shape defined by one or more edges along one or more sides;

a second wall having a shape that corresponds to the shape of the first wall, the shape of the second wall defined by one or more corresponding edges along one or more corresponding sides, wherein the second wall includes a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall within the interior space of the pocket, wherein the protrusions of the bridge structure protrude from the interior surface of the second wall toward the first wall in a wave shape comprising one or more crests and one or more troughs, and

a connecting wall that connects the one or more edges of the first wall to the one or more corresponding edges of the second wall across a span between the first wall and the second wall;

a suction connector portion connected to a first end of the main body portion, the suction connector configured to connect a vacuum source to the interior space of the pocket; and

a cheek retractor connected to a second end of the main body portion, wherein the second end is opposite the first end of the main body portion.

* * * * *

EXHIBIT B

US011589970B2

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

(10) **Patent No.: US 11,589,970 B2**
(45) **Date of Patent: *Feb. 28, 2023**

(54) **INTRAORAL DEVICE WITH DETACHABLE MOUTH PROP**

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(72) Inventors: **Thien Nguyen**, Santa Ana, CA (US); **Tam Thanh Pham**, San Francisco, CA (US)

(73) Assignee: **SOLMETEX, LLC**, Northborough, MA (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/228,061**

(22) Filed: **Mar. 27, 2014**

(65) **Prior Publication Data**

US 2014/0212841 A1 Jul. 31, 2014

Related U.S. Application Data

(63) Continuation of application No. 14/100,323, filed on Dec. 9, 2013, now Pat. No. 8,911,232.
(Continued)

(51) **Int. Cl.**
A61C 17/02 (2006.01)
A61C 17/08 (2006.01)

(52) **U.S. Cl.**
CPC ***A61C 17/0208*** (2013.01); ***A61C 17/08*** (2019.05)

(58) **Field of Classification Search**
CPC A61C 17/043; A61C 17/046; A61C 17/04; A61C 17/0208; A61C 17/08
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

50,461 A 10/1865 Dibble
1,471,207 A 10/1923 Napoleon
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2851861 2/2016
CA 3139689 11/2020
(Continued)

OTHER PUBLICATIONS

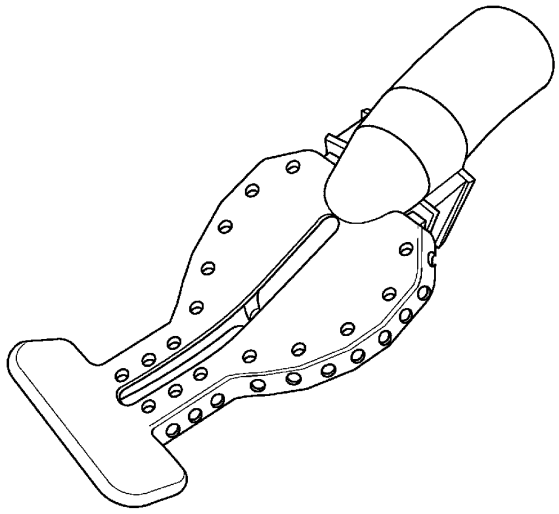
PCT Application No. PCT/US2014/032892 International Search Report and Written Opinion dated Sep. 4, 14.
(Continued)

Primary Examiner — Nicholas D Lucchesi
Assistant Examiner — Hao D Mai
(74) *Attorney, Agent, or Firm* — Polsinelli LLP

(57) **ABSTRACT**

A dental mouthpiece is provided that may be attached to a high-suction dental adapter for the purpose of assisting the dental staff during dental procedures through chair-side, hands-free suction, and isolation. Such mouthpiece may include a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded in one piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

18 Claims, 11 Drawing Sheets



Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Related U.S. Application Data

(60) Provisional application No. 61/734,939, filed on Dec. 7, 2012.

(58) **Field of Classification Search**
USPC 433/91–92, 140
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,731,322	A	10/1929	Riddle	
2,019,612	A *	11/1935	Langhans	H01J 35/16 313/242
2,937,445	A	5/1960	Erickson	
3,090,122	A	5/1963	Erickson	
3,453,735	A	7/1969	Burt et al.	
3,516,160	A	6/1970	Leffler et al.	
3,758,950	A *	9/1973	Krouzian	A61C 17/08 433/91
3,768,477	A	10/1973	Anders et al.	
3,802,081	A	4/1974	Rogers	
3,857,181	A	12/1974	Rappaport	
3,877,691	A	4/1975	Foster	
3,924,333	A	12/1975	Erickson	
4,017,975	A	4/1977	Johnson	
4,024,642	A	5/1977	Zorovich	
4,083,115	A	4/1978	McKelvey	
4,167,814	A	9/1979	Schubert	
4,192,071	A	3/1980	Erickson	
D267,586	S	1/1983	Hatlen	
4,511,329	A	4/1985	Diamond	
4,718,662	A	1/1988	North	
4,802,851	A	2/1989	Rhoades	
4,822,278	A	4/1989	Oliva et al.	
4,975,057	A	12/1990	Dyfvermark	
5,009,595	A	4/1991	Osborn	
5,037,298	A	8/1991	Hickham	
5,078,602	A	1/1992	Honoshofsky	
5,460,524	A	10/1995	Anderson	
D364,456	S	11/1995	Solnit et al.	
5,516,286	A	5/1996	Kushner	
5,588,836	A	12/1996	Landis et al.	
5,720,275	A	2/1998	Patil et al.	
5,730,599	A	3/1998	Pak	
5,762,496	A	6/1998	Albertsson et al.	
5,890,899	A	4/1999	Sclafani	
6,022,214	A	2/2000	Hirsch et al.	
6,213,772	B1	4/2001	Costello	
6,241,521	B1	6/2001	Garrison	
6,267,591	B1	7/2001	Barstow	
6,338,627	B2	1/2002	Hirsch et al.	
6,575,746	B2	6/2003	Hirsch et al.	
6,652,276	B2	11/2003	Fischer et al.	
6,655,960	B2	12/2003	Fischer	
6,672,305	B2	1/2004	Parker	
6,716,029	B2	4/2004	Fischer et al.	
D495,799	S	9/2004	Hirsch et al.	
D497,426	S	10/2004	Hirsch et al.	
6,908,308	B2	6/2005	Hirsch et al.	
6,974,321	B2	12/2005	Hirsch et al.	
7,287,981	B2	10/2007	Hirsch	
7,293,990	B2	11/2007	Hirsch et al.	
7,611,354	B2	11/2009	Hirsch et al.	
D615,203	S	5/2010	Hirsch et al.	
7,748,981	B2	7/2010	Hirsch et al.	
8,029,280	B2	10/2011	Black et al.	
8,057,227	B2	11/2011	Hirsch et al.	
8,057,228	B2	11/2011	Hirsch et al.	
8,075,310	B2	12/2011	Hirsch et al.	
D663,831	S	7/2012	Sidhu et al.	
D666,726	S	9/2012	Davis et al.	
8,297,973	B2	10/2012	Hirsch et al.	
8,529,256	B2	9/2013	Hirsch et al.	
8,535,056	B2	9/2013	Dragan et al.	
D696,779	S	12/2013	Hirsch et al.	
8,911,232	B2	12/2014	Nguyen	
D734,851	S	7/2015	Nguyen	
9,084,656	B2	7/2015	Hirsch	
9,089,389	B2	7/2015	Hirsch et al.	
D735,858	S	8/2015	Hirsch et al.	
D737,964	S	9/2015	Jessop et al.	
9,358,086	B2	6/2016	Hirsch	
D782,047	S	3/2017	Ritter	
D782,048	S	3/2017	Ritter	
D787,069	S	5/2017	Ritter	
D787,070	S	5/2017	Ritter	
9,788,924	B2	10/2017	Nguyen	
D809,660	S	2/2018	Nguyen	
9,968,341	B2	5/2018	Ritter	
10,390,734	B2	8/2019	Johnson et al.	
10,390,916	B1	8/2019	Rassibi	
D868,958	S	12/2019	Reyes	
D876,627	S	2/2020	Nguyen	
10,939,979	B2	3/2021	Lombardi	
D962,438	S	8/2022	Nguyen	
D962,439	S	8/2022	Nguyen	
2001/0008752	A1	7/2001	Hirsch et al.	
2003/0134253	A1	7/2003	Hirsch et al.	
2004/0033468	A1	2/2004	Fischer et al.	
2006/0063126	A1	3/2006	Aloise et al.	
2006/0063129	A1	3/2006	Hirsch	
2006/0084031	A1	4/2006	Hirsch et al.	
2008/0166684	A1	7/2008	Kanas	
2008/0318183	A1	12/2008	Suzman	
2009/0123886	A1	5/2009	Vaska	
2009/0274991	A1	11/2009	Black et al.	
2011/0207076	A1	8/2011	Hirsch et al.	
2011/0311942	A1	12/2011	Black et al.	
2012/0015317	A1	1/2012	Milo	
2012/0015320	A1	1/2012	Koo	
2012/0237894	A1	9/2012	Maycher et al.	
2013/0095450	A1	4/2013	Ames	
2013/0252193	A1	9/2013	Bowman et al.	
2014/0004478	A1	1/2014	Hirsch et al.	
2014/0162209	A1	6/2014	Nguyen	
2014/0212837	A1	7/2014	Nguyen	
2014/0212838	A1	7/2014	Nguyen	
2014/0212839	A1	7/2014	Nguyen	
2014/0212840	A1	7/2014	Nguyen	
2014/0349249	A1	11/2014	Reyes	
2015/0305842	A1	10/2015	Hirsch et al.	
2015/0335409	A1	11/2015	Hirsch	
2017/0156831	A1	6/2017	Reyes	
2017/0156832	A1	6/2017	Reyes	
2017/0156833	A1	6/2017	Reyes	
2018/0153637	A1	6/2018	Al-Shawi et al.	
2020/0155284	A1	5/2020	Baker	
2020/0352680	A1	11/2020	Nguyen	
2020/0383560	A1	12/2020	Day	

FOREIGN PATENT DOCUMENTS

CN	102026587		4/2011
CN	102247140		11/2011
CN	104490483		4/2015
CN	105578986	A	5/2016
EP	2903557		8/2015
EP	3184076		6/2017
EP	3965637		3/2022
FR	2992161	A1	12/2013
GB	2 170 106		7/1986
JP	2022-533276		7/2022
KR	100654392	B1	12/2006
TW	202108088		3/2021
WO	WO 1999/037238		7/1999
WO	0042939	A1	7/2000
WO	0061031	A1	10/2000
WO	WO 2011/014952		2/2011
WO	WO 2015/088577		6/2015
WO	2018126150	A1	7/2018
WO	WO 2020/231864		11/2020

(56) **References Cited**

OTHER PUBLICATIONS

Australian Patent Application No. 2014202637; AU Examination Report dated Jan. 23, 15.
U.S. Appl. No. 14/100,323, Thien Nguyen, Intraoral Dental Suction and Isolation System, filed Dec. 9, 2013.
U.S. Appl. No. 14/228,046, Thien Nguyen, Intraoral Device With Mesh, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,050, Thien Nguyen, Intraoral Device With Bridge, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,054, Thien Nguyen, Intraoral Device With Stability Start, filed Mar. 27, 2014.
U.S. Appl. No. 14/228,057, Thien Nguyen, Intraoral Device With Slit, filed Mar. 27, 2014.
U.S. Appl. No. 14/100,323; Office Action dated May 6, 2014.
U.S. Appl. No. 14/100,323; Final Office Action dated Oct. 24, 2014.
U.S. Appl. No. 14/228,046; Office Action dated Nov. 6, 2015.
U.S. Appl. No. 14/228,050; Office Action dated Nov. 6, 2015.
U.S. Appl. No. 14/228,054; Office Action dated Dec. 3, 2015.
U.S. Appl. No. 14/228,057; Office Action dated Nov. 20, 2015.
U.S. Appl. No. 29/477,887 Office Action dated Nov. 127, 2015.
U.S. Appl. No. 29/477,888 Office Action dated Dec. 2, 2015.
U.S. Appl. No. 29/491,367 Final Office Action dated Mar. 4, 2015.
U.S. Appl. No. 29/491,367 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 29/477,887 Final Office Action dated May 1, 2015.
U.S. Appl. No. 29/477,887 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 29/477,888 Final Office Action dated May 1, 2015.
U.S. Appl. No. 29/477,888 Office Action dated Nov. 14, 2014.
U.S. Appl. No. 29/491,367, Thien Nguyen, Dental Mouthpiece, filed May 20, 2014.
U.S. Appl. No. 29/477,887, Thien Nguyen, Bridge Structure for Dental Mouthpiece, filed Dec. 27, 2013.
U.S. Appl. No. 29/477,888, Thien Nguyen, Cheek Retractor for Dental Mouthpiece, filed Dec. 27, 2013.
European Patent Application No. 14721736.8; Extended European Search Report dated Oct. 20, 2015.
Canadian Patent Application No. 2,919,142; CA Examination Report dated May 31, 2016.
U.S. Appl. No. 14/228,046; Office Action dated Nov. 7, 2016.
U.S. Appl. No. 14/228,050; Office Action dated Nov. 4, 2016.
U.S. Appl. No. 14/228,046; Final Office Action dated Jun. 6, 2016.
U.S. Appl. No. 14/228,050; Final Office Action dated May 20, 2016.
U.S. Appl. No. 14/228,057; Final Office Action dated Jun. 7, 2016.
U.S. Appl. No. 29/477,887 Final Office Action dated Jun. 1, 2016.
U.S. Appl. No. 29/477,888 Final Office Action dated Jun. 1, 2016.
Chinese Patent Application No. 201480039991.2 First Office Action dated Dec. 29, 2016.
U.S. Appl. No. 14/228,046; Office Action dated Jun. 5, 2017.
European Patent Application No. 17150671.0; Extended European Search Report dated May 19, 2017.
U.S. Appl. No. 14/228,054; Final Office Action dated Apr. 24, 2017.
U.S. Appl. No. 14/228,057; Office Action dated Apr. 13, 2017.
U.S. Appl. No. 14/228,054; Final Office Action dated Nov. 2, 2017.
U.S. Appl. No. 14/228,057; Final Office Action dated Nov. 2, 2017.
U.S. Appl. No. 14/228,046; Final Office Action dated Jan. 16, 2018.
U.S. Appl. No. 14/228,057; Final Office Action dated Mar. 22, 2019.
U.S. Appl. No. 14/228,046; Office Action dated Oct. 5, 2018.
U.S. Appl. No. 14/228,057; Office Action dated Sep. 7, 2018.
U.S. Appl. No. 14/228,054; Office Action dated Nov. 29, 2018.
U.S. Appl. No. 14/228,046; Final Office Action dated Jul. 15, 2019.
U.S. Appl. No. 14/228,054; Final Office Action dated Aug. 8, 2019.
U.S. Appl. No. 14/228,057; Final Office Action dated May 19, 2020.
PCT Application No. PCT/US2014/032892 International Preliminary Report on Patentability dated Jun. 14/6.
PCT Application No. PCT/US2020/032228 International Search Report and Written Opinion dated Aug. 12, 2020.
U.S. Appl. No. 14/228,046; Office Action dated Jan. 10, 2020.
U.S. Appl. No. 14/228,054; Office Action dated Jan. 13, 2020.
Brazilian Patent Application No. BR1120140116377 Preliminary Office Action dated Jan. 7, 2020.
U.S. Appl. No. 14/228,057; Office Action dated Oct. 7, 2019.
U.S. Appl. No. 14/228,046; Non-Final Office Action dated Oct. 6, 2021.
U.S. Appl. No. 14/228,057; Non-Final Office Action dated Nov. 12, 2021.
U.S. Appl. No. 29/782,645; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,638; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,644; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,643; Non-Final Office Action dated Oct. 4, 2021.
Dryshield brochure. Dryshield.com. Publish date: May 2019. Retrieval date: Sep. 15, 2021. Retrieved from internet: https:// dryshield.com/ds/Brochure_May2019.pdf (Year: 2019).
"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: Oct. 27, 2014. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).
"Dryshield (single-use) vs Zryis/Isolite (single-use) mouthpieces" posted by Mark Frias, RDH. Youtube. Posting date: Jan. 18, 2020. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=uKX9XahO6EY (Year: 2020).
"Dryshield Tutorial—Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: Apr. 15, 2015. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).
U.S. Appl. No. 14/228,057; Office Action dated Sep. 2, 2022.
U.S. Appl. No. 14/228,054; Final Office Action dated Jan. 3, 2022.
U.S. Appl. No. 16/870,745 Non-Final Office Action dated Dec. 3, 2021.
U.S. Appl. No. 14/228,046; Final Office Action dated Nov. 27, 2020.
U.S. Appl. No. 14/228,054; Final Office Action dated Dec. 22, 2020.
U.S. Appl. No. 14/228,057; Office Action dated May 5, 2021.
U.S. Appl. No. 29/477,888 Office Action dated Mar. 21, 2017.
PCT Application No. PCT/US2020/032228 International Preliminary Report on Patentability dated Nov. 16, 2021.
U.S. Appl. No. 16/870,745 Final Office Action dated May 12, 2022.
U.S. Appl. No. 29/782,644 Final Office Action dated May 11, 2022.
U.S. Appl. No. 29/782,643 Final Office Action dated May 11, 2022.

* cited by examiner

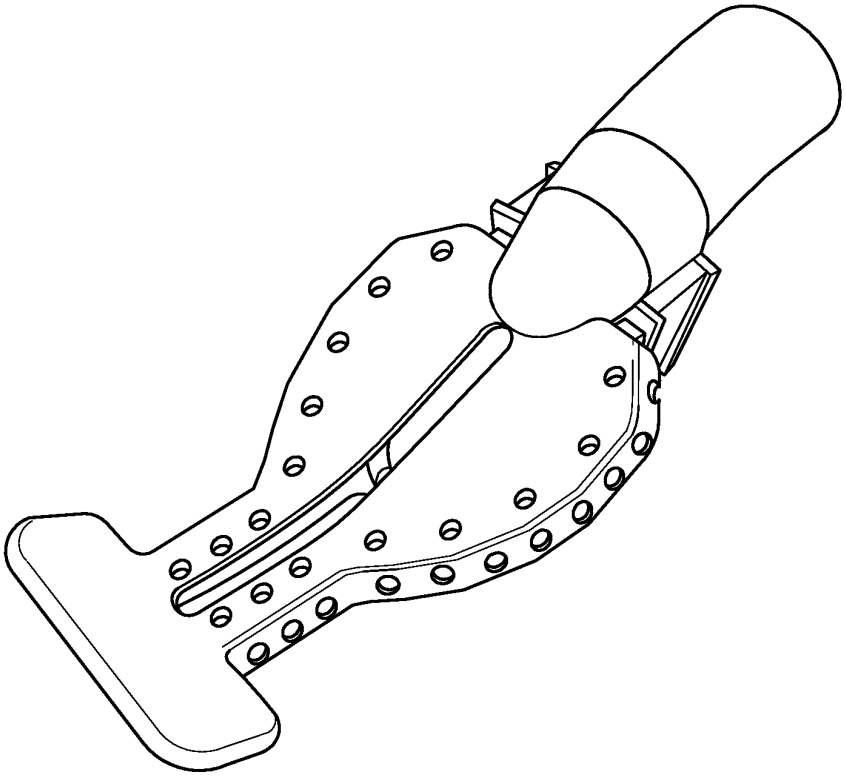


FIG. 1A

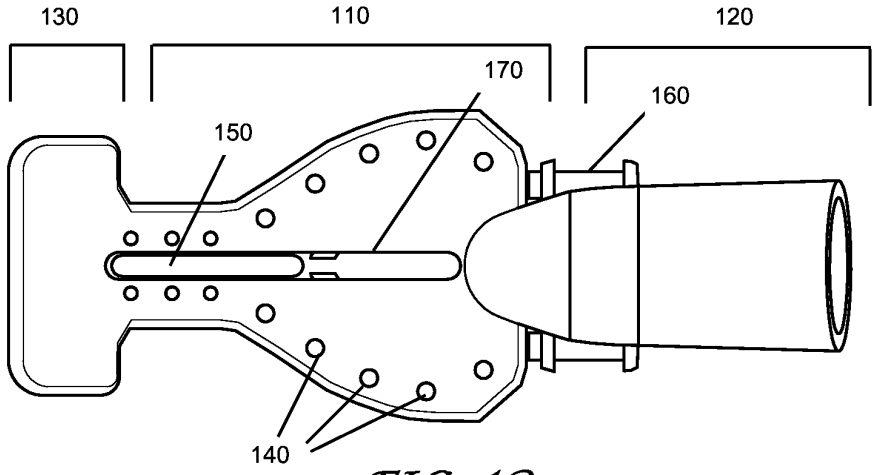


FIG. 1B

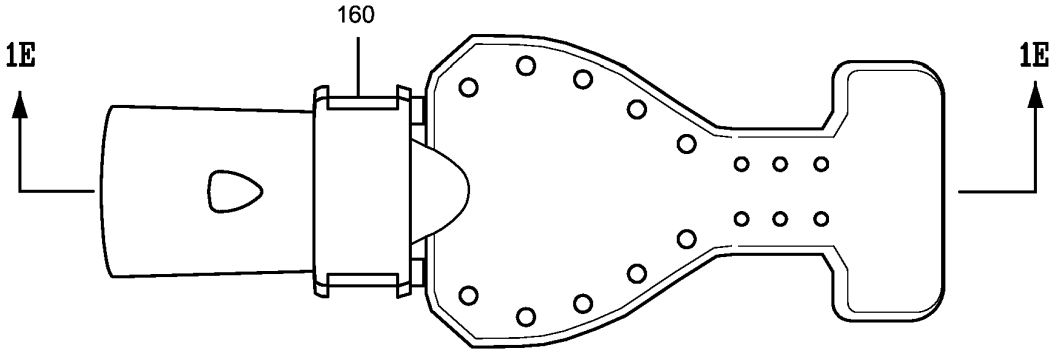


FIG. 1C

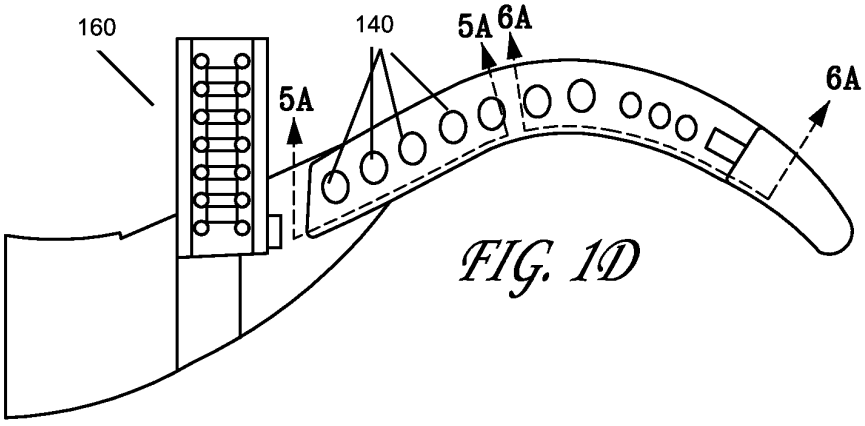


FIG. 1D

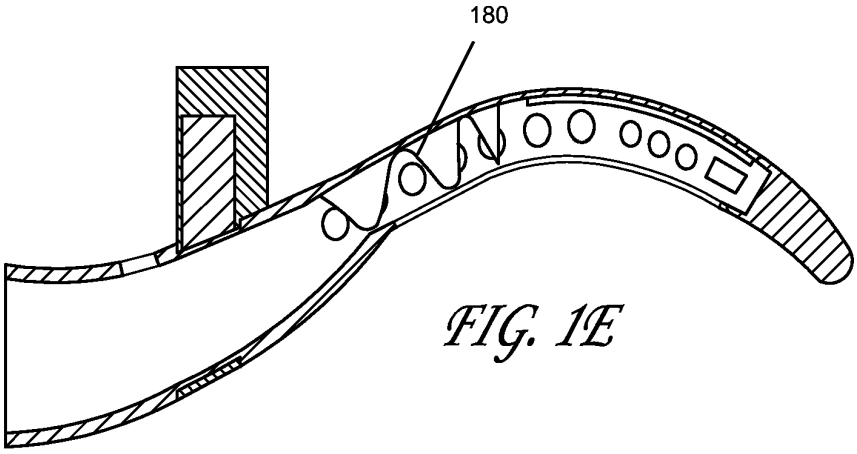


FIG. 1E

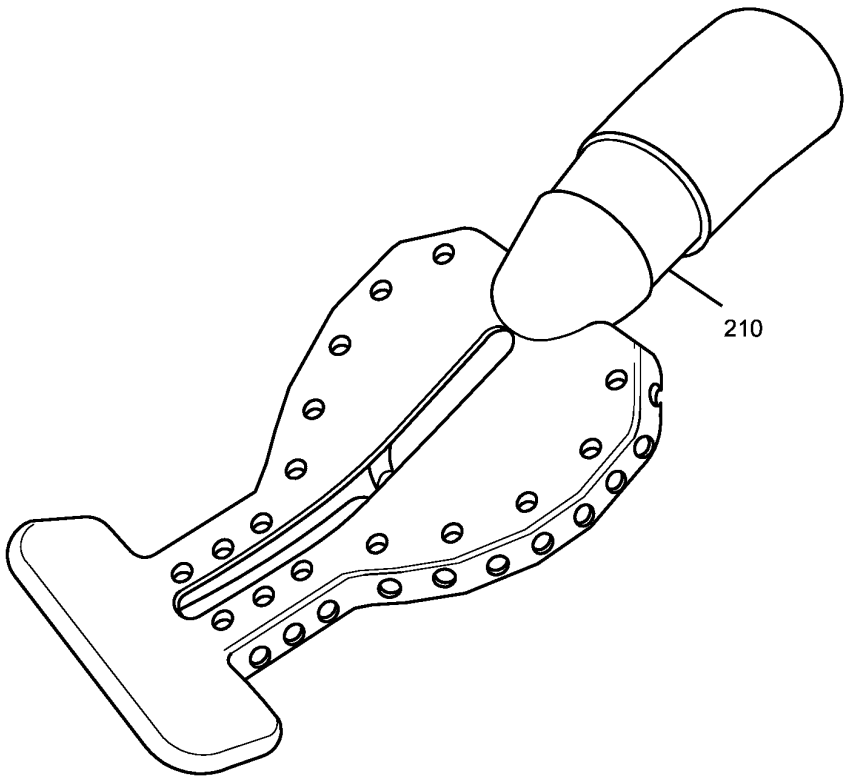


FIG. 2A

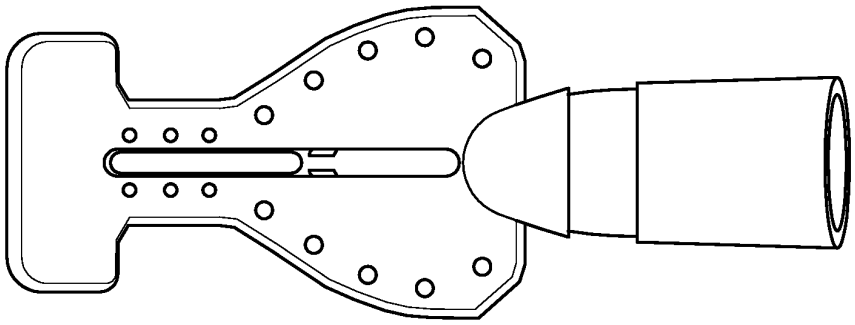


FIG. 2B

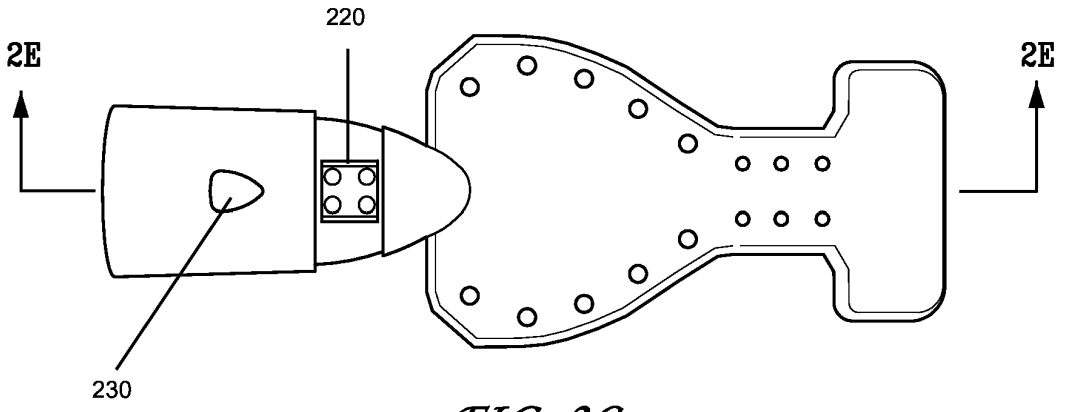


FIG. 2C

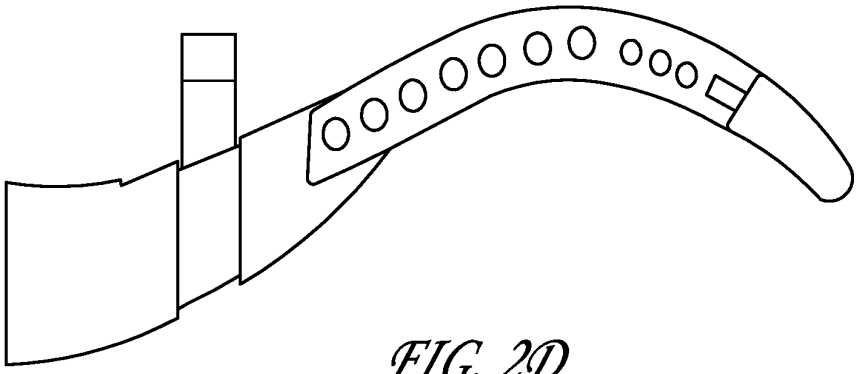


FIG. 2D

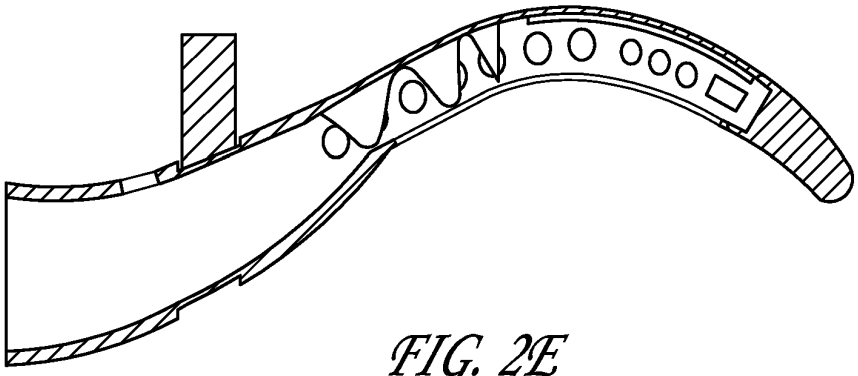


FIG. 2E

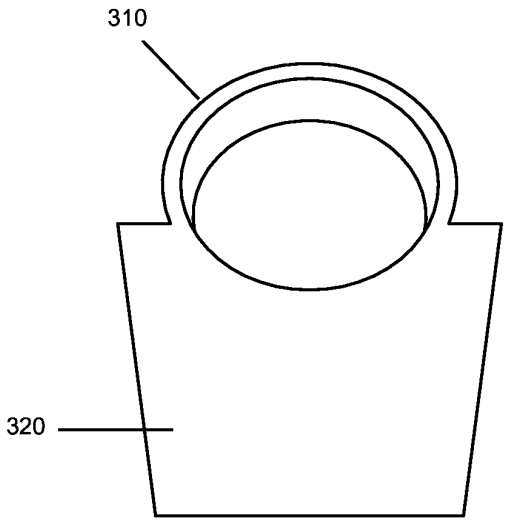


FIG. 3A

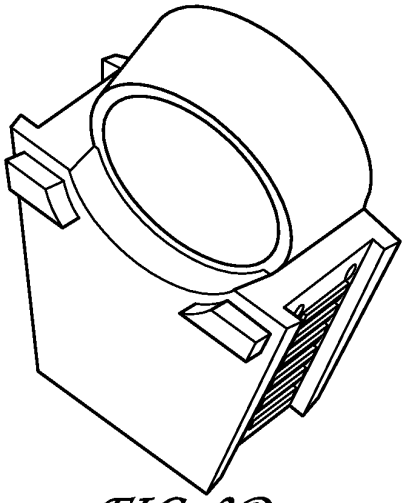


FIG. 3D

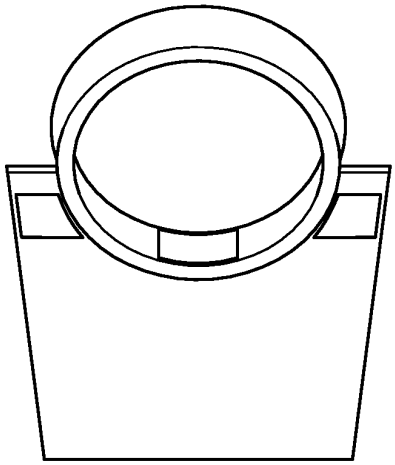


FIG. 3B

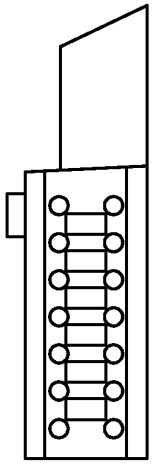


FIG. 3E

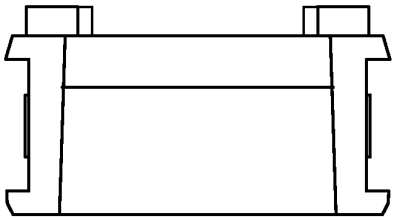


FIG. 3C

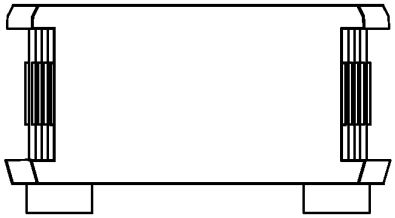


FIG. 3F

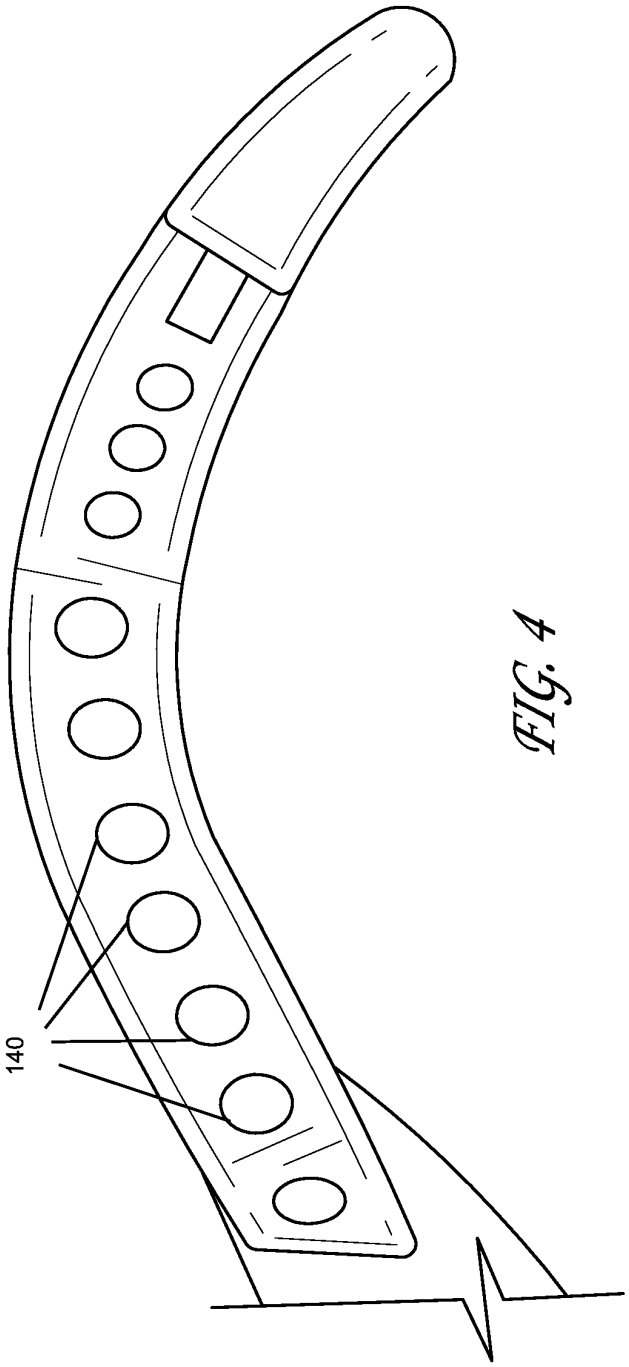


FIG. 4

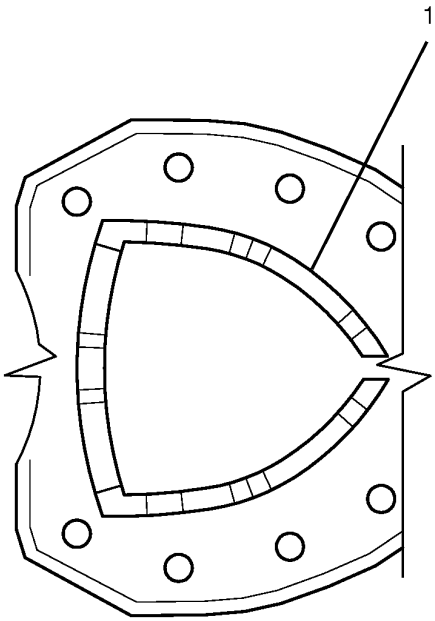


FIG. 5

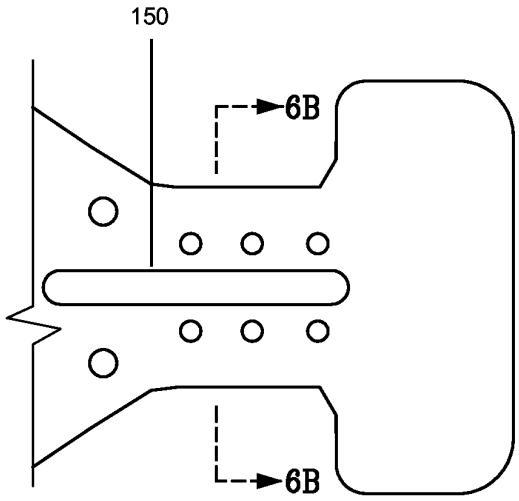


FIG. 6A

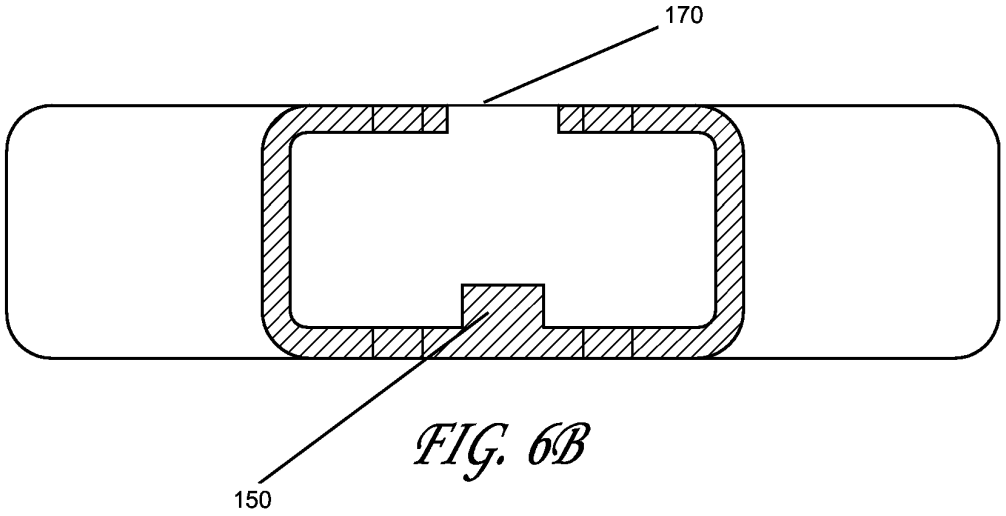


FIG. 6B

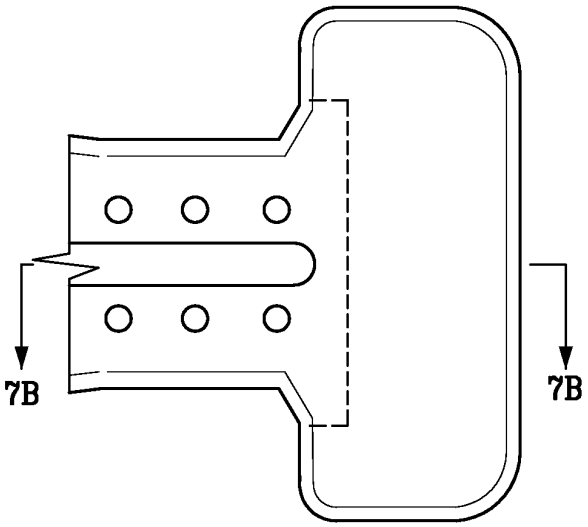


FIG. 7A

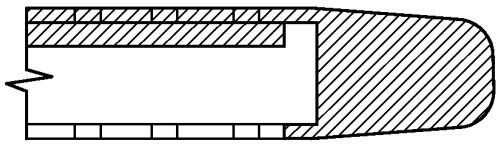


FIG. 7B

INTRAORAL DEVICE WITH DETACHABLE MOUTH PROP

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation and claims the priority benefit of U.S. patent application Ser. No. 14/100,323 filed Dec. 9, 2013, which claims the priority benefit of U.S. provisional patent application No. 61/734,939 filed Dec. 7, 2012, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to the field of dental mouthpieces. More specifically, the present invention relates to intraoral dental suction and isolation mouthpieces.

2. Description of Related Art

Various mouthpieces are currently used by dental health professionals, dental hygienists, and dental assistants in the field of dentistry. In the past, a dental patient has been treated by a traditional two-person team that comprises a dental professional and a dental assistant. Further, dental treatment may be provided by the team using many different types of dental equipment and materials. Such dental equipment and materials may include such items as an intraoral mirror, a bite block, a slow speed suction ejector, a high speed suction ejector, gauzes, cotton rolls, and dry angles. Each item of dental equipment may be used for different purposes, though some may be used in combination for some types of dental services. As such, a dental professional seeking to provide such dental services may need to use multiple items of such dental equipment. An important role of the dental assistant is therefore to assist the dental professional in coordinating the use of these multiple items of different equipment and materials.

There is, therefore, a need in the art for improved systems and methods of providing dental services in a more efficient, comfortable, and safe manner to the dental patient.

SUMMARY OF THE CLAIMED INVENTION

Embodiments of the present invention may include a mouthpiece that may be attached to a high-suction dental adapter for the purpose of assisting the dental staff during dental procedures through chair-side, hands-free suction, and isolation. Such a mouthpiece may comprise a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded in one piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of a high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

The main body portion may comprise an enclosed pocket made up of an anterior wall, a posterior wall, and a side wall in between the anterior and posterior walls. The side wall may be perforated with a plurality of perforations. Such perforations may constitute a mesh. Additional perforations may be located on the anterior and posterior walls. The main body portion may further include a slit along a longitudinal, central axis on the anterior wall. Such openings (e.g., perforations and slit) allow for suction of air, fluids, and small debris from the patient's mouth, through the openings into the interior portion, and into the suction connector portion towards a suction source. Because the mouthpiece is made of a flexible and resilient material (e.g., silicone), the mouthpiece may be bent when placed in a patient's mouth to conform to the shape of the mouth. When properly positioned, the suction connector portion may protrude from one side of the patient's mouth, while the main body lies against the back of the patient's mouth, and the cheek retractor presses against the patient's cheek on the opposite side of the patient's mouth.

The main body may further include an protruding bridge structure on the interior surface of the posterior wall. Such a bridge structure may protrude from the interior surface in a wave shape with crests and troughs. The crests provide a plurality of contact points with the anterior wall to keep the anterior wall separated from the posterior wall during suction. Meanwhile, the troughs provide gaps that allow for suction of air, fluids, and small debris through the bridge structure.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1**A is a perspective view of an exemplary mouthpiece with a detachable mouth prop.

FIG. **1**B is a top view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**C is a bottom view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**D is a side view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **1**E is a cross-sectional view of the exemplary mouthpiece and detachable mouth prop of FIG. **1**A.

FIG. **2**A is a perspective view of the exemplary mouthpiece of FIG. **1**A where the detachable mouth prop has been detached.

FIG. **2**B is a top view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**C is a bottom view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**D is a side view of the exemplary mouthpiece of FIG. **2**A.

FIG. **2**E is a cross-sectional view of the exemplary mouthpiece of FIG. **2**A.

FIG. **3**A is a front view of an exemplary mouth prop.

FIG. **3**B is a back view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**C is a bottom view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**D is a perspective view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**E is a side view of the exemplary mouth prop of FIG. **3**A.

FIG. **3**F is a top view of the exemplary mouth prop of FIG. **3**A.

FIG. **4** is a close-up view of exemplary mesh sides in an exemplary mouthpiece.

FIG. **5** is a close-up view of an internal bridge in an exemplary mouthpiece.

FIG. **6**A is a close-up view of an exemplary reinforcing bar in an exemplary mouthpiece.

FIG. **6**B is a cross-sectional view of the exemplary reinforcing bar of FIG. **6**A.

FIG. **7**A is a close-up view of an exemplary cheek retractor portion in an exemplary mouthpiece.

FIG. **7**B is a cross-sectional view of the exemplary cheek retractor portion of FIG. **7**A.

DETAILED DESCRIPTION

Embodiments of the present invention provide for a mouthpiece comprising a main body portion, a cheek retractor portion, and a suction connector portion. In some embodiments, the main body portion, cheek retractor portion, and suction connector portion (and sub-portions thereof) may be molded as one-piece, preferably by injection molding. In an exemplary embodiment, the mouthpiece may be made of a material that is flexible, translucent, conducive to injection molding, high heat-resistant, and autoclavable. Such a material may include silicone. Because the mouthpiece may be made of a high heat-resistant and autoclavable material, such a mouthpiece may be reusable.

FIGS. **1**A-E are different views of an exemplary mouthpiece with an attachable mouth prop **160**, while FIGS. **2**A-E are different views of the exemplary mouthpiece of FIG. **1**A where the attachable mouth prop **160** has been detached. Such a mouthpiece may include a main body portion **110**, a suction connector portion **120**, and a cheek retractor portion **130**.

The main body portion **110** may include mesh or perforations **140**, a stability bar **150**, an open slit **170**, and an internal bridge **180**. The main body potion **110** may connect to a suction connector portion **120** on one end and a cheek retractor portion **130** at the other end. Such a cheek retractor portion **130** may be configured to press against and retract a patient's cheek away from the patient's teeth. When placed in a patient's mouth, the suction connector portion **120** may protrude from one side of the patient's mouth, while the main body portion **110** lies against the back of the patient's mouth, and the cheek retractor portion **130** retracts the patient's cheek on the opposite side of the patient's mouth. The flexibility of the material used to form the mouthpiece allows for some bending when placed in the patient's mouth. The material is, however, resilient enough that the cheek retractor portion presses against the inside of the patient's cheek with such pressure being sufficient to move the cheek away from the patient's teeth.

An exemplary main body portion **110**, when placed in a mouth, may include an anterior wall facing the front of the mouth (e.g., the side with slit **170**) and a posterior wall facing the back of the mouth. The two walls may connect at a superior wall and an inferior wall forming a body that is at least partially enclosed.

Superior may be used herein to refer to the side that rests against a roof of a patient's mouth when placed therein, and inferior may be used to refer to the side that rests against the floor of the patient's mouth. The superior and inferior sides may be formed identically, which may allow for the mouthpiece to change orientation such that the superior side may appear as the inferior side and vice versa, in the new orientation. When in use, the respective sides of the main body portion **110** may serve to protect and separate the top of the mouth and the bottom of the mouth/tongue. In addition, the main body portion **110** may also serve to protect the back of the mouth (e.g., throat and airway) from falling debris.

Much of the main body portion **110** of the mouthpiece may be shaped as a straight-line arrowhead or shield whose base generally conforms to the intraoral shape of a patient's mouth. Differently-sized mouthpieces may be provided for differently-sized mouths of adults and children. Part of the base side of the arrowhead may be formed with thicker walls than the rest of the main body. Such thickening may provide additional stability.

In addition, the main body portion **110** of the mouthpiece may include a plurality of holes **140** distributed along the superior and inferior sides of the anterior and posterior walls to assist in suctioning of water, saliva and debris from the oral cavity. In some embodiments, a set of holes may also form a mesh along the walls of the superior and inferior edges. FIG. **4** is a close-up view of an exemplary mesh wall in an exemplary mouthpiece.

At the narrow end of the arrowhead that connects to the cheek retractor portion **130**, the main body portion **110** may include a rectangular portion. Narrower than the base of the arrowhead, the rectangle may additionally include a reinforcing bar (or stability bar) **150** (described in further detail below) and may be at least partially crossed by a slit **170** (described in further detail below) into the interior of the pocket of the main body portion **110**.

Stability bar **150** may be a protrusion or otherwise a thickened area that reinforces the stability of the rectangular portion and assist in shaping this region to the intraoral posterior shape of a patient's mouth. FIG. **6**A is a close-up view of an exemplary stability bar **150** of an exemplary mouthpiece. FIG. **6**B is a cross-sectional view of the exemplary reinforcing bar in the cheek retractor connector portion of FIG. **6**A.

In some embodiments, the internal, rectangular-shaped reinforcing or stability bar **150** may be located distally to the internal wavelike bridge structure **180** and attached to both the interior side of the posterior surface of the main body and the rectangular portion. Such a stability bar **150** may be located in the area where a positioned mouthpiece begins to wrap from the lingual side of the most posterior mandibular tooth, around the distal side of the most posterior tooth, and to anterior side of the most posterior mandibular tooth, thereby assisting in shaping the mouthpiece to the general intraoral shape of a patient's mouth.

Various embodiments of the mouthpiece may further include a longitudinal, open slit **170** extending over approximately two-thirds of the main body on the anterior surface. Running along the center of the main body across the rectangle and most of the arrowhead, such a slit **170** may assist in capture and suction of water, saliva and debris, as well as assisting in cleaning and maintenance.

Additionally, the main body of the mouthpiece may include a bridge structure **180** on an interior surface to ensure that the anterior and posterior surfaces remain separated during suction. FIG. **1**E is a cross-sectional view of the mouthpiece in which the bridge structure **180** is illustrated. FIG. **5** is a close-up view of the bridge structure **180** without the surrounding walls of the main body portion. Such a bridge structure **180** may be formed as an wave-like protrusion that generally corresponds to the distance between the anterior and posterior walls extending substantially (e.g., within 1 mm) the full distance at its crest and substantially flush to the surface at its trough. In some embodiments, the bridge structure **180** may be centrally-located in the main body portion **110** of the mouthpiece. The gaps (or troughs) between the waves of the bridge structure **180** assist in the suction-driven transfer of water and saliva to the suction connector portion **120** and ultimately, into a central suction vacuum. In some embodiments, the bridge structure **180** may follow the shape of a logo (e.g., an arrowhead or shield).

The suction connector portion **120** may be oval-shaped and also attached to the main body portion **110**. The suction connector portion **120** may be formed with thicker walls than the main body portion **110** and configured to attach to a high-suction vacuum adapter and to assist in transferring water, saliva, and debris from the oral cavity to the external adapter for removal. The suction connector portion **120** may also include an internal stop to assist in sliding the mouthpiece onto the adapter to a desired depth. The suction connector portion **120** may additionally have an external, concave, notched region **210** that corresponds to a removable strap such that when the strap is in place, the external walls of the strap and the rest of the connector portion may be flush.

The cheek retractor portion **130** is illustrated as a hammerhead distal region, which may be attached to the main body portion **110**. FIG. **7**A is a close-up view of an exemplary cheek retractor portion **130** in an exemplary mouthpiece. FIG. **7**B is a cross-sectional view of the exemplary cheek retractor portion **130** of FIG. **7**A.

The mouthpiece may be used with a mouth prop **160**, as illustrated in FIG. **1** (with a mouth prop **160**) and FIG. **2** (illustrated without the mouth prop **160**). FIGS. **3**A-E provide different close-up views of an exemplary mouth prop **160**. The removable strap **310** may be attached to mouth prop **160**, which may be used to prop open a patient's mouth and teeth. In this regard, the suction connector portion **120** may additionally have an external plug **220** (FIG. **2**C) protruding from the posterior side of the suction connector portion **120**. Such a plug **220** may correspond to and serve to connect with an opening in the mouth prop **160**. The mouth prop **160** may be reinforced by the presence of the plug **220** in the opening, thereby resulting in a more crush-resistant, nearly incompressible, and stable mouth prop **160**. In some embodiments, the suction connector portion **120** may further have a cutout **230** (e.g., which may be shaped as a logo) providing extra interlocking with a corresponding protrusion (e.g., which may also be shaped as a logo) on an external high-suction vacuum adapter.

The mouth prop **160** may be made of thickened silicone material injection molded in a single piece with an elastic strap corresponding to the circumference of the suction connector portion. The mouth prop **160** has an internal, rectangular-shaped female slot designed to fit snugly with the external, rectangular-shaped male plug **220** of the suction connector portion **120** of the mouthpiece. Mouth props may be made in different sizes for differently sized mouths. Because the mouth prop and mouthpiece are detachable from each other, different sizes of each may be mixed and matched as needed for a particular patient's mouth.

The mouthpiece as described herein may be used with a one-piece, autoclavable, high-suction vacuum adapter. Such a high-suction vacuum body adapter may be made of a single homogenous material. Having a single lever design, such a vacuum adapter may function in the same manner as all the current high-suction vacuum evacuators and saliva ejectors in controlling the removal of water, saliva, and debris from the oral cavity to the outside vacuum source. The single lever may be designed to control the removal of water, saliva, and debris from the at least partially enclosed so main body through a single, large evacuation conduit within the suction connector portion.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. The descriptions are not intended to limit the scope of the invention to the particular forms set forth herein. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described exemplary embodiments. It should be understood that the above description is illustrative and not restrictive. To the contrary, the present descriptions are intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims and otherwise appreciated by one of ordinary skill in the art. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

What is claimed is:

1. A mouthpiece comprising:

a main body portion configured as a pocket at least partially enclosing an interior space that extends from a first end to a second end of the main body portion, the pocket defined by:

a first wall extending from the first end to the second end, wherein the first wall is narrower at the second end than at the first end,

a second wall located at a distance from the first wall and extending from the first end to the second end, wherein the second wall is also narrower at the second end than at the first end, the second wall comprising a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall and extending across the distance between the first wall and the second wall, wherein the bridge structure is not attached to the first wall, and wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs, and

a connecting wall that connects one or more edges of the first wall to one or more corresponding edges of the second wall across the distance between the first wall and the second wall;

a suction connector extending from the first end of the main body portion and integral to the main body portion, the suction connector including a cavity extending longitudinally from the main body portion, the cavity in communication with the interior space of the pocket and extending from a first opening of the suction connector at the first end of the main body portion and through a length of the suction connector towards a suction port opening opposite from the main body portion; and

a mouth prop molded in one piece, and wherein the suction connector extends through and past the mouth prop.

2. The mouthpiece of claim **1**, wherein the mouth prop comprises a bite block portion and a strap portion, wherein the strap portion corresponds to a circumference of the suction connector, wherein a cross section of an opening of the strap portion is parallel to the cross section of the first opening of the suction connector and parallel to the cross section of the suction port opening, wherein a first edge and a second edge of an external surface of the strap portion are adjacent to an external surface of the suction connector, wherein the first edge is opposite the second edge, and wherein the strap portion is injection-molded in a single piece with the bite block portion.

3. The mouthpiece of claim **2**, wherein the strap portion is elastic.

4. The mouthpiece of claim 2, wherein an external surface of the suction connector comprises a notch region corresponding to the strap portion, the notch region separating the external surface into a first surface and a second surface and defining an interior surface coupled to the first surface by a first side wall and coupled to the second surface by a second side wall.

5. The mouthpiece of claim 4, wherein the strap portion sits in the notch region when attached around the circumference of the suction connector and the strap portion has a thickness corresponding to a height of the first side wall and the second side wall so that the strap portion is flush with both the first surface and the second surface.

6. The mouthpiece of claim 5, wherein an interior surface of the strap portion is adjacent to the interior surface of the suction connector defined by the notch region.

7. The mouthpiece of claim 2, wherein the suction connector further comprises an external plug protrusion corresponding to an opening through the bite block portion.

8. The mouthpiece of claim 7, wherein the plug protrusion fits into the opening through the bite block portion to provide additional crush-resistance and decreased compressibility during biting by a patient.

9. The mouthpiece of claim 1, wherein the suction connector comprises a cutout corresponding to a protrusion on a vacuum adapter for an interlocking fit.

10. The mouthpiece of claim 1, wherein the suction connector connects the interior of the pocket to a vacuum source, wherein activation of the vacuum source provides suction of fluids from the interior of the pocket toward the vacuum source.

11. The mouthpiece of claim 1, wherein at least one of the first wall, the second wall, or the connecting wall comprise a plurality of perforations.

12. The mouthpiece of claim 11, wherein activation of a vacuum source associated with suction connector extending from the first end of the main body portion draws fluids from an exterior of the main body portion through one or more of the plurality of perforations into the interior space of the pocket of the main body portion.

13. The mouthpiece of claim 1, further comprising a cheek retractor portion connected to the main body portion and having a surface that applies pressure when bent, wherein the pressure is based on resilience of the cheek retractor portion.

14. The mouthpiece of claim 1, wherein the second wall further includes a stability bar protruding from an interior surface of the second wall and along a longitudinal axis of the main body portion.

15. The mouthpiece of claim 1, wherein the main body portion is formed by injection-molding as one piece.

16. The mouthpiece of claim 1, wherein a material that forms the main body portion is a flexible, translucent, high heat-resistant, autoclavable silicone-based material.

17. The mouthpiece of claim 1, wherein the mouth prop is interchangeable with a second mouth prop that is attachably and detachably associated with the main body portion, the second mouth prop being of a different size.

18. A mouthpiece comprising:

a main body portion configured as a pocket at least partially enclosing an interior space that extends from a first end to a second end of the main body portion, the pocket defined by:

a first wall extending from the first end to the second end, the first wall having an interior surface facing the interior space of the pocket, and

a second wall located at a distance from to the first wall and extending from the first end to the second end, the second wall having an interior surface facing the interior surface of the first wall, the second wall comprising a bridge structure that includes a plurality of protrusions integral with and protruding from the interior surface of the second wall and extending across the distance between the first wall and the second wall, wherein the bridge structure is not attached to the first wall, and wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs, and

a connecting wall that connects one or more edges of the first wall to one or more corresponding edges of the second wall across the distance between the first wall and the second wall;

a mouth prop molded in one piece and located at the first end of the main body portion; and

a suction connector integral with the main body portion and extending from the first end of the main body portion past the mouth prop, wherein the suction connector includes a cavity in communication with the interior space of the pocket.

* * * * *

EXHIBIT C

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(12) United States Design Patent

Nguyen et al.

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(54) **MOUTHPIECE**

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(51) **LOC (13) Cl.** **24-01**

(52) **U.S. Cl.**
USPC **D24/152**

(58) **Field of Classification Search**
USPC D24/108, 110.5, 111–113, 127, 129, 152, D24/176
CPC . A61C 17/02; A61C 17/0202; A61C 17/0205; A61C 17/0208; A61C 17/0211; A61C 17/06; A61C 17/065; A61C 17/08; A61C 17/092; A61C 17/096; A61C 17/10; A61C 17/12; A61M 1/0023; A61M 1/0058
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

50,461	A	10/1865	Dibble	
1,471,207	A	10/1923	Napoleon	
1,731,322	A	10/1929	Riddle	
2,019,612	A	11/1935	Langhans et al.	
2,937,445	A	5/1960	Erickson	
3,090,122	A	5/1963	Erickson	
3,453,735	A *	7/1969	Burt	A61C 17/08 433/96

(Continued)

FOREIGN PATENT DOCUMENTS

CA	2851861	2/2016
CN	102026587	4/2011

(Continued)

OTHER PUBLICATIONS

"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: Oct. 27, 2014. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).*

(Continued)

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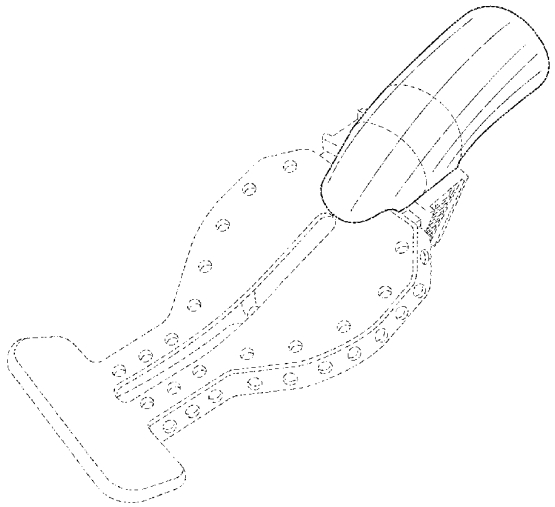
(57) **CLAIM**

The ornamental design for a mouthpiece, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of a mouthpiece showing our new design.
FIG. **2** is a top view thereof.
FIG. **3** is a bottom view thereof; and,
FIG. **4** is a left side view thereof, with the right side view being a mirror image thereof.
The broken lines shown in the Figures show portions of the mouthpiece that form no part of the claimed design. The dash-dot broken lines represent the boundary of the claimed design and form no part thereof.

1 Claim, 4 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

3,516,160	A *	6/1970	Leffler	A61C 17/08 433/95
3,758,950	A	9/1973	Krouzian	
3,768,477	A	10/1973	Anders et al.	
3,802,081	A	4/1974	Rogers	
3,857,181	A	12/1974	Rappaport	
3,877,691	A	4/1975	Foster	
3,924,333	A	12/1975	Erickson	
4,017,975	A	4/1977	Johnson	
4,024,642	A	5/1977	Zorovich	
4,083,115	A	4/1978	McKelvey	
4,167,814	A	9/1979	Schubert	
4,192,071	A	3/1980	Erickson	
4,511,329	A	4/1985	Diamond	
4,718,662	A	1/1988	North	
4,802,851	A	2/1989	Rhoades	
4,822,278	A	4/1989	Oliva et al.	
5,009,595	A	4/1991	Osborn	
5,037,298	A	8/1991	Hickham	
5,078,602	A	1/1992	Honoshofsky	
5,460,524	A	10/1995	Anderson	
D364,456	S *	11/1995	Solnit	D24/112
5,516,286	A	5/1996	Kushner	
5,588,836	A	12/1996	Landis et al.	
5,720,275	A	2/1998	Patil et al.	
5,762,496	A	6/1998	Albertsson et al.	
5,890,899	A	4/1999	Sclafani	
6,022,214	A	2/2000	Hirsch et al.	
6,213,772	B1	4/2001	Costello	
6,241,521	B1	6/2001	Garrison	
6,267,591	B1	7/2001	Barstow	
6,338,627	B2	1/2002	Hirsch et al.	
6,575,746	B2	6/2003	Hirsch et al.	
6,672,305	B2	1/2004	Parker	
D495,799	S	9/2004	Hirsch et al.	
D497,426	S	10/2004	Hirsch et al.	
6,908,308	B2	6/2005	Hirsch et al.	
6,974,321	B2	12/2005	Hirsch et al.	
7,287,981	B2	10/2007	Hirsch	
7,293,990	B2	11/2007	Hirsch et al.	
7,611,354	B2	11/2009	Hirsch et al.	
D615,203	S	5/2010	Hirsch et al.	
7,748,981	B2	7/2010	Hirsch et al.	
8,029,280	B2	10/2011	Black et al.	
8,057,227	B2	11/2011	Hirsch et al.	
8,057,228	B2	11/2011	Hirsch et al.	
8,075,310	B2	12/2011	Hirsch et al.	
D663,831	S *	7/2012	Sidhu	D24/112
D666,726	S	9/2012	Davis et al.	
8,297,973	B2	10/2012	Hirsch et al.	
8,529,256	B2	9/2013	Hirsch et al.	
8,535,056	B2	9/2013	Dragan et al.	
D696,779	S	12/2013	Hirsch et al.	
8,911,232	B2	12/2014	Nguyen	
D734,851	S	7/2015	Nguyen	
9,084,656	B2	7/2015	Hirsch	
9,089,389	B2	7/2015	Hirsch et al.	
D735,858	S	8/2015	Hirsch et al.	
D737,964	S	9/2015	Jessop et al.	
9,358,086	B2	6/2016	Hirsch	
D782,047	S	3/2017	Ritter	
D782,048	S	3/2017	Ritter	
D787,069	S	5/2017	Ritter	
D787,070	S	5/2017	Ritter	
9,788,924	B2	10/2017	Nguyen	
D809,660	S	2/2018	Nguyen	
9,968,341	B2	5/2018	Ritter	
10,390,734	B2	8/2019	Johnson et al.	
10,390,916	B1	8/2019	Rassibi	
D868,958	S	12/2019	Reyes	
D876,627	S	2/2020	Nguyen	
2001/0008752	A1	7/2001	Hirsch et al.	
2003/0134253	A1	7/2003	Hirsch et al.	
2004/0033468	A1 *	2/2004	Fischer	A61C 5/90 433/140
2006/0063126	A1	3/2006	Aloise et al.	
2006/0063129	A1	3/2006	Hirsch	
2006/0084031	A1	4/2006	Hirsch et al.	
2008/0166684	A1	7/2008	Kanas	
2008/0318183	A1	12/2008	Suzman	
2009/0123886	A1	5/2009	Vaska	
2009/0274991	A1	11/2009	Black et al.	
2011/0207076	A1	8/2011	Hirsch et al.	
2011/0311942	A1	12/2011	Black et al.	
2012/0015317	A1	1/2012	Milo	
2012/0015320	A1	1/2012	Koo	
2012/0237894	A1	9/2012	Maycher et al.	
2013/0095450	A1	4/2013	Ames	
2013/0252193	A1	9/2013	Bowman et al.	
2014/0004478	A1	1/2014	Hirsch et al.	
2014/0162209	A1	6/2014	Nguyen	
2014/0212837	A1	7/2014	Nguyen	
2014/0212838	A1	7/2014	Nguyen	
2014/0212839	A1	7/2014	Nguyen	
2014/0212840	A1	7/2014	Nguyen	
2014/0212841	A1	7/2014	Nguyen	
2014/0349249	A1 *	11/2014	Reyes	A61C 17/08 433/96
2015/0305842	A1	10/2015	Hirsch et al.	
2015/0335409	A1	11/2015	Hirsch	
2017/0156831	A1	6/2017	Reyes	
2017/0156832	A1	6/2017	Reyes	
2017/0156833	A1	6/2017	Reyes	
2020/0155284	A1	5/2020	Baker	
2020/0352680	A1	11/2020	Nguyen	

FOREIGN PATENT DOCUMENTS

CN	102247140		11/2011
CN	105578986	A	5/2016
EP	2903557		8/2015
EP	3184076		6/2017
FR	2992161	A1	12/2013
GB	2 170 106		7/1986
KR	100654392	B1	12/2006
WO	WO 1999/037238		7/1999
WO	0042939	A1	7/2000
WO	0061031	A1	10/2000
WO	WO 2011/014952		2/2011
WO	WO 2015/088577		6/2015
WO	2018126150	A1	7/2018
WO	WO 2020/231864		11/2020

OTHER PUBLICATIONS

"Dryshield Tutorial—Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: Apr. 15, 2015. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).*

Dryshield brochure. Dryshield.com. Publish date: May 2019. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://dryshield.com/ds/Brochure_May2019.pdf (Year: 2019).*

"Dryshield (single-use) vs Zryis/Isolite (single-use) mouthpieces" posted by Mark Frias, RDH. Youtube. Posting date: Jan. 18, 2020. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=uKX9XahO6EY (Year: 2020).*

PCT Application No. PCT/US2014/032892 International Preliminary Report on Patentability dated Jun. 14, 2016.

PCT Application No. PCT/US2014/032892 International Search Report and Written Opinion dated Sep. 4, 2014.

PCT Application No. PCT/US2020/032228 International Search Report and Written Opinion dated Aug. 12, 2020.

Australian Patent Application No. 2014202637; AU Examination Report dated Jan. 23, 2015.

Brazilian Patent Application No. BR1120140116377 Preliminary Office Action dated Jan. 7, 2020.

Canadian Patent Application No. 2,919,142; CA Examination Report dated May 31, 2016.

Chinese Patent Application No. 201480039991.2 First Office Action dated Dec. 29, 2016.

(56) **References Cited**

OTHER PUBLICATIONS

European Patent Application No. 14721736.8; Extended European Search Report dated Oct. 20, 2015.
European Patent Application No. 17150671.0; Extended European Search Report dated May 29, 2017.
U.S. Appl. No. 29/782,645, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 29/780,960, Thien Nguyen, Mouthpiece Mouth Prop, filed Apr. 27, 2021.
U.S. Appl. No. 29/782,644, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 29/782,643, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 14/228,054; Final Office Action dated Jan. 3, 2022.
U.S. Appl. No. 14/228,061; Non-Final Office Action dated Dec. 8, 2021.
U.S. Appl. No. 16/870,745 Non-Final Office Action dated Dec. 3, 2021.
U.S. Appl. No. 14/228,054; Office Action dated Jun. 25, 2021.
U.S. Appl. No. 14/228,046; Non-Final Office Action dated Oct. 6, 2021.
U.S. Appl. No. 14/228,057; Final Office Action dated Nov. 12, 2021.
U.S. Appl. No. 29/782,645; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,644; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,643; Non-Final Office Action dated Oct. 4, 2021.

* cited by examiner

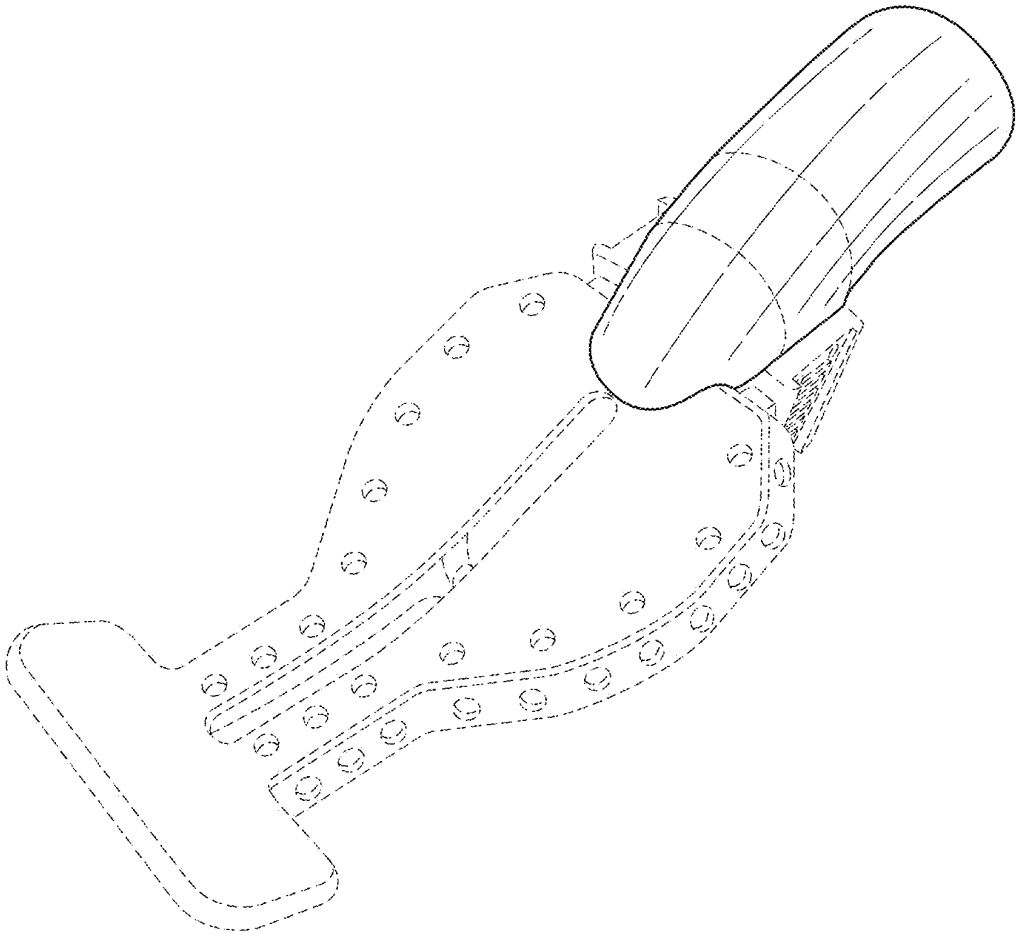


FIG.1

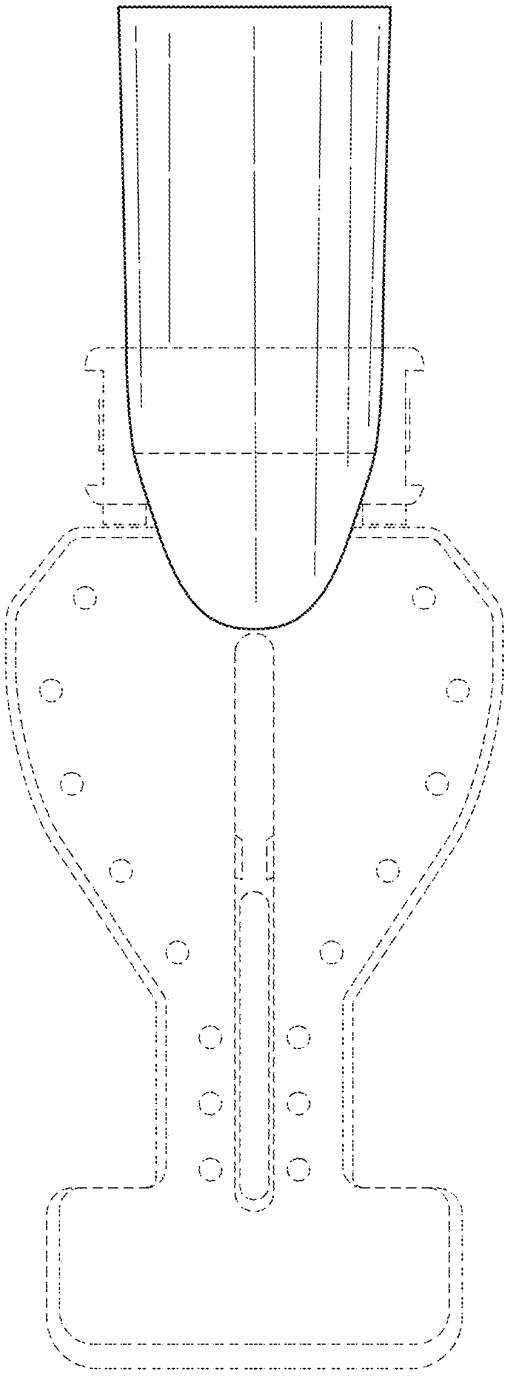


FIG.2

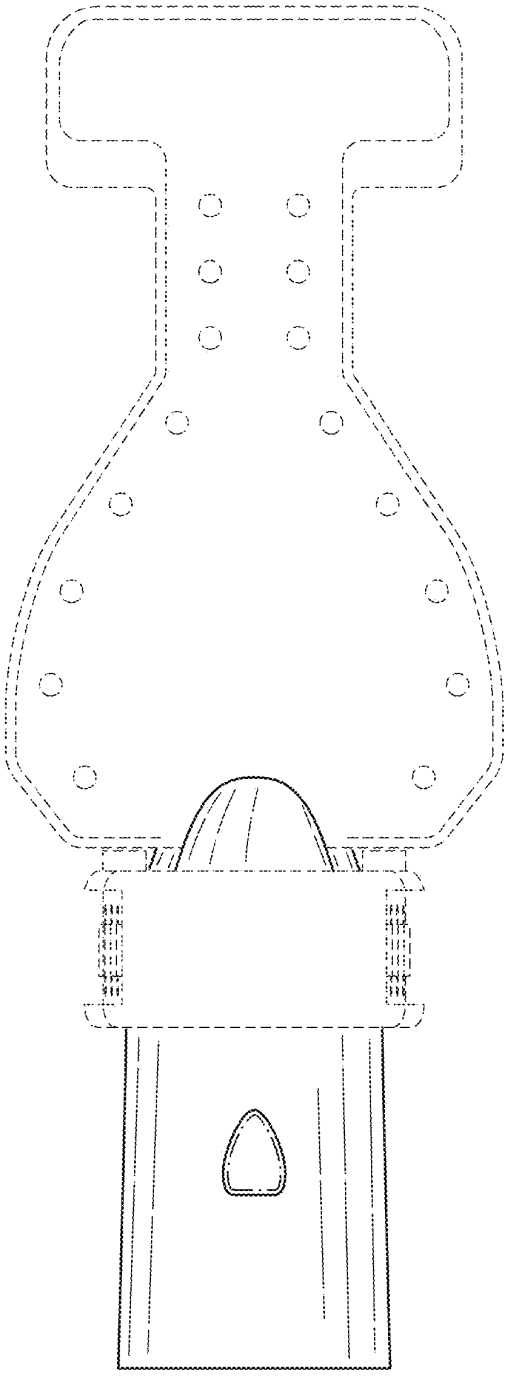


FIG.3

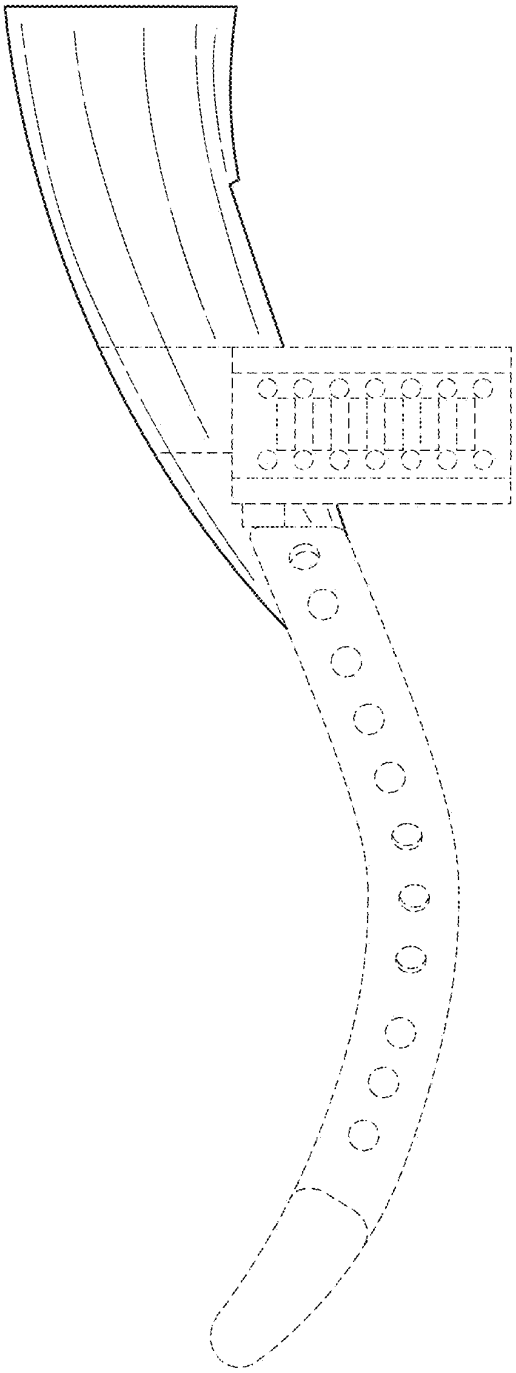


FIG.4

EXHIBIT D

US00D962439S

(12) United States Design Patent

Nguyen et al.

(10) Patent No.: US D962,439 S
(45) Date of Patent: ** Aug. 30, 2022

(54) **MOUTHPIECE**

(71) Applicant: **Dryshield, LLC**, Fountain City, CA (US)

(72) Inventors: **Thien Nguyen**, Santa Ana, CA (US); **Tam Thanh Pham**, San Francisco, CA (US)

(73) Assignee: **SOLMETEX, LLC**, Northborough, MA (US)

(**) Term: **15 Years**

(21) Appl. No.: **29/782,645**

(22) Filed: **May 7, 2021**

Related U.S. Application Data

(63) Continuation of application No. 14/228,046, filed on Mar. 27, 2014, which is a continuation of application No. 14/100,323, filed on Dec. 9, 2013, now Pat. No. 8,911,232.

(51) **LOC (13) Cl.** **24-01**

(52) **U.S. Cl.**
USPC **D24/152**

(58) **Field of Classification Search**
USPC D24/108, 110.5, 111–113, 127, 129, 152, D24/176
CPC . A61C 17/02; A61C 17/0202; A61C 17/0205; A61C 17/0208; A61C 17/0211; A61C 17/06; A61C 17/065; A61C 17/08; A61C 17/092; A61C 17/096; A61C 17/10; A61C 17/12; A61M 1/0023; A61M 1/0058
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

50,461 A 10/1865 Dibble
1,471,207 A 10/1923 Napoleon
1,731,322 A 10/1929 Riddle
2,019,612 A 11/1935 Langhans et al.
2,937,445 A 5/1960 Erickson
3,090,122 A 5/1963 Erickson
3,453,735 A 7/1969 Burt et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2851861 2/2016
CN 102026587 4/2011
(Continued)

OTHER PUBLICATIONS

"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: Oct. 27, 2014. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).*
(Continued)

Primary Examiner — Mary Shannon Malley
Assistant Examiner — Lee D. Starr
(74) *Attorney, Agent, or Firm* — Polsinelli PC

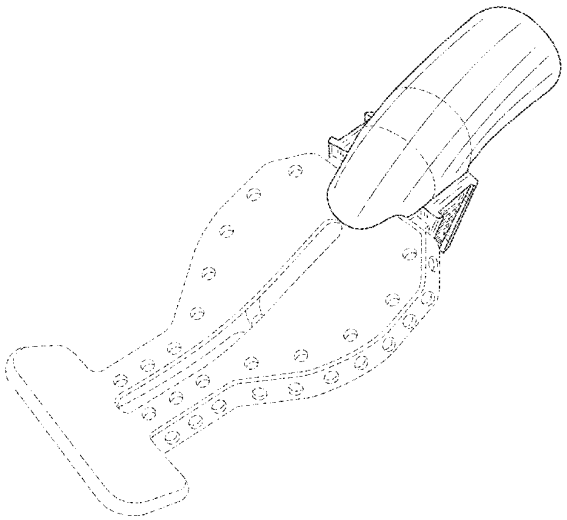
(57) **CLAIM**

The ornamental design for a mouthpiece, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of a mouthpiece showing our new design.
FIG. **2** is a top view thereof.
FIG. **3** is a bottom view thereof; and,
FIG. **4** is a left side view thereof, with the right side view being a mirror image thereof.
The broken lines shown in the Figures show portions of the mouthpiece that form no part of the claimed design. The dash-dot broken lines represent the boundary of the claimed design and form no part thereof.

1 Claim, 4 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

3,516,160	A *	6/1970	Leffler	A61C 17/08 433/95
3,758,950	A	9/1973	Krouzian	
3,768,477	A	10/1973	Anders et al.	
3,802,081	A	4/1974	Rogers	
3,857,181	A	12/1974	Rappaport	
3,877,691	A	4/1975	Foster	
3,924,333	A	12/1975	Erickson	
4,017,975	A	4/1977	Johnson	
4,024,642	A	5/1977	Zorovich	
4,083,115	A	4/1978	McKelvey	
4,167,814	A	9/1979	Schubert	
4,192,071	A	3/1980	Erickson	
4,511,329	A	4/1985	Diamond	
4,718,662	A	1/1988	North	
4,802,851	A	2/1989	Rhoades	
4,822,278	A	4/1989	Oliva et al.	
5,009,595	A	4/1991	Osborn	
5,037,298	A	8/1991	Hickham	
5,078,602	A	1/1992	Honoshofsky	
5,460,524	A	10/1995	Anderson	
D364,456	S *	11/1995	Solnit	D24/112
5,516,286	A	5/1996	Kushner	
5,588,836	A	12/1996	Landis et al.	
5,720,275	A	2/1998	Patil et al.	
5,762,496	A	6/1998	Albertsson et al.	
5,890,899	A	4/1999	Sclafani	
6,022,214	A	2/2000	Hirsch et al.	
6,213,772	B1	4/2001	Costello	
6,241,521	B1	6/2001	Garrison	
6,267,591	B1	7/2001	Barstow	
6,338,627	B2	1/2002	Hirsch et al.	
6,575,746	B2	6/2003	Hirsch et al.	
6,672,305	B2	1/2004	Parker	
D495,799	S	9/2004	Hirsch et al.	
D497,426	S	10/2004	Hirsch et al.	
6,908,308	B2	6/2005	Hirsch et al.	
6,974,321	B2	12/2005	Hirsch et al.	
7,287,981	B2	10/2007	Hirsch	
7,293,990	B2	11/2007	Hirsch et al.	
7,611,354	B2	11/2009	Hirsch et al.	
D615,203	S	5/2010	Hirsch et al.	
7,748,981	B2	7/2010	Hirsch et al.	
8,029,280	B2	10/2011	Black et al.	
8,057,227	B2	11/2011	Hirsch et al.	
8,057,228	B2	11/2011	Hirsch et al.	
8,075,310	B2	12/2011	Hirsch et al.	
D663,831	S	7/2012	Sidhu et al.	
D666,726	S	9/2012	Davis et al.	
8,297,973	B2	10/2012	Hirsch et al.	
8,529,256	B2	9/2013	Hirsch et al.	
8,535,056	B2	9/2013	Dragan et al.	
D696,779	S	12/2013	Hirsch et al.	
8,911,232	B2	12/2014	Nguyen	
D734,851	S	7/2015	Nguyen	
9,084,656	B2	7/2015	Hirsch	
9,089,389	B2	7/2015	Hirsch et al.	
D735,858	S	8/2015	Hirsch et al.	
D737,964	S	9/2015	Jessop et al.	
9,358,086	B2	6/2016	Hirsch	
D782,047	S	3/2017	Ritter	
D782,048	S	3/2017	Ritter	
D787,069	S	5/2017	Ritter	
D787,070	S	5/2017	Ritter	
9,788,924	B2	10/2017	Nguyen	
D809,660	S	2/2018	Nguyen	
9,968,341	B2	5/2018	Ritter	
10,390,734	B2	8/2019	Johnson et al.	
10,390,916	B1	8/2019	Rassibi	
D868,958	S	12/2019	Reyes	
D876,627	S	2/2020	Nguyen	
2001/0008752	A1	7/2001	Hirsch et al.	
2003/0134253	A1	7/2003	Hirsch et al.	
2004/0033468	A1 *	2/2004	Fischer	A61C 5/90 433/140
2006/0063126	A1	3/2006	Aloise et al.	
2006/0063129	A1	3/2006	Hirsch	
2006/0084031	A1	4/2006	Hirsch et al.	
2008/0166684	A1	7/2008	Kanas	
2008/0318183	A1	12/2008	Suzman	
2009/0123886	A1	5/2009	Vaska	
2009/0274991	A1	11/2009	Black et al.	
2011/0207076	A1	8/2011	Hirsch et al.	
2011/0311942	A1	12/2011	Black et al.	
2012/0015317	A1	1/2012	Milo	
2012/0015320	A1	1/2012	Koo	
2012/0237894	A1	9/2012	Maycher et al.	
2013/0095450	A1	4/2013	Ames	
2013/0252193	A1	9/2013	Bowman et al.	
2014/0004478	A1	1/2014	Hirsch et al.	
2014/0162209	A1	6/2014	Nguyen	
2014/0212837	A1	7/2014	Nguyen	
2014/0212838	A1	7/2014	Nguyen	
2014/0212839	A1	7/2014	Nguyen	
2014/0212840	A1	7/2014	Nguyen	
2014/0212841	A1	7/2014	Nguyen	
2014/0349249	A1 *	11/2014	Reyes	A61C 17/08 433/96
2015/0305842	A1	10/2015	Hirsch et al.	
2015/0335409	A1	11/2015	Hirsch	
2017/0156831	A1	6/2017	Reyes	
2017/0156832	A1	6/2017	Reyes	
2017/0156833	A1	6/2017	Reyes	
2020/0155284	A1	5/2020	Baker	
2020/0352680	A1	11/2020	Nguyen	

FOREIGN PATENT DOCUMENTS

CN	102247140		11/2011
CN	105578986	A	5/2016
EP	2903557		8/2015
EP	3184076		6/2017
FR	2992161	A1	12/2013
GB	2 170 106		7/1986
KR	100654392	B1	12/2006
WO	WO 1999/037238		7/1999
WO	0042939	A1	7/2000
WO	0061031	A1	10/2000
WO	WO 2011/014952		2/2011
WO	WO 2015/088577		6/2015
WO	2018126150	A1	7/2018
WO	WO 2020/231864		11/2020

OTHER PUBLICATIONS

"Dryshield Tutorial—Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: Apr. 15, 2015. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).*

Dryshield brochure. Dryshield.com. Publish date: May 2019. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://dryshield.com/ds/Brochure_May2019.pdf (Year: 2019).*

"Dryshield (single-use) vs Zryis/Isolite (single-use) mouthpieces" posted by Mark Frias, RDH. Youtube. Posting date: Jan. 18, 2020. Retrieval date: Sep. 15, 2021. Retrieved from internet: https://www.youtube.com/watch?v=uKX9XahO6EY (Year: 2020).*

PCT Application No. PCT/US2014/032892 International Preliminary Report on Patentability dated Jun. 14, 2016.

PCT Application No. PCT/US2014/032892 International Search Report and Written Opinion dated Sep. 4, 2014.

PCT Application No. PCT/US2020/032228 International Search Report and Written Opinion dated Aug. 12, 2020.

Australian Patent Application No. 2014202637; AU Examination Report dated Jan. 23, 2015.

Brazilian Patent Application No. BR1120140116377 Preliminary Office Action dated Jan. 7, 2020.

Canadian Patent Application No. 2,919,142; CA Examination Report dated May 31, 2016.

Chinese Patent Application No. 201480039991.2 First Office Action dated Dec. 29, 2016.

(56) **References Cited**

OTHER PUBLICATIONS

European Patent Application No. 14721736.8; Extended European Search Report dated Oct. 20, 2015.
European Patent Application No. 17150671.0; Extended European Search Report dated May 29, 2017.
U.S. Appl. No. 29/780,960, Thien Nguyen, Mouthpiece Mouth Prop, filed Apr. 27, 2021.
U.S. Appl. No. 29/782,638, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 29/782,644, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 29/782,643, Thien Nguyen, Mouthpiece, filed May 7, 2021.
U.S. Appl. No. 14/228,054; Final Office Action dated Jan. 3, 2022.
U.S. Appl. No. 14/228,061; Non-Final Office Action dated Dec. 8, 2021.
U.S. Appl. No. 16/870,745 Non-Final Office Action dated Dec. 3, 2021.
U.S. Appl. No. 14/228,054; Office Action dated Jun. 25, 2021.
U.S. Appl. No. 14/228,046; Non-Final Office Action dated Oct. 6, 2021.
U.S. Appl. No. 14/228,057; Final Office Action dated Nov. 12, 2021.
U.S. Appl. No. 29/782,638; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,644; Non-Final Office Action dated Oct. 4, 2021.
U.S. Appl. No. 29/782,643; Non-Final Office Action dated Oct. 4, 2021.

* cited by examiner

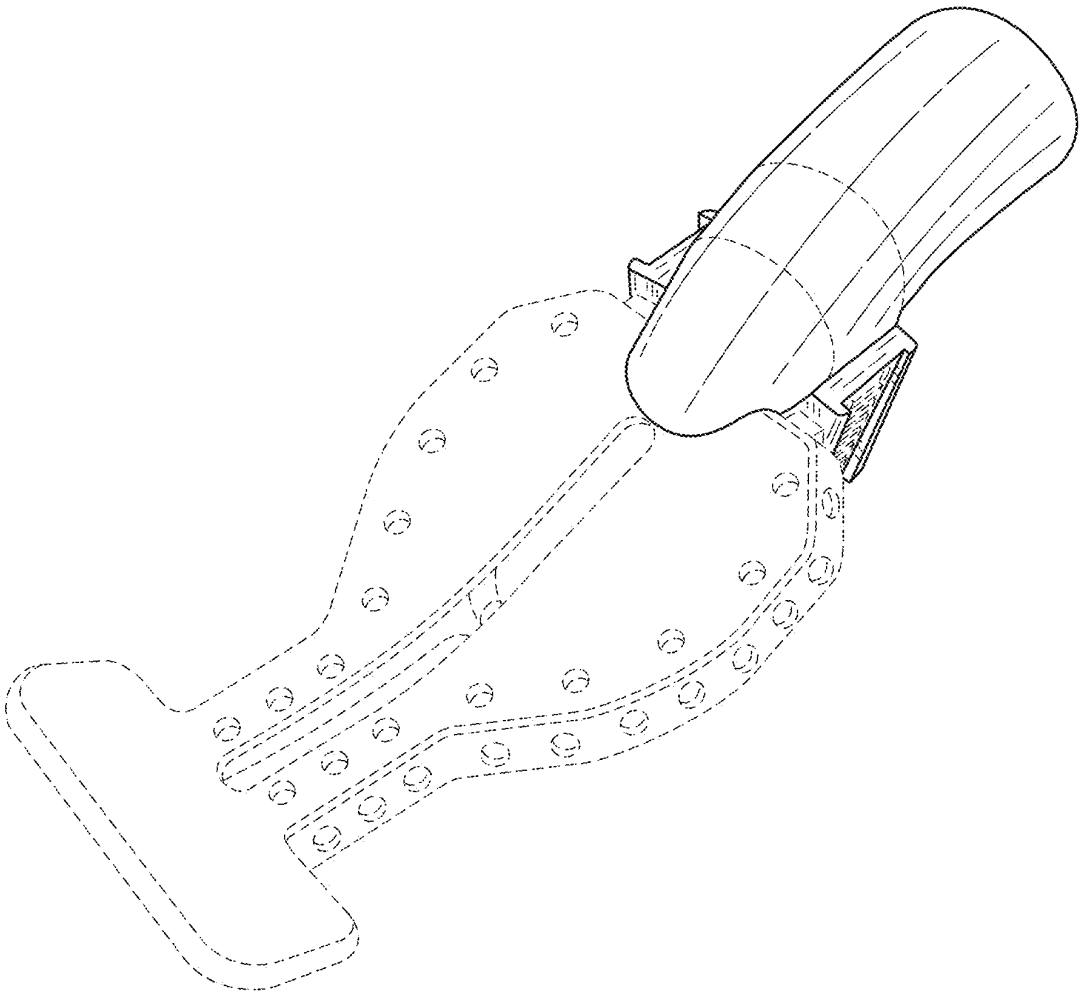


FIG.1

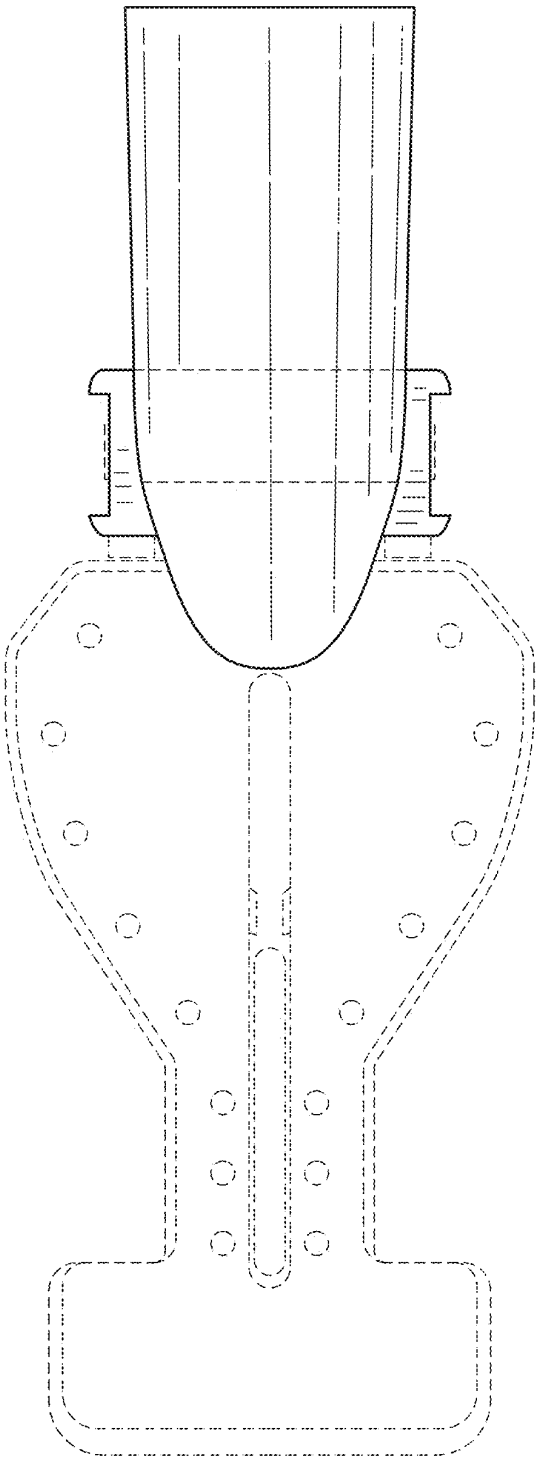


FIG.2

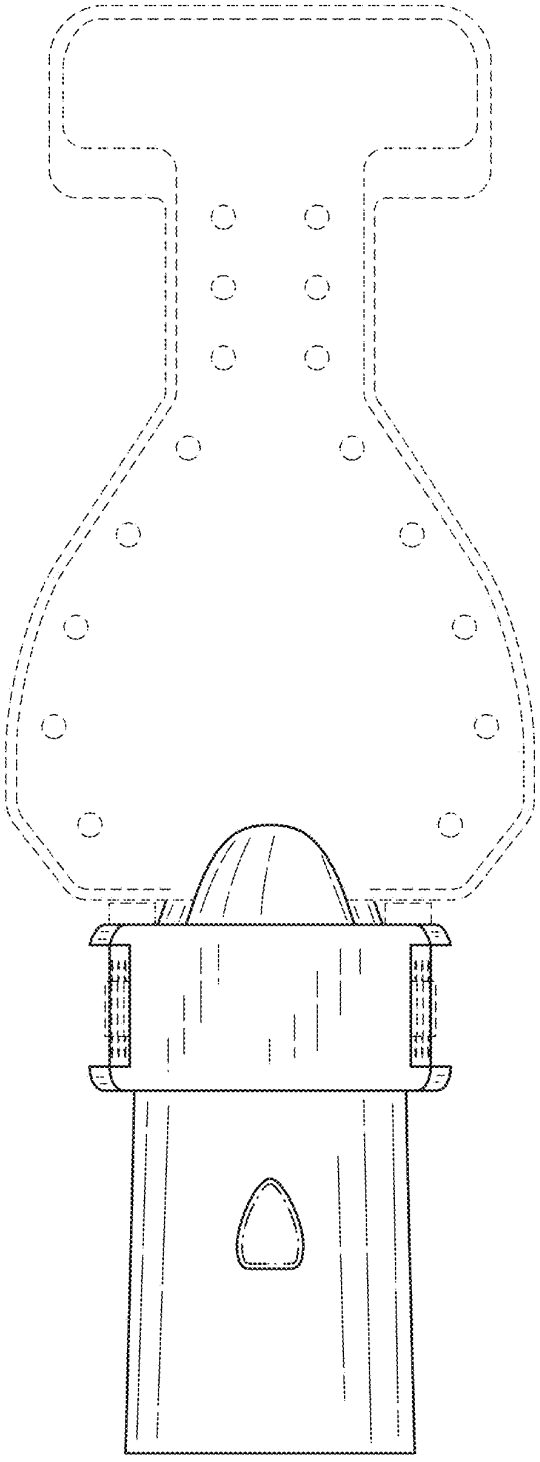


FIG.3

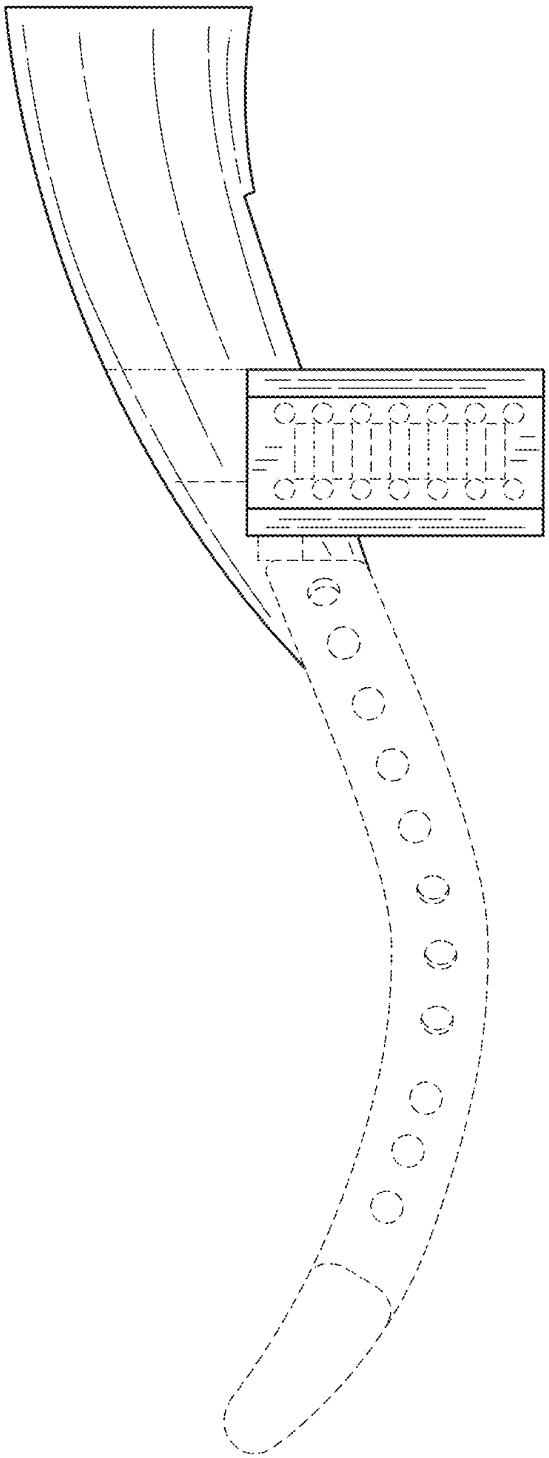


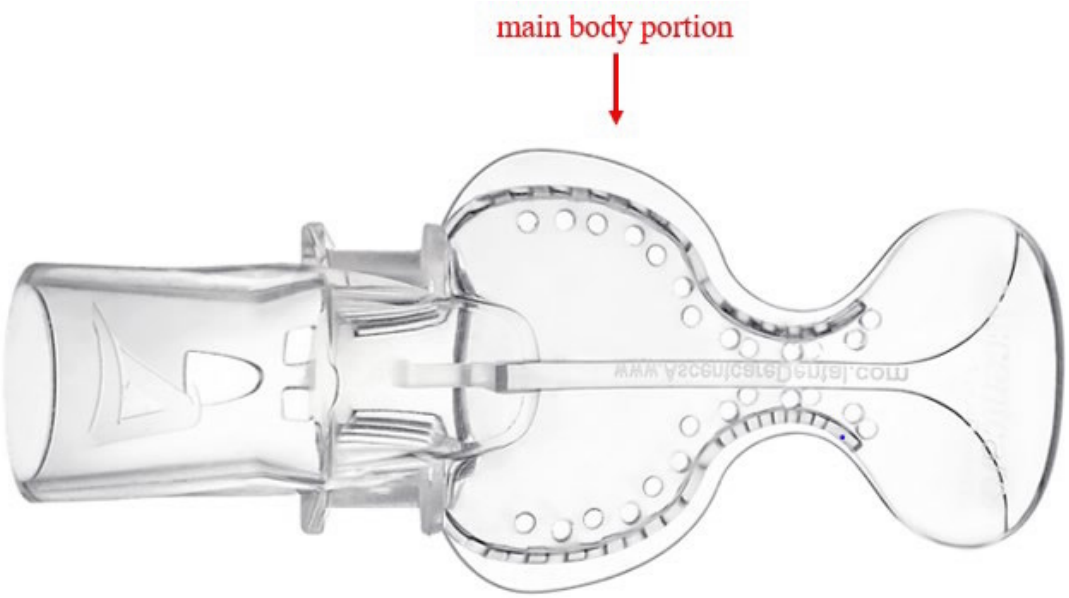
FIG.4

EXHIBIT E

Exhibit E - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,969

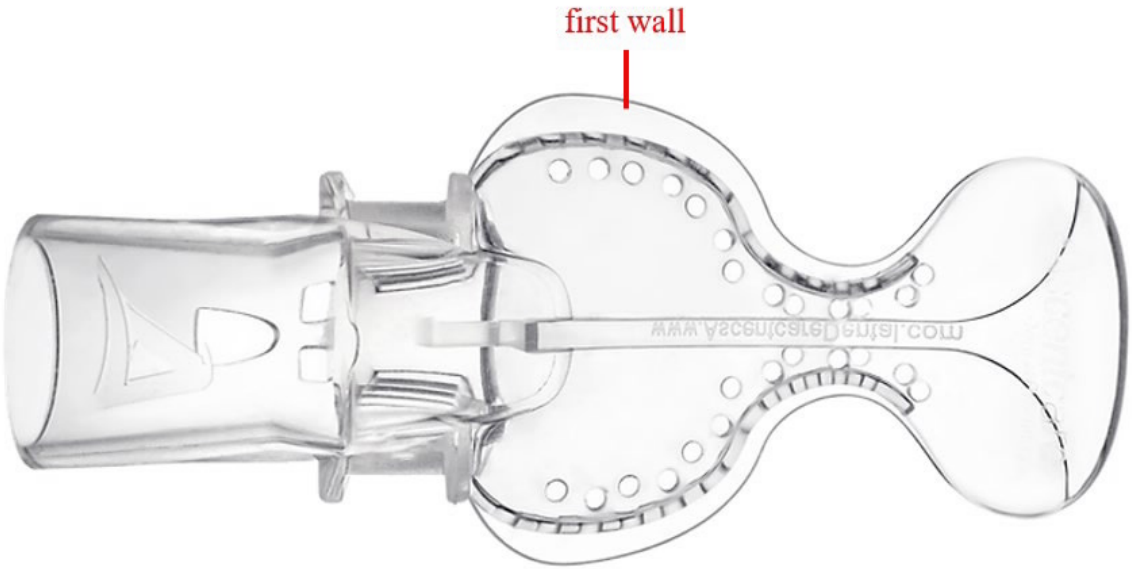
Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
19[pre] A dental mouthpiece comprising	To the extent the preamble is limiting, the Ascentcare VacuLUX Mouthpiece is a dental mouthpiece.  VacuLUX ISOLATION MOUTHPIECES https://www.ascentcaredental.com/isolation-mouthpieces
19[a] a main body portion configured as a pocket at least partially enclosing an interior space, the pocket defined by	The Ascentcare VacuLUX Mouthpiece includes a main body portion configured as a pocket at least partially enclosing an interior space.

Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

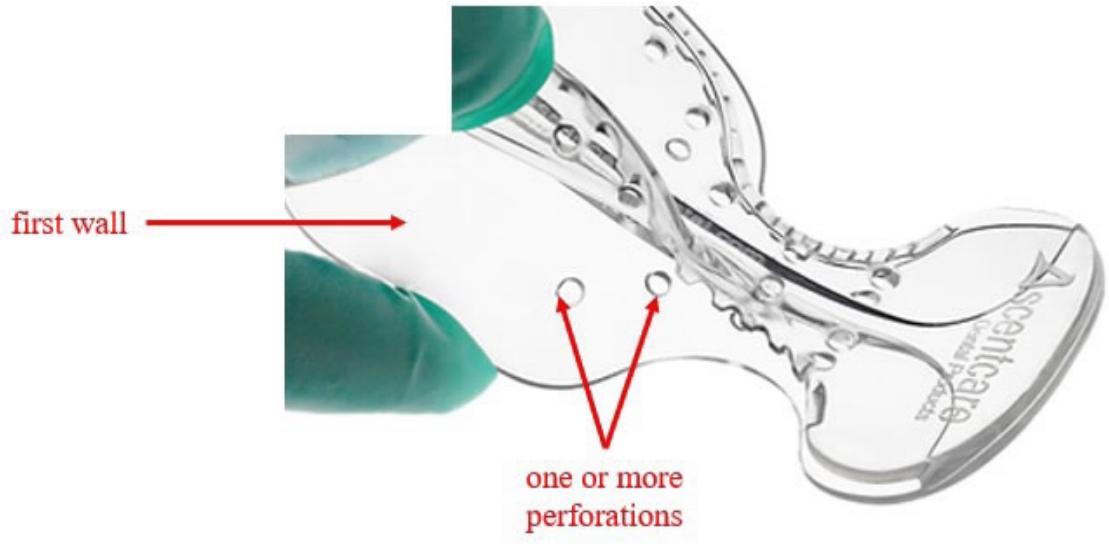
Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece 

Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

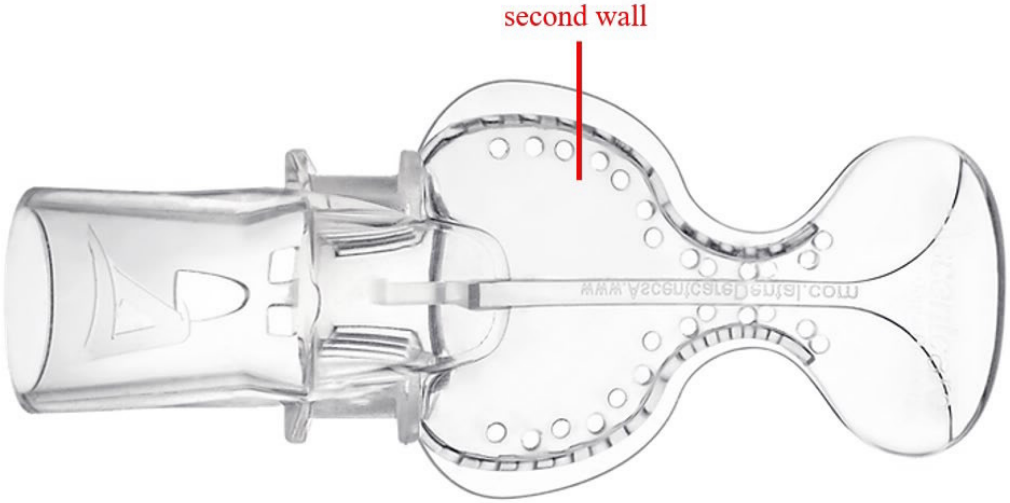
Exhibit E - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,969

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	https://www.ascentcaredental.com/post/get-the-most-from-your-vaculux-mouthpieces
19[a][1] a first wall that includes one or more perforations in communication with the interior space of the pocket, the first wall having a shape defined by one or more edges along one or more sides;	The Ascentcare VacuLUX Mouthpiece includes a first wall that includes one or more perforations in communication with the interior space of the pocket. The first wall has a shape defined by one or more edges along one or more sides.  https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece

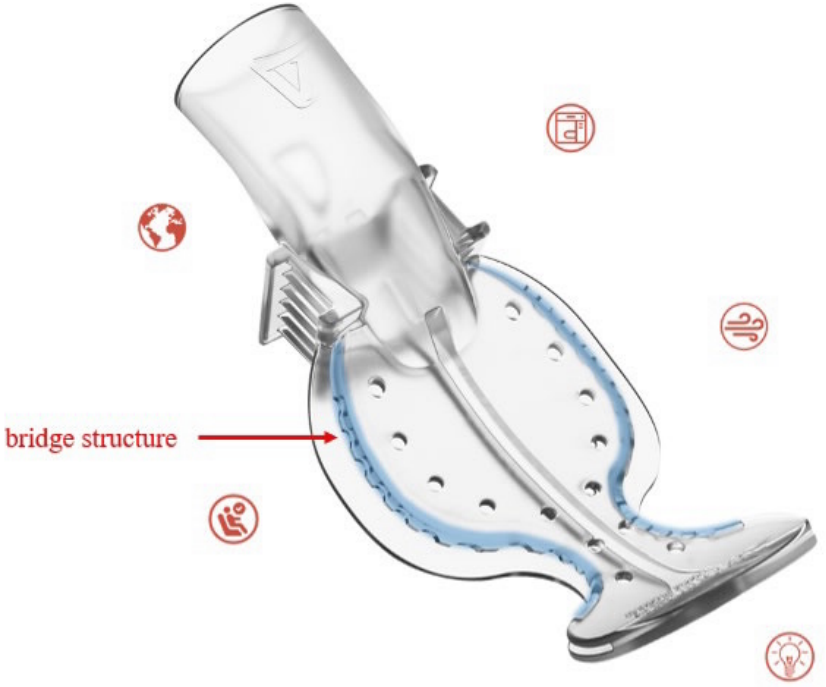
Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece
19[a][2] a second wall having a shape that corresponds to the shape of the first wall, the shape of the second wall defined by one or more corresponding edges along one or more corresponding sides, wherein the second wall includes a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second	The Ascentcare VacuLUX Mouthpiece includes a second wall having a shape that corresponds to the shape of the first wall, the shape of the second wall defined by one or more corresponding edges along one or more corresponding side.

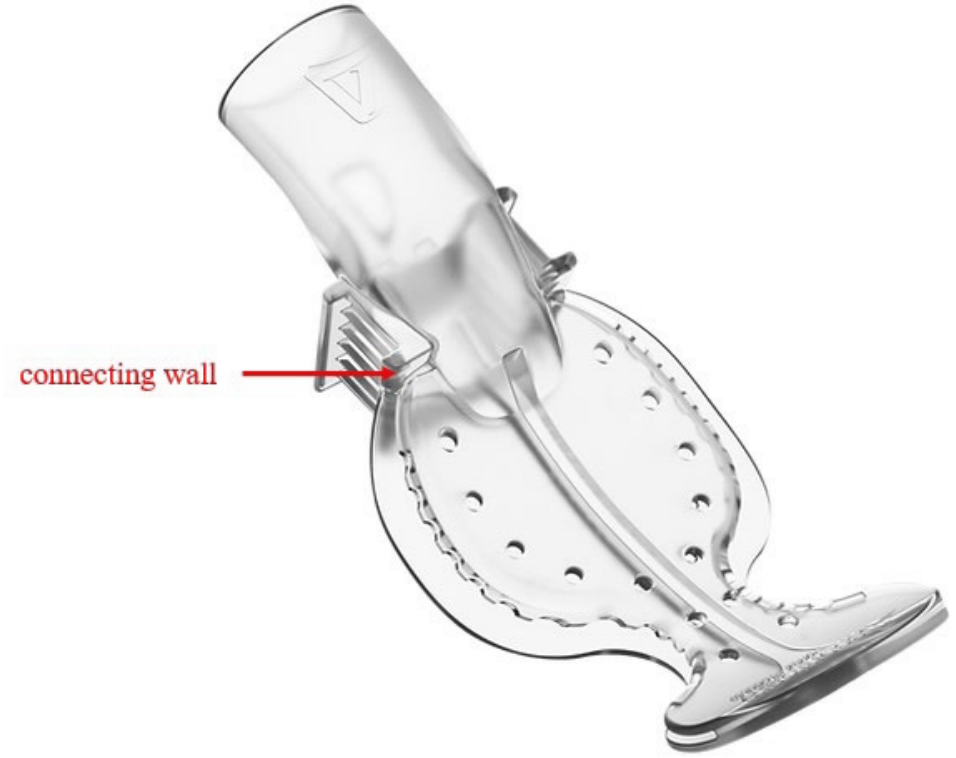
Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
wall within the interior space of the pocket, wherein the protrusions of the bridge structure protrude from the interior surface of the second wall toward the first wall in a wave shape comprising one or more crests and one or more troughs, and	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece The second wall includes a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall within the interior space of the pocket, wherein the protrusions of the bridge structure protrude from the interior surface of the second wall toward the first wall in a wave shape comprising one or more crests and one or more troughs.

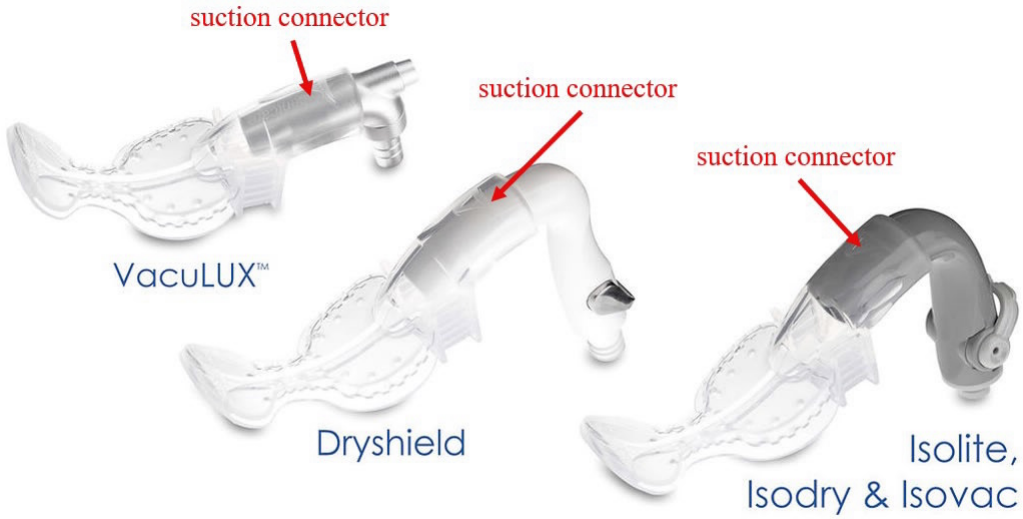
Ascentcare Dental Products v. Solmetex - IPR2025-01057
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Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/isolation-mouthpieces
19[a][3] a connecting wall that connects the one or more edges of the first wall to the one or more corresponding edges of the second wall across a span between the first wall and the second wall;	The Ascentcare VacuLUX Mouthpiece includes a connecting wall that connects the one or more edges of the first wall to the one or more corresponding edges of the second wall across a span between the first wall and the second wall.

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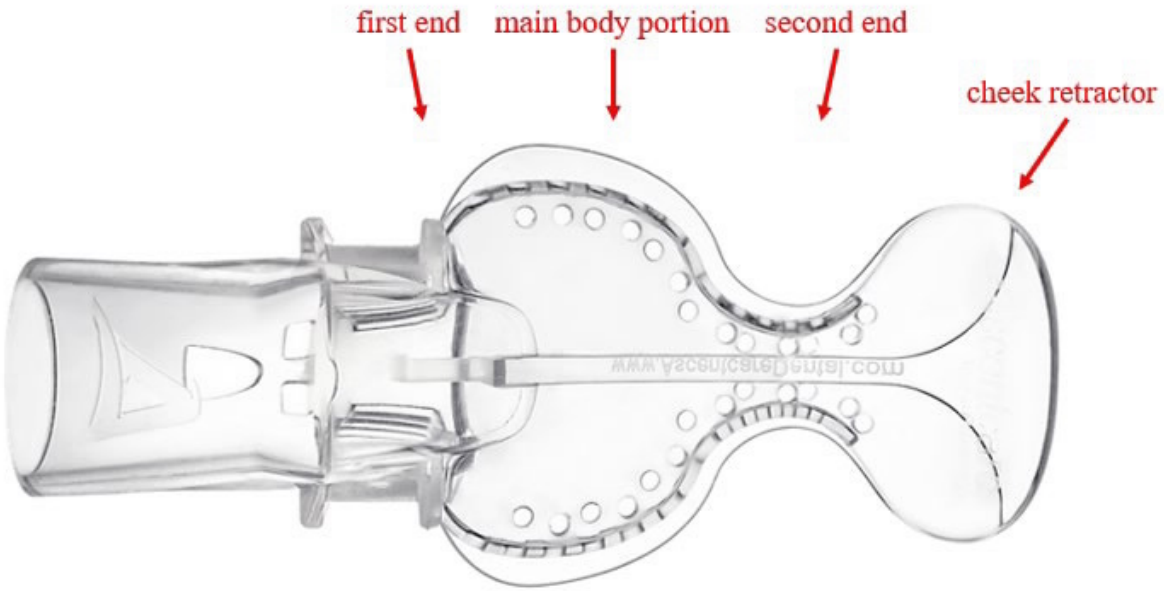
Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/isolation-mouthpieces
19[b] a suction connector portion connected to a first end of the main body portion, the suction connector configured to connect a	The Ascentcare VacuLUX Mouthpiece includes a suction connector portion connected to a first end of the main body portion, the suction connector configured to connect a vacuum source to the interior space of the pocket.

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Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
vacuum source to the interior space of the pocket; and	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece
19[c] a cheek retractor connected to a second end of the main body portion, wherein the second end is opposite the first end of the main body portion.	The Ascentcare VacuLUX Mouthpiece includes a cheek retractor connected to a second end of the main body portion, wherein the second end is opposite the first end of the main body portion.

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Solmetex Ex. 2006

Exhibit E - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,969

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece All-in-one bite block, cheek retractor, tongue guard and hands free, continuous high-volume suction. https://www.ascentcaredental.com/isolation-mouthpieces

Solmetex Ex. 2006
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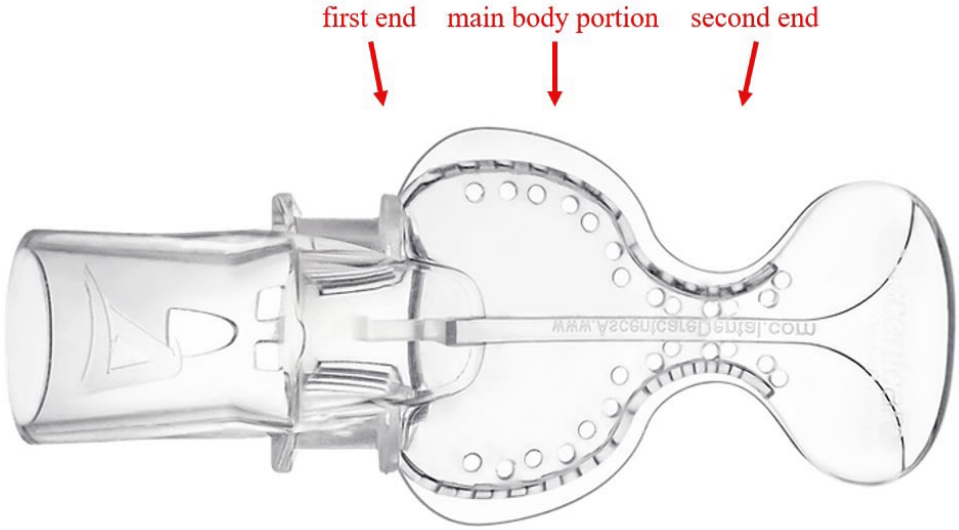
EXHIBIT F

Exhibit F - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,970

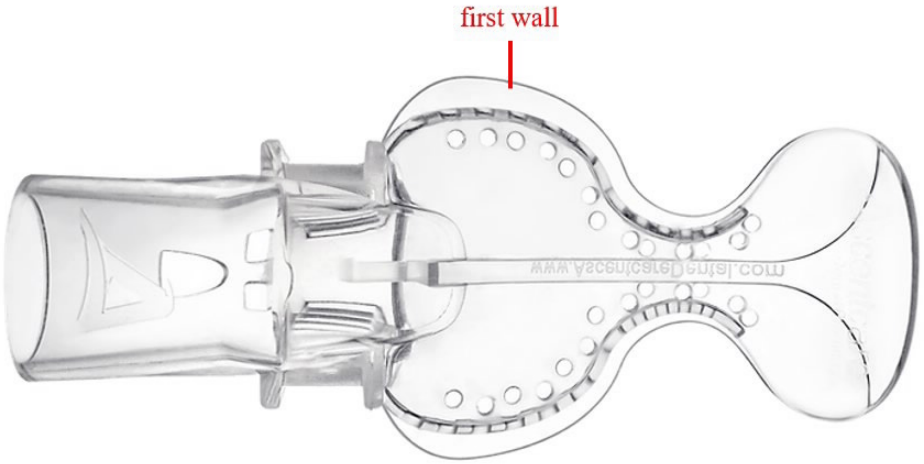
Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
1[pre] A mouthpiece comprising	To the extent the preamble is limiting, the Ascentcare VacuLUX Mouthpiece is a mouthpiece.  VacuLUX ISOLATION MOUTHPIECES https://www.ascentcaredental.com/isolation-mouthpieces
1[a] a main body portion configured as a pocket at least partially enclosing an interior space that extends from a first end to a second end of the main body portion, the pocket defined by	The Ascentcare VacuLUX Mouthpiece includes a main body portion configured as a pocket at least partially enclosing an interior space that extends from a first end to a second end of the main body portion.

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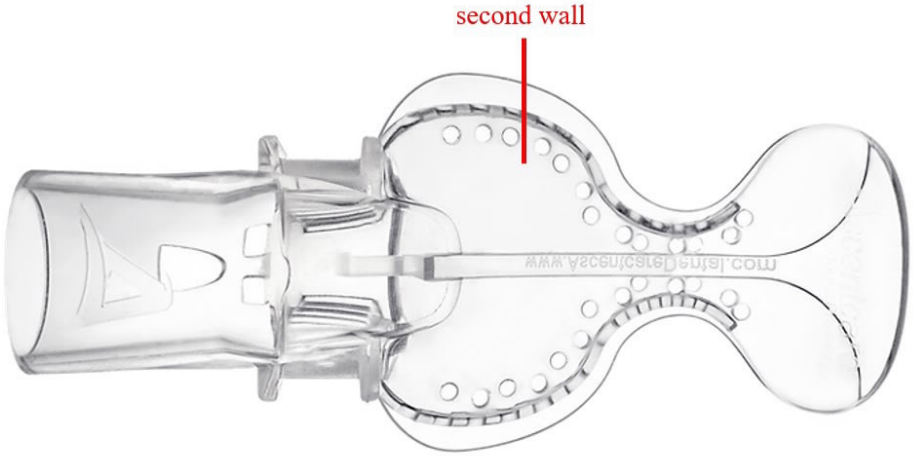
Exhibit F - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,970

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece  https://www.ascentcaredental.com/post/get-the-most-from-your-vaculux-mouthpieces

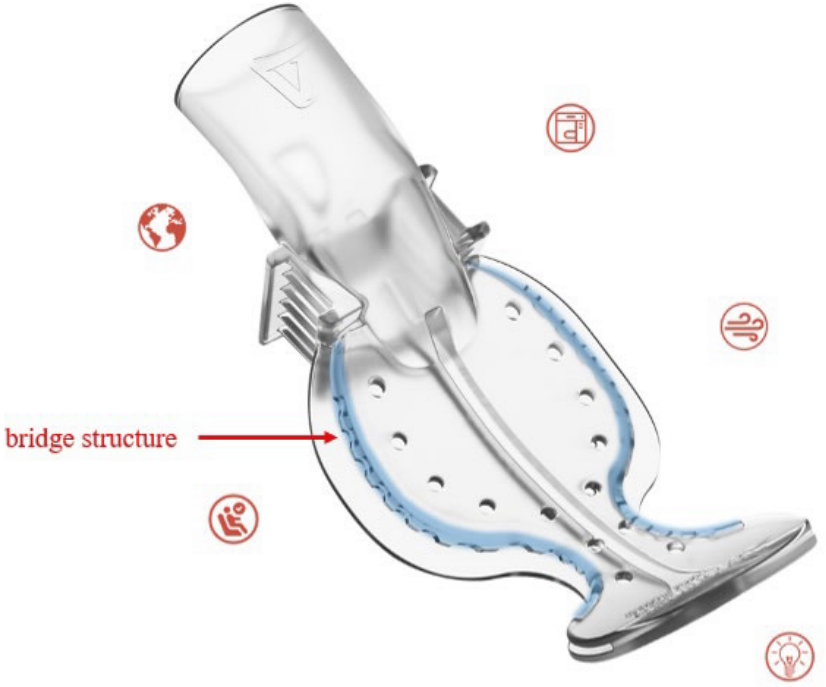
Solmetex Ex. 2006
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Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
1[a][1] a first wall extending from the first end to the second end, wherein the first wall is narrower at the second end than at the first end,	The Ascentcare VacuLUX Mouthpiece includes a first wall extending from the first end to the second end, wherein the first wall is narrower at the second end than at the first end.  https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece
1[a][2] a second wall located at a distance from the first wall and extending from the first end to the second end, wherein the second wall is also narrower at the second end than at the first end, the second wall comprising a bridge structure that includes a plurality of protrusions integral	The Ascentcare VacuLUX Mouthpiece includes a second wall located at a distance from the first wall and extending from the first end to the second end. The second wall is narrower at the second end than at the first end.

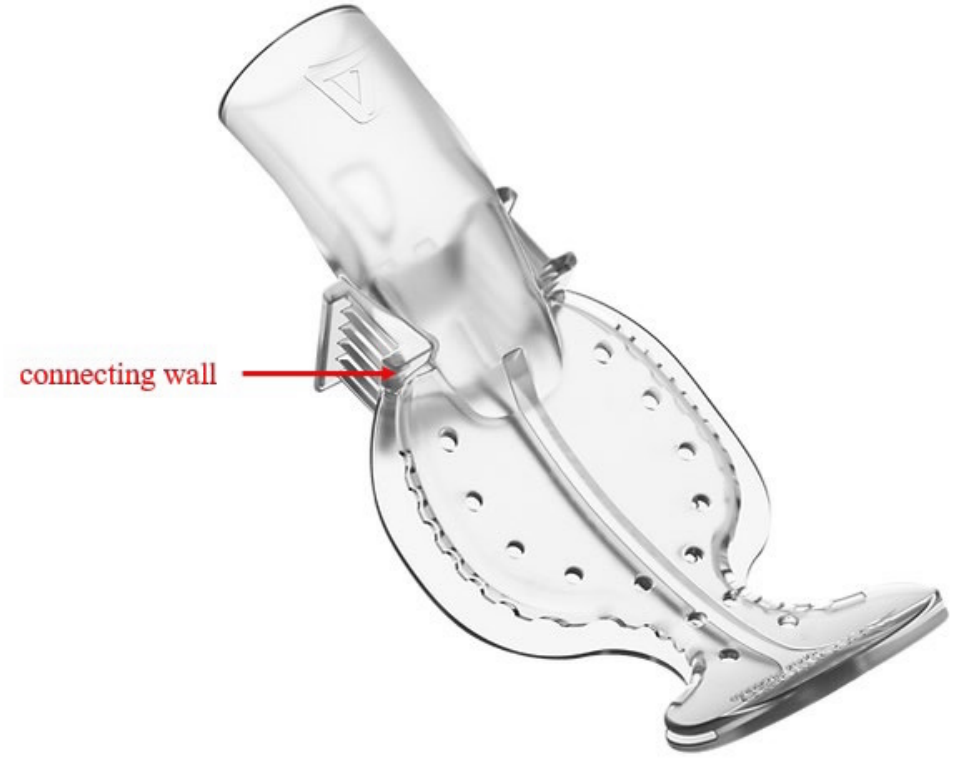
Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
with and protruding from an interior surface of the second wall and extending across the distance between the first wall and the second wall, wherein the bridge structure is not attached to the first wall, and wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs, and	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece The second wall comprises a bridge structure that includes a plurality of protrusions integral with and protruding from an interior surface of the second wall and extending across the distance between the first wall and the second wall. The bridge structure is not attached to the first wall, and wherein the plurality of protrusions of the bridge structure protrude from the interior surface of the second wall in a wave shape comprising one or more crests and one or more troughs.

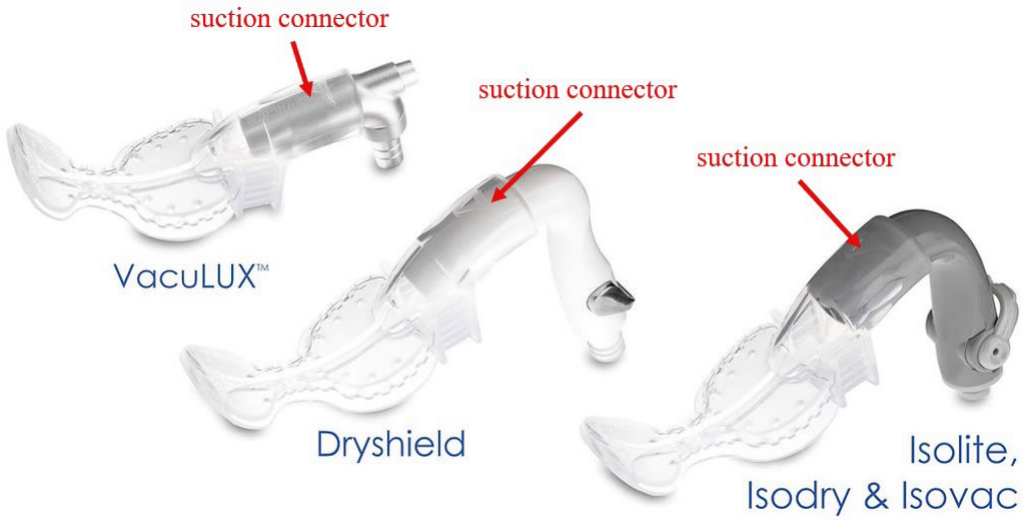
Solmetex Ex. 2006
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Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/isolation-mouthpieces
1[a][3] a connecting wall that connects one or more edges of the first wall to one or more corresponding edges of the second wall across the distance between the first wall and the second wall;	The Ascentcare VacuLUX Mouthpiece includes a connecting wall that connects one or more edges of the first wall to one or more corresponding edges of the second wall across the distance between the first wall and the second wall.

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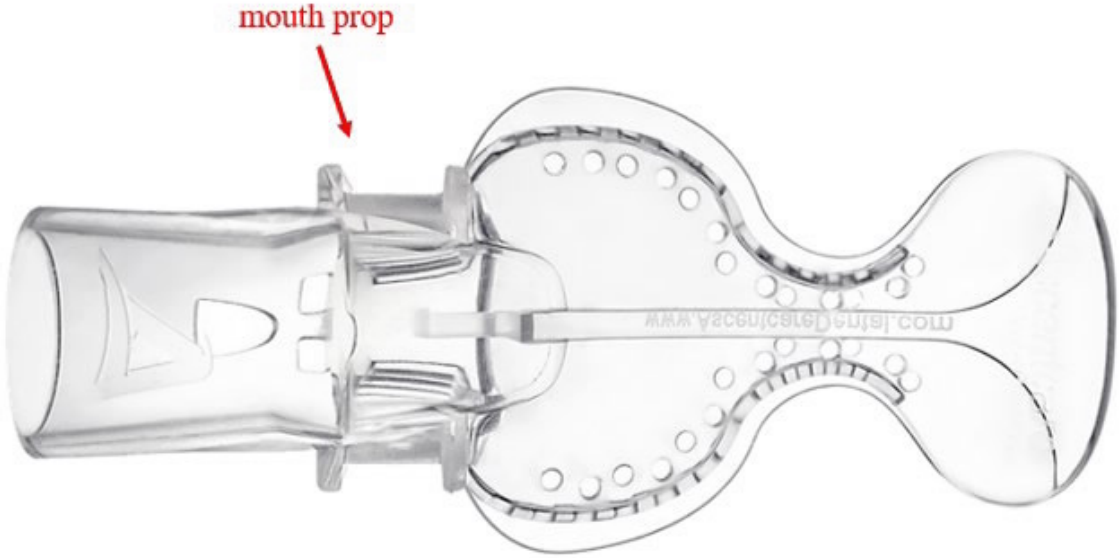
Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/isolation-mouthpieces
1[b] a suction connector extending from the first end of the main body portion and integral to the main body portion, the suction connector including a cavity	The Ascentcare VacuLUX Mouthpiece includes a suction connector extending from the first end of the main body portion and integral to the main body portion, the suction connector including a cavity extending longitudinally from the main body portion, the cavity in communication with the interior space of the pocket and extending from a first opening of the suction connector at the first

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Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
extending longitudinally from the main body portion, the cavity in communication with the interior space of the pocket and extending from a first opening of the suction connector at the first end of the main body portion and through a length of the suction connector towards a suction port opening opposite from the main body portion; and	end of the main body portion and through a length of the suction connector towards a suction port opening opposite from the main body portion.  https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece
1[c] a mouth prop molded in one piece, and wherein the suction connector extends through and past the mouth prop.	The Ascentcare VacuLUX Mouthpiece includes a mouth prop molded in one piece, and wherein the suction connector extends through and past the mouth prop.

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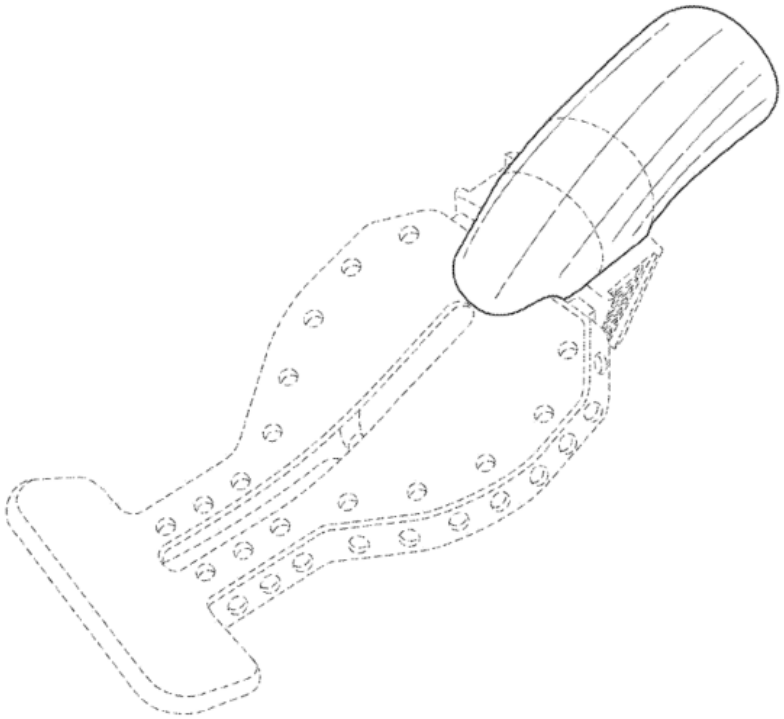
Exhibit F - Exemplary Infringement Claim Chart – U.S. Patent No. 11,589,970

Claim Limitation	Ascentcare Dental VacuLUX Mouthpiece
	 https://www.ascentcaredental.com/post/a-new-universal-isolation-mouthpiece All-in-one bite block, cheek retractor, tongue guard and hands free, continuous high-volume suction. https://www.ascentcaredental.com/isolation-mouthpieces

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EXHIBIT G

Exhibit G - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,438

U.S. Design Patent No. D962,438	Ascentcare Dental VacuLUX Mouthpiece
 FIG.1	

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Exhibit G - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,438

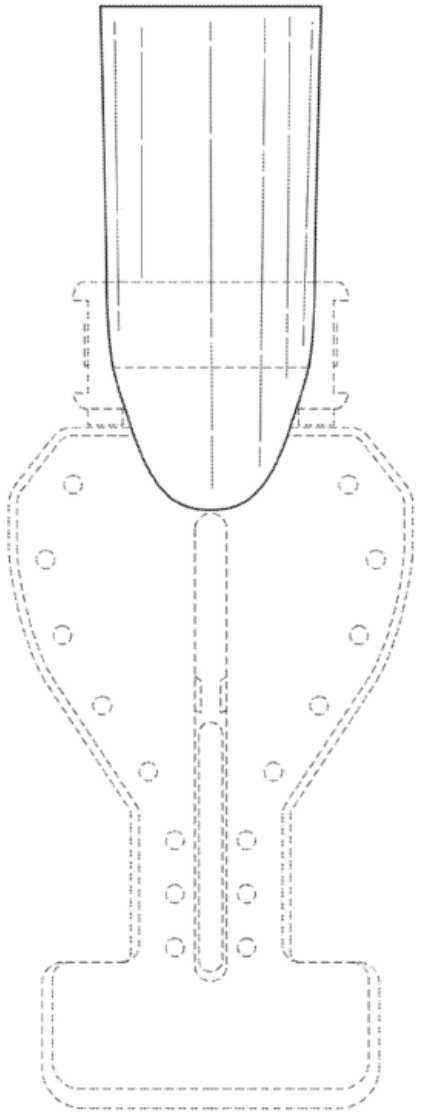


FIG.2



Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Exhibit G - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,438

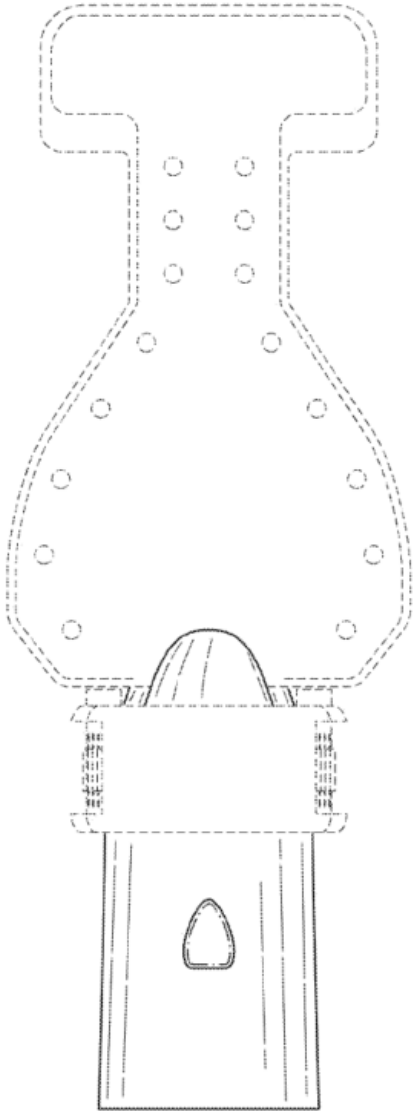
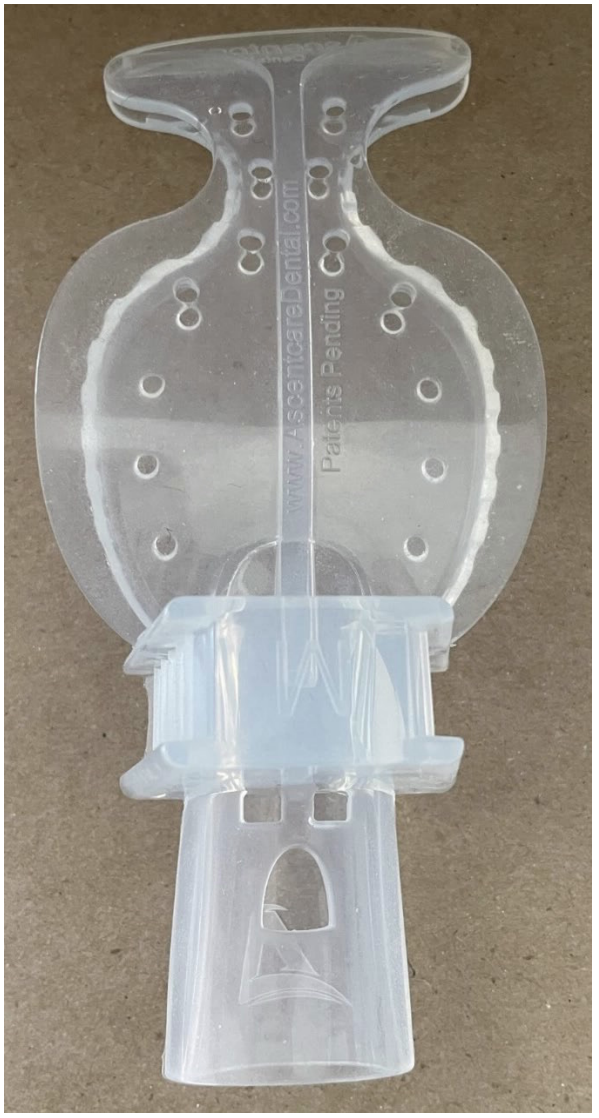


FIG.3



Solmetex Ex. 2006
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Exhibit G - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,438

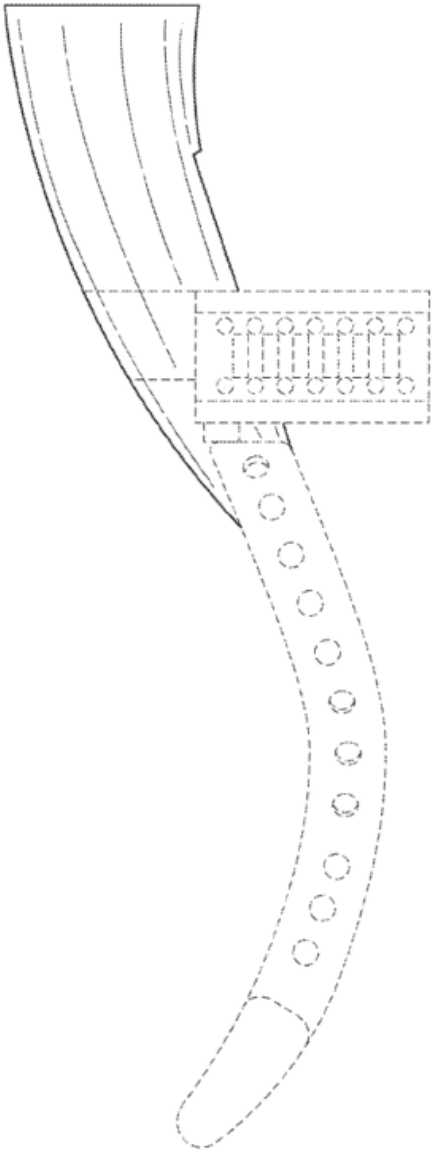


FIG.4



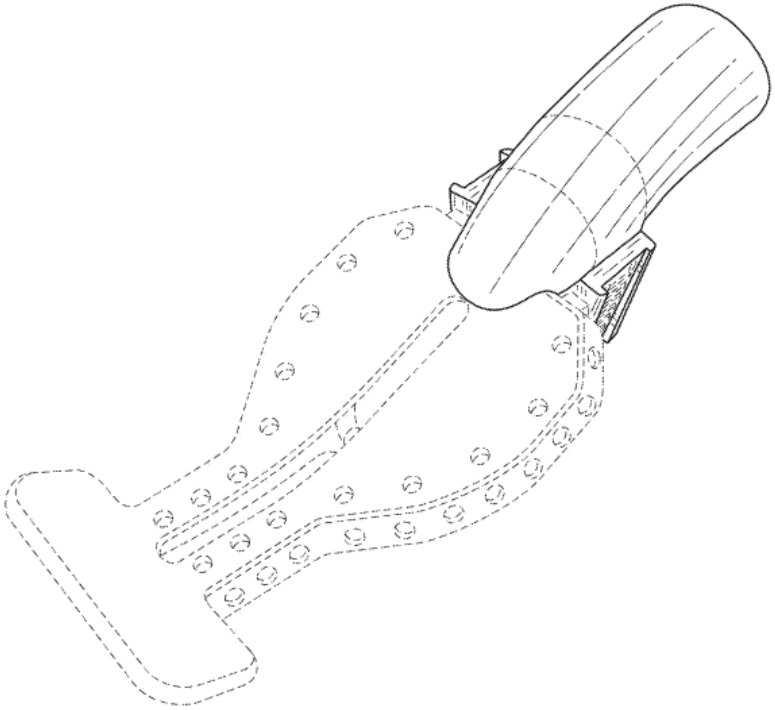
Solmetex Ex. 2006
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Exhibit G - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,438

Solmetex Ex. 2006
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EXHIBIT H

Exhibit H - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,439

U.S. Design Patent No. D962,439	Ascentcare Dental VacuLUX Mouthpiece
 FIG.1	

Solmetex Ex. 2006
Ascentcare Dental Products v. Solmetex - IPR2025-01057

Exhibit H - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,439

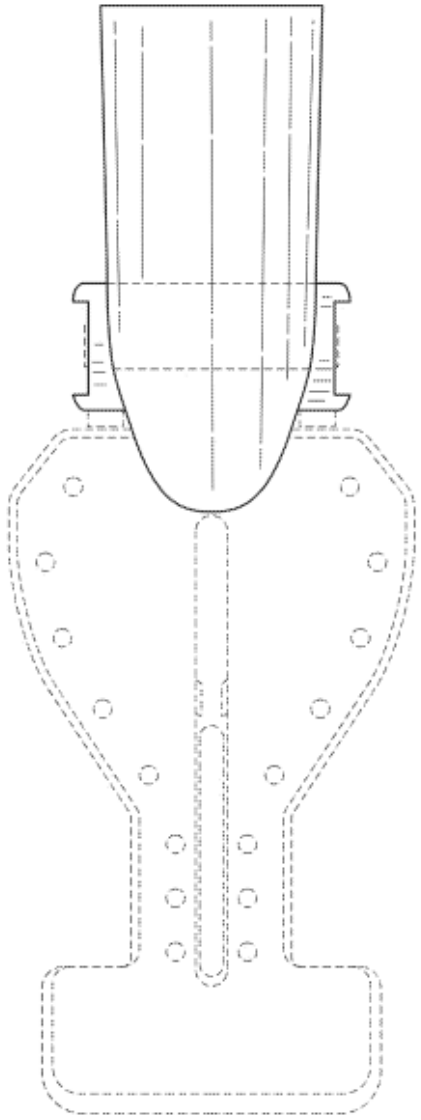


FIG.2



Solmetex Ex. 2006
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Exhibit H - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,439

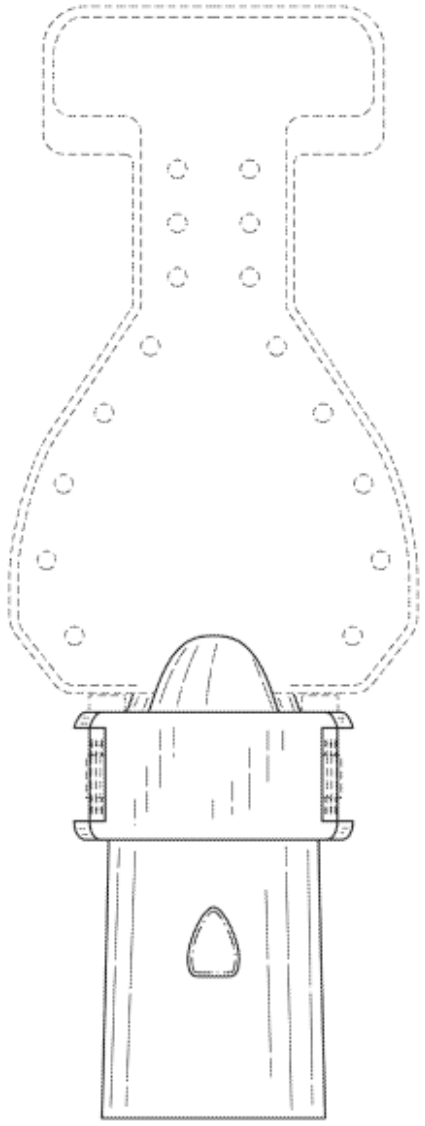
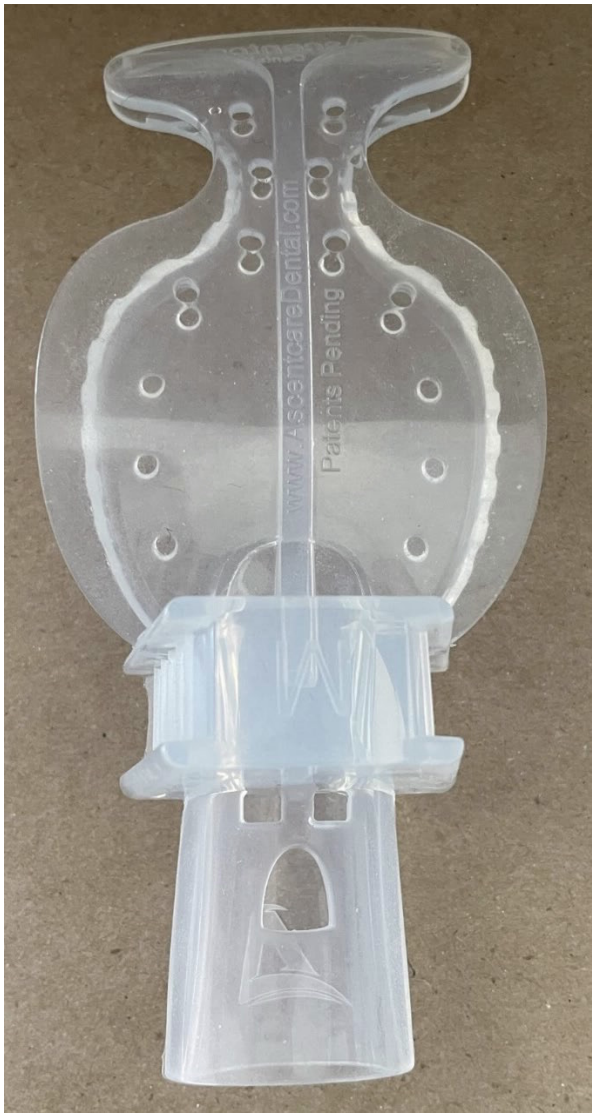


FIG.3



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Exhibit H - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,439

FIG.4

Exhibit H - Exemplary Infringement Claim Chart for U.S. Design Patent No. D962,439

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