

DENTAL MOUTHPIECE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the priority benefit of U.S. Provisional Patent Application Serial No. 62/846,353 filed May 10, 2019 entitled, "Dental Mouthpiece," the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] 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

[0003] 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.

[0004] 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

[0005] Embodiments of a dental mouthpiece formed in a curve are disclosed. Such a mouthpiece may comprise of a main body portion at a central part of the curve having a first end and a second end, a suction connector portion connected to the main body portion at the first end, and a cheek retractor portion connected to the main body portion at the second end.

[0006] In some embodiments, the main body portion, the suction connector portion, and the cheek retractor portion 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, conductive 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.

[0007] The main body portion may comprise of an anterior wall inside the curve and a posterior wall outside the curve. The anterior wall and the posterior wall may define an interior space, within which at least one connector connects the anterior wall to the posterior wall. At least one anterior intervening wall extends from the anterior wall partially towards the posterior wall, and at least one posterior intervening wall extends from the posterior wall partially towards the anterior wall. The anterior intervening walls and the posterior intervening walls each has alternating crests and troughs.

BRIEF DESCRIPTION OF THE FIGURES

- [0008] FIG. 1 is a top view of the dental mouthpiece;
- [0009] FIG. 2 is an isometric view of a dental mouthpiece shown in FIG. 1;
- [0010] FIG. 3 is a rear view of the dental mouthpiece shown in FIG. 1;
- [0011] FIG. 4 is a bottom view of the dental mouthpiece shown in FIG. 1;
- [0012] FIG. 5 is a coronal top cross section view of the dental mouthpiece shown in FIG. 1;
and
- [0013] FIG. 6 is a side view of the dental mouthpiece shown in FIG. 1;
- [0014] FIG. 7 is a side of the dental mouthpiece shown in FIG. 1 with an anterior wall of the mouthpiece pulled away from a posterior wall of the mouthpiece;
- [0015] FIG. 8 is a transverse cross section view of the dental mouthpiece shown in FIG. 1 at the intersection between the suction connector and the main body.
- [0016] FIG. 9 is a transverse cross section view of the dental mouthpiece shown in FIG. 1 at the intersection between the suction connector and the main body.
- [0017] FIG. 10 is a longitudinal cross section view of an embodiment of the dental mouthpiece shown in FIG. 1 with a wall connector.
- [0018] FIG. 11 is a longitudinal cross section view of an embodiment of the dental mouthpiece shown in FIG. 1 with column connectors.

DETAILED DESCRIPTION

[0019] 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, a suction connector portion, a stability bar, and a bite block. In some embodiments, any combination of the main body portion, cheek retractor portion, suction connector portion, a stability bar and bite block (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, resilient, at least translucent, and conducive to injection molding. Such a material may include thermoplastic elastomers known in the art.

[0020] FIG. 1 is a top view of the dental mouthpiece. A dental mouthpiece 100 includes a main body portion 102 having a first end 104 and a second end 106 opposite the first end 104. A longitudinal axis 103 may extend from the first end 104 to the second end 106. In the illustrated embodiment, a suction connector portion 108 may be coupled to the first end 104 and a cheek retractor portion 110 may be coupled to the second end 106, though in other examples the mouthpiece 100 may not have a suction connector portion 108 and/or a cheek retractor portion 110. A bite block 101 may also be integrated to the suction connector portion 108 near the first end 104 of the main body portion 102, though the bite block 101 may be positioned anywhere on the suction connector portion 108.

[0021] The main body portion 101 may include a neck 120 extending from the second end 106 to the cheek retractor portion 110. The neck 120 may have a width 122 that is less than a width of the main body portion 102, a width of the cheek retractor portion 110, and/or a width of the suction connector portion 108, though the width 122 may be greater than the width of the main body portion 102, the cheek retractor portion 110, and/or the suction connector portion 108 in other examples.

[0022] In the illustrated embodiment, the suction connector portion 108, the cheek retractor portion 110, the bite block 101, and the main body portion 102 are constructed as one piece,

though in other examples each of the suction connector portion 108, the cheek retractor portion 110, the bite block 101, and/or the main body 102 may be separate pieces. For example, in some embodiments, the main body portion 102, the cheek retractor portion 110, and the suction connector portion 108 (and sub-portions thereof) may be molded as one-piece, preferably by injection molding and the bite block 101 may be a separate piece attachable to the suction connector portion 108. In an exemplary embodiment, the mouthpiece 100 may be made of a material that is flexible, resilient, translucent, and conducive to injection molding. Such a material may include thermoplastic elastomer.

[0023] FIG. 2 is an isometric view of a dental mouthpiece shown in FIG. 1. As illustrated in FIG. 2, the main body portion 102 may be shaped in a curve. Because the mouthpiece 100 is made of a flexible and resilient material (e.g., thermoplastic elastomer), the mouthpiece 100 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 108 may protrude from one side of the patient's mouth, while the main body portion 102 lies against the back of the patient's mouth, and the cheek retractor portion 110 presses against the patient's cheek on the opposite side of the patient's mouth.

[0024] The cheek retractor portion 110 may be configured to press against and retract a patient's cheek away from the patient's teeth on an opposite side of the patient's mouth than the side from which the connection portion 108 extends. The flexibility of the material used to form the mouthpiece 100 allows for some bending when placed in the patient's mouth, but the resilience of the material further allows the mouthpiece 100 to apply pressure against a part of the patient's mouth when the mouthpiece 100 is released from bending. The material is resilient enough, for example, to allow the cheek retractor portion 110 to press against the inside of the patient's cheek with such pressure being sufficient to move the cheek away from the patient's teeth. The cheek retractor portion 110 is illustrated as a hammerhead distal region, which may be attached to the main body portion 102. The cheek retractor portion 110 may be solid in some examples, though may be hollow in other examples.

[0025] The main body portion 102 may comprise an anterior wall 112 on an inner part of the curve and a posterior wall 114 (also seen in FIG. 4) on an outer part of the curve. The

anterior wall 112 may face a front of the patient's mouth and the posterior wall 114 may face a back of the patient's mouth. The anterior wall 112 and the posterior wall 114 of the main body portion 102 may be configured in parallel to each other. The anterior wall 112 has a defined shape that may correspond to the defined shape of the posterior wall 114, though the anterior wall 112 may be a different shape than the posterior wall 114 in other examples. The defined shape may be wider at the first end 104 and narrower at the second end 106. In some embodiments, the shape corresponds to a shield shape though the shape may be, for example, a square, a straight line arrow, a rectangle, a star, an oval, a circle, or a shape that generally conforms to the intraoral shape of the patient's mouth. Differently-sized mouthpieces may be provided for differently-sized mouths of adults and children. Part of the shape at the first end 104 may be formed with thicker walls than the rest of the main body portion 102. Such thickening may provide additional stability at the first end 104. When positioned within the mouth of a patient, the anterior wall 112 and the posterior wall 114 are capable of blocking an airway of the patient, while the bite block 101 is positioned between the patient's teeth, the suction connector portion 108 extends from one side of the patient's mouth, and the cheek retractor portion 110 presses against the cheek on the opposite side of the patient's mouth.

[0026] The main body portion 102 may also include openings 140 located on the anterior wall 112 and/or the posterior wall 114. Such openings 140 (e.g., perforations, slit, aperture, etc.) allow for suction of air, fluids, and small debris from the patient's mouth through the openings 140 and into the interior space 126, and into the suction connector portion 108 towards a suction source. The openings 140 may be positioned on a perimeter of the shape of the anterior wall 112 and/or the posterior wall 114. In the same example, the openings 140 may be positioned on either side of the neck 120 on the anterior wall 112 and/or the posterior wall 114. In another example, the openings 140 are apertures. In the same example, the apertures are each the same size, though in other examples some or all of the apertures may be different sizes.

[0027] FIG. 3 is a rear view of the dental mouthpiece shown in FIG 1. As visible in FIG. 3, the suction connector portion 108 may be oval-shaped and also attached to the main body portion 102. The suction connector portion 108 may be formed with thicker walls than the main body portion 102 and configured to attach to a high-suction vacuum adapter and to assist in

transferring water, saliva, and debris from the interior space 126 to the external adapter for removal. The suction connector portion 108 may also include an internal stop to assist in sliding the mouthpiece onto the adapter to a desired depth.

[0028] The superior wall 116 in FIG. 3 may be used herein to refer to the side that rests against a roof of a patient's mouth when placed therein, and the inferior wall 118 may be used to refer to the side that rests against the floor of the patient's mouth. The superior wall 116 and inferior wall 118 may be formed identically, which may allow for the mouthpiece to change orientation such that the superior wall 116 may appear as the inferior wall 118 and vice versa, in the new orientation. When in use, the superior wall 116 and the inferior wall 118 of the main body portion 101 may serve to protect and separate the top of the mouth and the bottom of the mouth/tongue. In addition, the main body portion 101 may also serve to protect the back of the mouth (e.g., throat and airway) from falling debris.

[0029] FIG. 4 is a bottom view of the dental mouthpiece shown in FIG 1. The anterior wall 112 and the posterior wall 114 may be connected to each other at by at least one connector 124. In some embodiments, the suction connector portion 108 may have a cutout 142 (e.g., which may be shaped as a logo, a rectangular notch, a square notch, or a circular notch, or any shaped notch) providing extra interlocking with a corresponding protrusion (e.g., which may also be shaped as a logo, a rectangular protrusion, a square protrusion, or a circular protrusion, or any shaped protrusion) on an external high-suction vacuum adapter.

[0030] The bite block 101 may be reinforced by bite block openings 141 to create cavities in the bite block to result in a more stable bite block. In an embodiment, the bite block openings 141 may be two parallel rectangular openings that open at the bottom of the bite block. The bite block openings 141 may extend up to the suction connector portion 108 but not extending past the thickness of the suction connector portion 108.

[0031] FIG. 5 is a coronal top cross section view of the dental mouthpiece shown in FIG. 1. The main body portion 102 may include the bridge structure 136 that protrudes from the interior surface 135 of the posterior wall 114, as shown in FIG. 5 and also visible in FIGS. 7 and 8. In some embodiments, the bridge structure 136 may follow the shape of a logo (e.g., an arrowhead or shield). The bridge structure may have a gap at the tip of the arrowhead shape,

creating an open arc instead of a point of an arrow. In some embodiments, the bridge structure 136 may be centrally-located in the main body portion 110 of the mouthpiece 100. In some examples, such bridge structure 136 may protrude from the interior surface 135 in a wave shape with bridge crests 137 and bridge troughs 138. In other embodiments, the bridge structure 136 may protrude in the shape of battlements or trapezoids. The bridge crests 137 provide a plurality of contact points that are generally separate from the anterior wall 112. The bridge crests 137 near the opening 146 of the suction connector portion 108 may have a greater height than the bridge crests 137 further from the opening 146, as visible in FIGS. 7 and 8. The bridge crests 137 near the opening 146 of the suction connection portion 108 may also be longer than the bridge crests 137 further away from the suction connection portion 108 as shown later in FIG. 8. The bridge troughs 138 may be substantially flush or extend above the interior surface 135. The bridge crests 137 contact the anterior wall 112 during suction to keep the anterior wall 112 spaced away from the posterior wall 114 during suction, thereby preventing collapse of the anterior wall 112 or the posterior wall 114 into the interior space 126 so that debris and/or water can be evacuated through the interior space 126. Meanwhile, the bridge troughs 138 provide gaps that allow for suction of air, fluids, and small debris through the bridge structure 136. In other examples, the bridge structure 136 may be smooth, may include sharp crests and sharp troughs, circular crests and circular troughs, square crests and square troughs, or shape or combination of shapes of crests and troughs.

[0032] The main body portion 102 may further include a stability bar 143, shown in FIG. 5 and also visible in FIG. 7, that extends from approximately the center of the main body portion 102 toward the cheek retractor portion 110. Such stability bar 143 may protrude from the interior surface 135 of the posterior wall 114 along the longitudinal axis 103. In an embodiment, the stability bar 143 begins from the open arc of the bridge structure 136 and continue along the longitudinal axis 103 towards the second end 106 past the neck 120 and ends before reaching the cheek retractor portion 110. The stability bar 143 may protrude from the interior surface 135 of the posterior wall 114 towards the interior surface 113 of the anterior wall 112. The stability bar 143 may be of any height ranging from the height of the interior space 126 or any height less than the interior space 126. In an embodiment, the stability bar 143 may have attached

connectors 124 at specific locations that may attach the anterior wall 112 to the posterior wall 114. The connectors 124 on the stability bar 143 may assist with retraction, stability, support and curvature of the mouthpiece 100 during suction. In an exemplary embodiment, there may be multiple connectors 124 aligned with the stability bar 143 the stability bar 143, though the stability bar 143 may not be aligned with the at least one connector 124 in other examples.

[0033] FIG. 6 is a side view of the dental mouthpiece shown in FIG. 1. FIG. 6 illustrates the view of the inferior side that rests against the floor of the patient's mouth. The anterior wall 112 and the posterior wall 114 are spaced from each other and define the interior space 126. Other than the at least one connector 124, a stability bar 143, and a bridge structure 136, the interior space 126 is generally open and unobstructed, thereby allowing for suction to flow throughout the interior space 126. The interior space 126 between the anterior wall 112 and the posterior wall 114 generally follows the same defined shape of the anterior wall 112 and the posterior wall 114. In one example, the interior space 126 extends through the neck 120, though in other examples the interior space 126 may not extend through the neck 120. In yet other examples, the interior space 126 extends through the neck 120 and into the cheek retractor portion 120.

[0034] At least one anterior intervening wall 127 may extend from at least one edge 128 of the anterior wall 112 partially towards the posterior wall 114 and may have a thickness that extends from the at least one edge 128 to a mid-point between the anterior wall 112 and the posterior wall 114. The span of such anterior intervening wall 127 therefore may not extend the entire distance between the anterior wall 112 and the posterior wall 114. The thickness of such anterior intervening wall 127 may increase from the cheek retractor portion 110, through the neck 120, and to the first end 104. Such increasing depth may provide for increased rigidity at the first end 104. Such anterior intervening wall 127 may further be ridged in some embodiments, or have a smooth edge in other embodiments. In one example, the anterior intervening wall 127 includes an alternating crest 130 and trough 132. In the illustrated embodiment, the crests 130 are a flat surface and the troughs 132 are a cylindrical cutout surface, though the crests 130 and the troughs 132 may be any shape. In some examples, the crests 130 and the troughs 132 extend the entire depth of the anterior intervening wall 127, though in other examples the crests 130 and/or the troughs 132 may extend partially along the

anterior intervening wall 127. The crests 130 and the troughs 132 may provide further retraction, stability, support and curvature to the mouthpiece 100.

[0035] The posterior wall 114 may have a corresponding at least one posterior intervening wall 134 that extends from at least one edge 133 of the posterior wall 114 and partially extends towards the anterior wall 112. The posterior intervening wall 134 may likewise exhibit ridges that are the same, a mirror image, or different from the anterior intervening wall 127. In one example, the ridges of the anterior intervening wall 127 may be aligned with the ridges of the posterior intervening wall 134, as shown in FIG. 6. In combination, the anterior intervening wall 127 and the posterior intervening wall 134 and their respective aligned ridges may form an open mesh between the anterior wall 112 and the posterior wall 114. Such open mesh may follow the edges 128, 133 of each of the anterior wall 112 and the posterior wall 114 from the first end 104 to the second end 106. The open mesh between the anterior intervening wall 127 and the posterior intervening wall 134 allows for suction of air, fluids, and small debris from patient's mouth, through the mesh into the interior space 126 and into the suction connector portion 108 towards a suction source.

[0036] The anterior intervening wall 127 may join with the posterior intervening wall 134 at the superior wall 116 and the inferior wall 118 at near the suction connector portion 108 of the main body at the first end 104. The anterior intervening wall 127 may also join with the posterior intervening wall 134 at the superior wall 116 and the inferior wall 118 near the cheek retractor portion 110 at the second end 106. In some embodiments, the anterior intervening wall 127 may join with the posterior intervening wall 134 at the cheek retractor portion 110.

[0037] FIG. 7 is a side of the dental mouthpiece shown in FIG. 1 with an anterior wall of the mouthpiece pulled away from a posterior wall of the mouthpiece. The at least one connector 124 may span the distance between the anterior wall 112 and the posterior wall 114 within the interior space 126. In other words, the connector 124 may be attached to an interior surface 135 of the posterior wall 114 and to an interior surface 113 of the anterior wall 112. The at least one connector 124 may provide structural rigidity to the mouthpiece 100 and may be a pillar, column, wall, or the like. In the illustrated example, the at least one connector 124 includes three connectors, each in the shape of a pillar and linearly spaced from each other.

[0038] FIG. 8 is a transverse cross section view of the dental mouthpiece shown in FIG. 1. The bridge crests 137 near the opening 146 of the suction connector portion 108 may have a greater height than the bridge crests 137 further from the opening 146. The bridge crests 137 near the opening 146 of the suction connection portion 108 may also be longer than the bridge crests 137 further away from the suction connection portion 108.

[0039] FIG. 9 is a transverse cross section view of the dental mouthpiece in FIG. 1. FIG 9 illustrates where the suction connector attaches to the main body. As visible in FIG. 9, the suction connector portion 108 may be oval-shaped and also attached to the main body portion 102 in a seamless transition until the main body reaches the bridge structure 136, where the bridge crests 137 and the bridge troughs 138 may partially block the opening of the main body portion 102 near the suction connector portion 108. The bite block 101 is attached on the outside of the suction connector portion 108 such a manner that the bite block does not interrupt the opening of the suction connector portion 108.

[0040] The suction connector portion 108 may include an opening 146 (also shown in FIG. 5), that opens into an interior space 126 of the main body portion 102 to allow for fluid communication between the interior space 126 and the suction connector portion 108. At least one suction connector portion wall 144 may extend from the anterior wall 112 to the posterior wall 114 near the opening 146 of the suction connector portion 108 to prevent collapse of the anterior wall 112 and the posterior wall 114 during suctioning. The at least one suction connector portion wall 144 includes a pair of walls positioned on either side of the opening 146 of the suction connector portion 108.

[0041] The bite block 101 may include bite block crests 147 and bite block troughs 148 on either sides of the bite block to create greater traction and support for the bite block. In an embodiment, the bite block crests 147 and bite block troughs 148 may create jagged shape or wave shape on either sides of the bite block, although the bite block crests 147 and bite block troughs 148 may be in any shape.

[0042] FIG. 10 is a cross section view of an embodiment of the dental mouthpiece shown in FIG. 1 with a wall connector. In this embodiment, the connector 124 connects the anterior wall 112 with the posterior wall 114 at the longitudinal axis 103 as a solid wall. The connector 124

extends from the neck 120 at the second end 106 some distance away from the cheek retractor portion 110 towards the first end 104 along the longitudinal axis 103 and stops near the opening of the bridge structure 136 around the mid-point of the main body portion 102. In other embodiment, the connector 124 may extend along the longitudinal axis 103 and stop anywhere within the interior space 126 of the main body portion.

[0043] FIG. 11 is a longitudinal cross section view of an embodiment of the dental mouthpiece shown in FIG. 1 with column connectors. In this embodiment, the connector 124 connects the anterior wall 112 with the posterior wall 114 at the longitudinal axis 103 as three evenly spaced cylindrical pillars in line with the stability bar 143. A first connector is positioned in the main body portion 102, a second connector is positioned near the neck 120, and a third connector is spaced near the cheek retractor portion 110. The linear spacing of the three connectors may provide additional rigidity to the neck 120, while maintaining a narrow width 122 of the neck 120. In other examples, such connectors 124 may be located in the area where a positioned mouthpiece 100 begins to wrap from one side of the mouth, to the back of the mouth, then to the other side of the mouth, thereby assisting in shaping the mouthpiece 100 to the general intraoral shape of a patient's mouth. In other examples, the at least one connector 124 may include one connector, two connectors, or more than two connectors and each connector may be positioned anywhere on the mouthpiece 100. In one example, the at least one connector 124 is a rib that extends from the main body portion 102, through the neck 120, and to the cheek retractor portion 110.

[0044] 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.

[0045] 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.

CLAIMS

WHAT IS CLAIMED:

1. A dental mouthpiece formed in a curve, the dental mouthpiece comprising:

a main body portion at a central part of the curve having a first end and a second end, the main body portion having an anterior wall inside the curve and a posterior wall outside the curve, the anterior wall and the posterior wall defining an interior space, at least one connector connecting the anterior wall to the posterior wall, at least one anterior intervening wall extending from the anterior wall partially towards the posterior wall, and at least one posterior intervening wall extending from the posterior wall partially towards the anterior wall, the at least one anterior intervening wall and the at least one posterior intervening wall each having alternating crests and troughs;

a suction connector portion connected to the first end, the connector portion connecting the interior space to a vacuum suction source; and

a cheek retractor portion connected to the second end.

2. The mouthpiece of claim 1, wherein the at least one connector is a cylindrical shaped pillar.

3. The mouthpiece of claim 1, wherein the at least one connector is a wall spanning longitudinally in the main body portion in the interior space.

4. The mouthpiece of claim 1, further comprising a bridge structure in the interior space protruding from the posterior wall, wherein the protrusions are battlement-shaped, with spaced crests.

5. The mouthpiece of claim 4, wherein the protrusions near the suction connector is in greater height and length.

6. The mouthpiece of claim 4, wherein spaces between the crests are troughs of the battlement-shape.
7. The mouthpiece of claim 1, wherein the alternating crests and troughs on the anterior intervening wall and the posterior intervening wall are semi-circle shaped.
8. The mouthpiece of claim 1, wherein the anterior intervening wall and the posterior intervening wall have varying heights to maintain integrity of the main body portion.
9. The mouthpiece of claim 1, wherein the troughs of the anterior intervening wall and the posterior intervening wall decrease in size as the troughs approach the cheek retractor portion.
10. The mouthpiece of claim 1, wherein the anterior intervening wall and the posterior intervening wall meet at a point where the suction connector meets the main body.
11. The mouthpiece of claim 1, wherein the anterior intervening wall and the posterior intervening wall meet at a point where the main body meets the cheek retractor portion.
12. The mouthpiece of claim 1, further comprising a bite block integrated to the suction connector portion, wherein the bite block provide additional crush-resistance and decreased compressibility during biting by a patient.
13. The mouthpiece of claim 1, wherein the main body portion, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece.
14. The mouthpiece of claim 1, wherein a material that forms the main body, the suction connector portion, and the cheek retractor portion is a flexible, translucent, high heat-resistant, autoclavable silicon-based material.

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

16. The mouthpiece of claim 15, wherein the at least one connector lies evenly spaced along the stability bar.

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

18. The mouthpiece of claim 1, where in the suction connector portion connects to a vacuum source, wherein activation of the vacuum source provides suction of fluids from the interior space of the main body.

19. The mouthpiece of claim 18, wherein the activation of the vacuum source draws fluids from an exterior of the main body through the crests and troughs of the anterior intervening wall and the posterior intervening wall, into the interior space of the main body.

20. The mouthpiece of claim 1, wherein the cheek retractor portion includes a surface that applies pressure based on resilience of the cheek retractor portion.

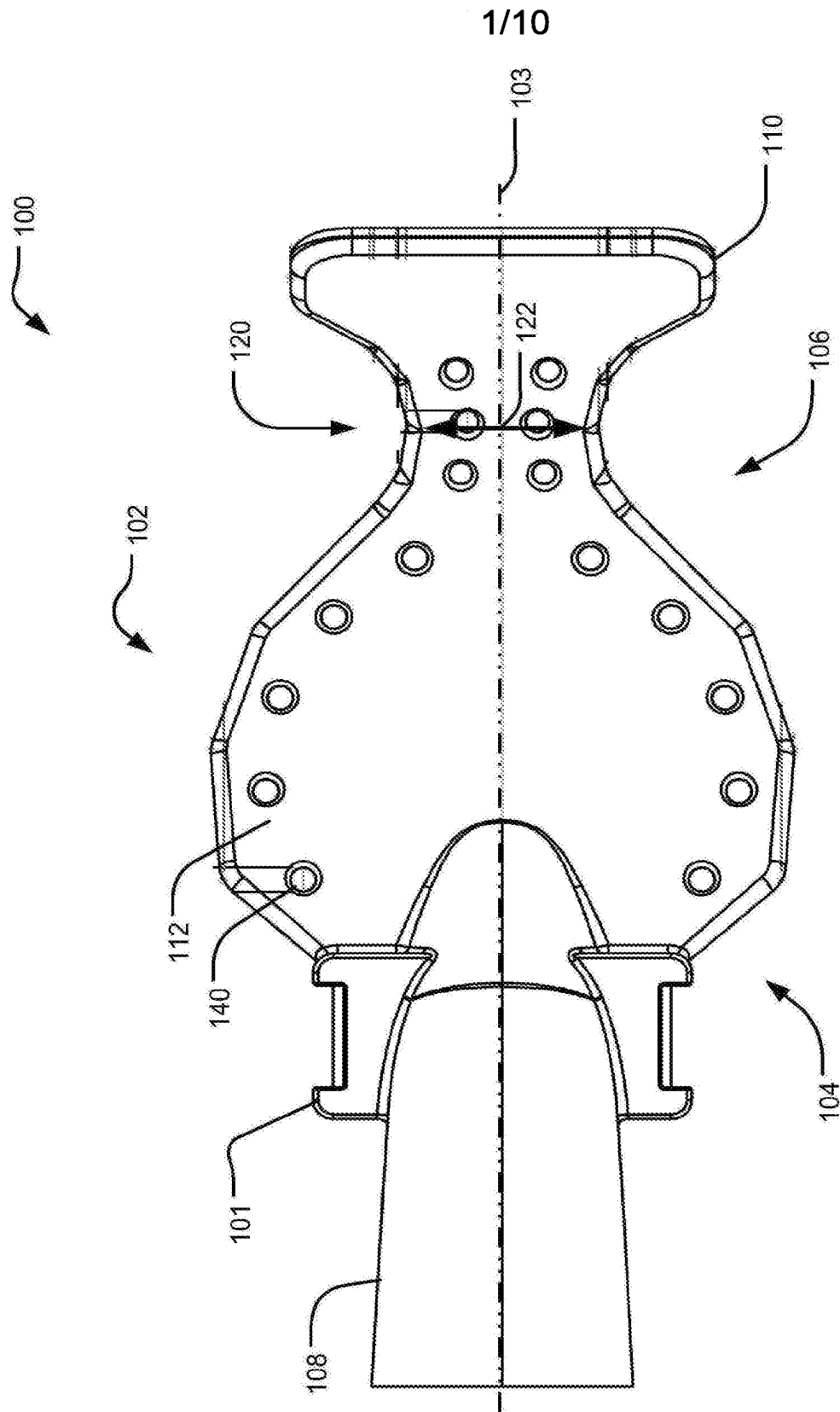
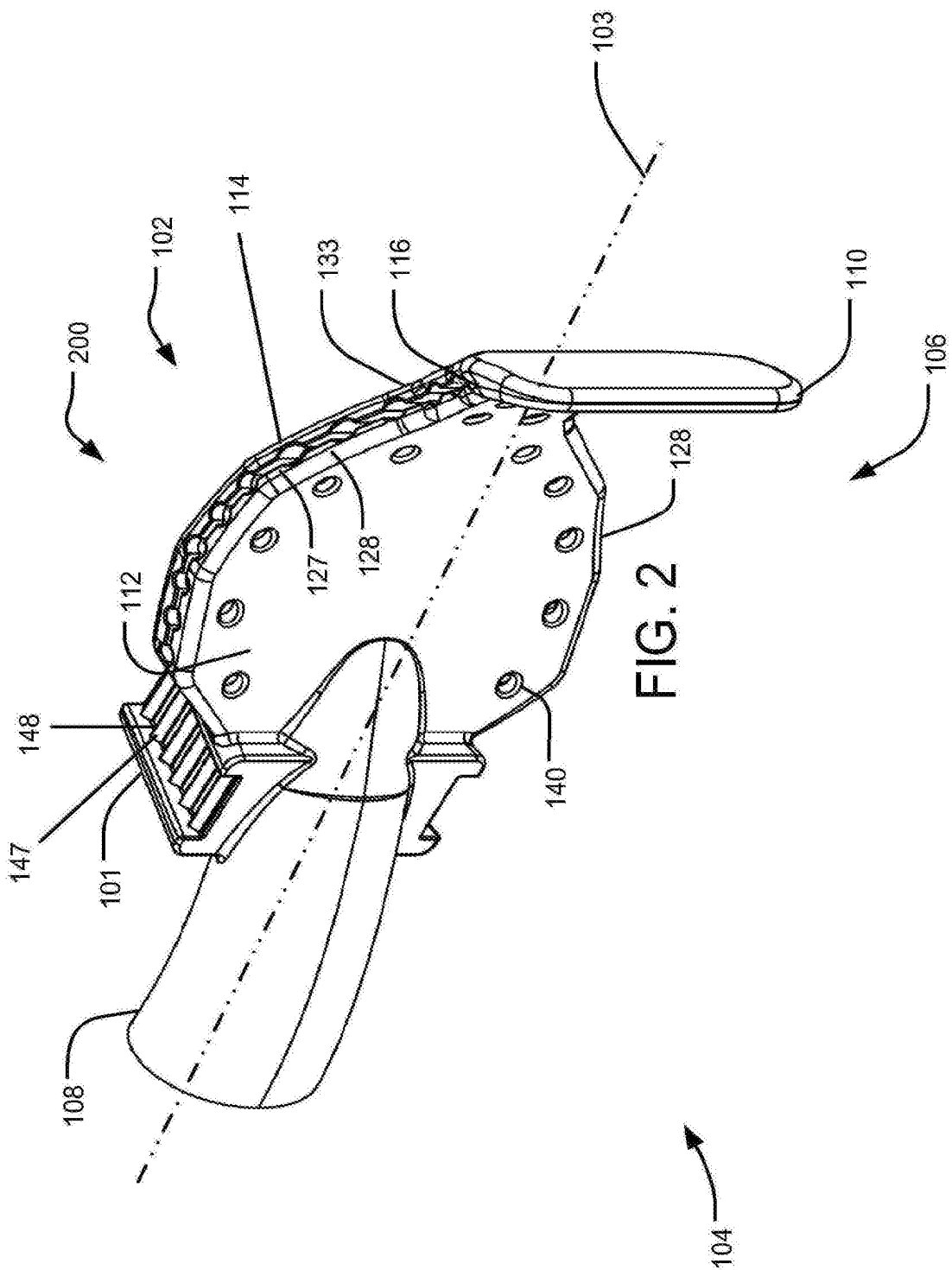


FIG. 1



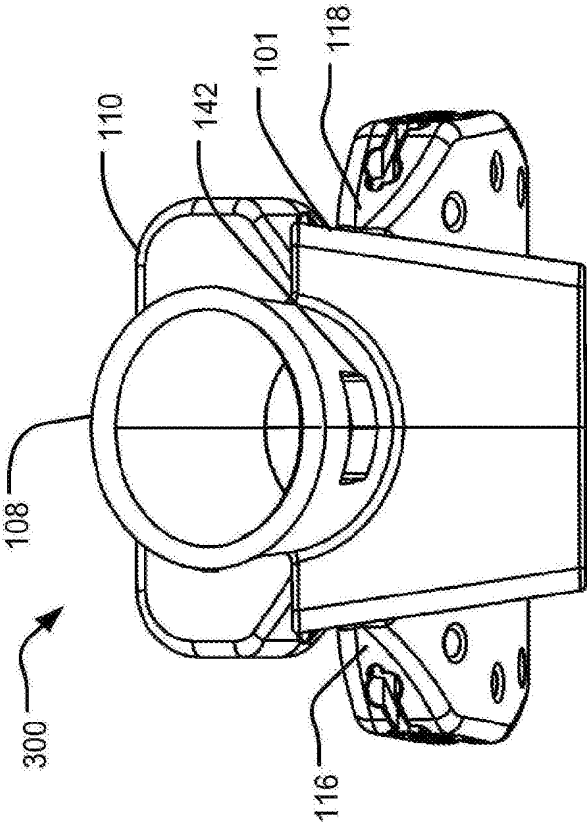


FIG. 3

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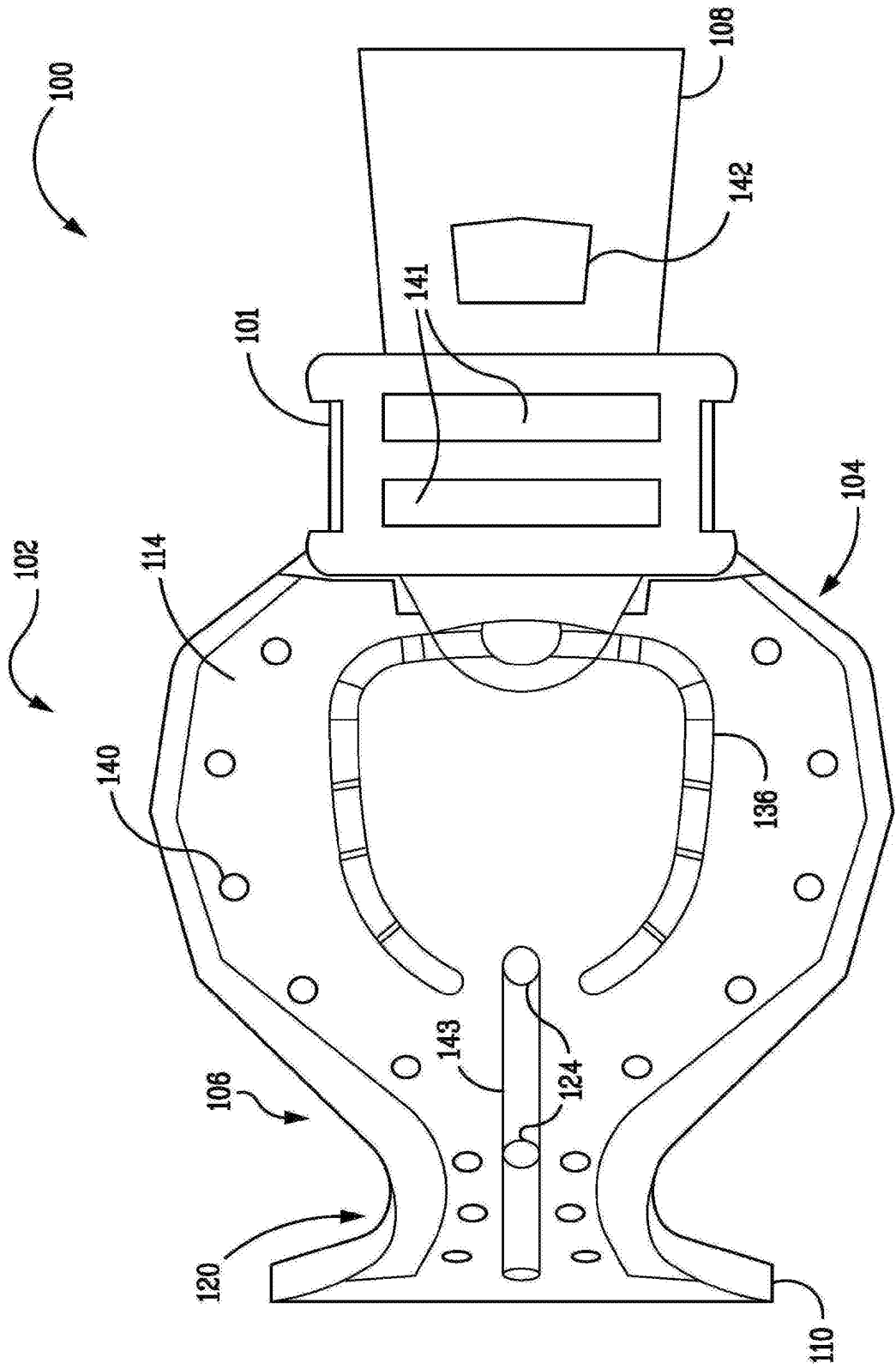
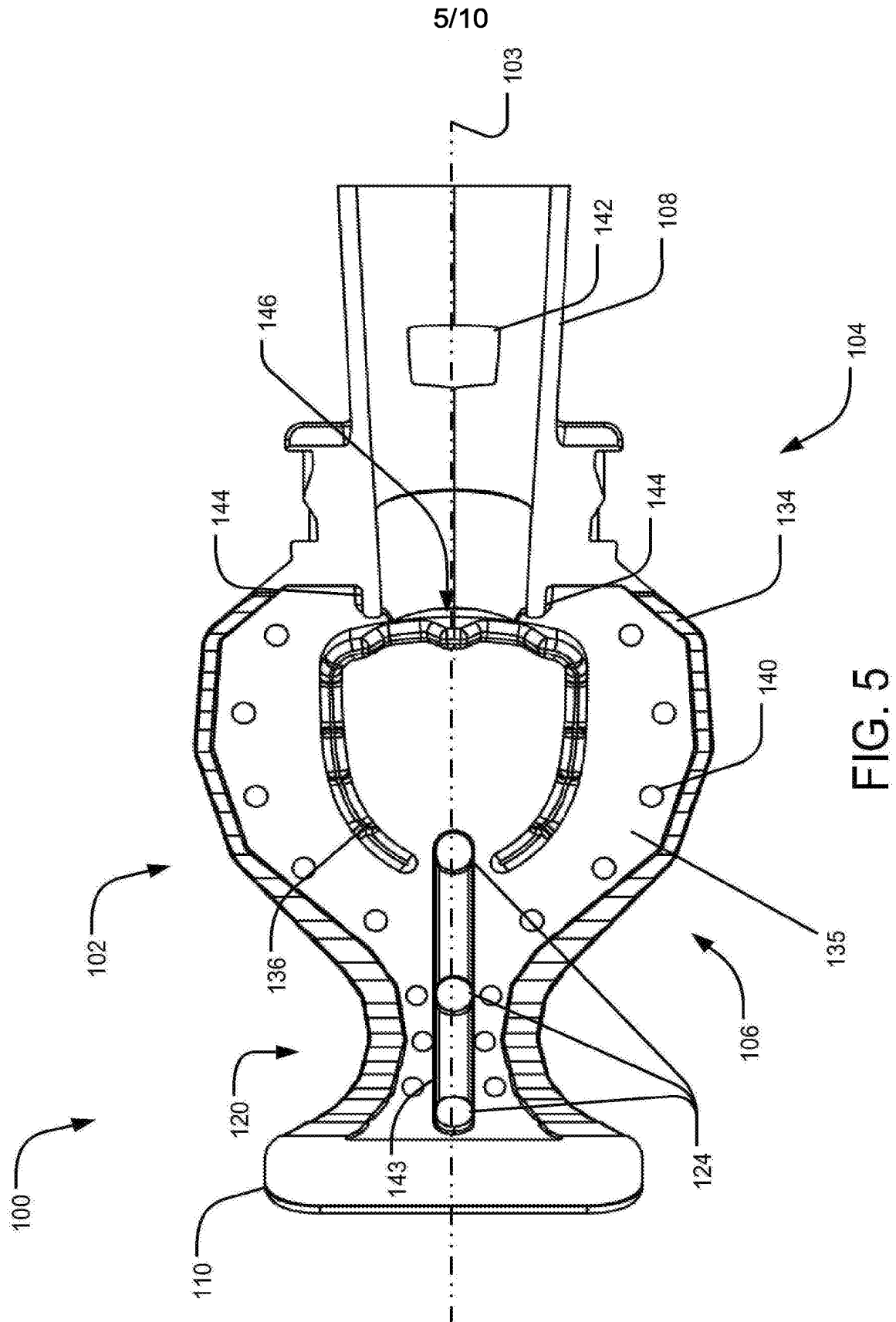


FIG. 4



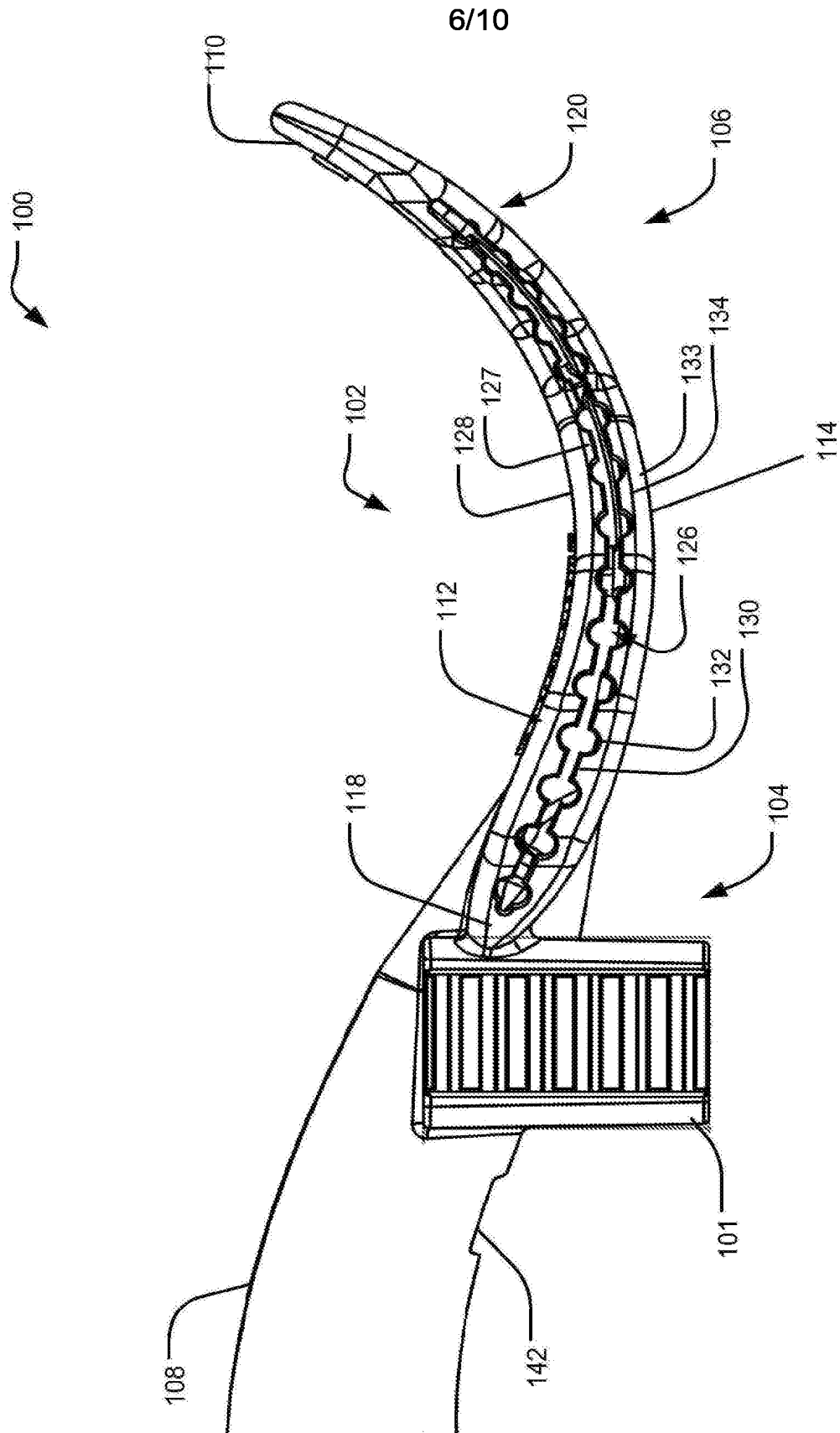


FIG. 6

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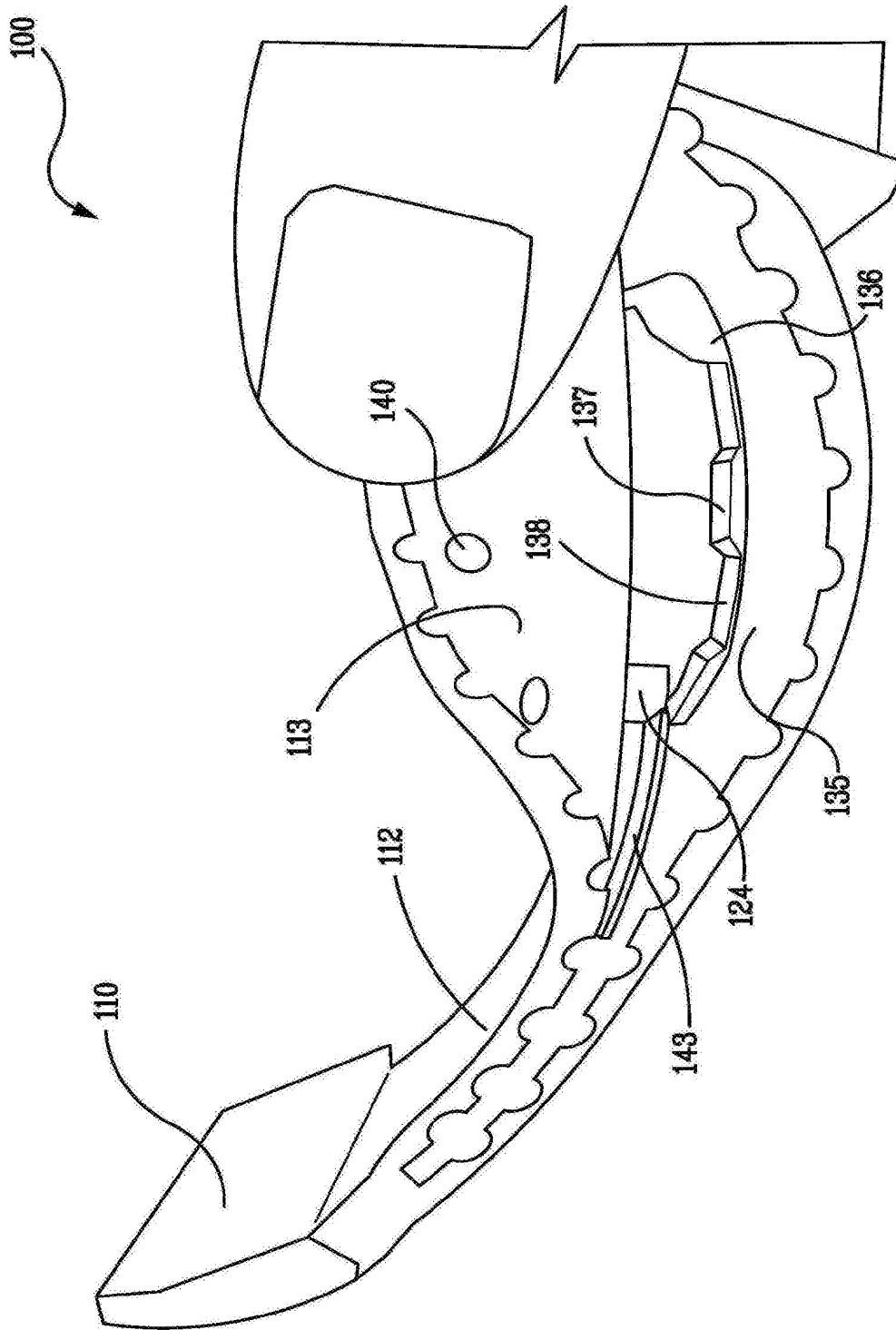


FIG. 7

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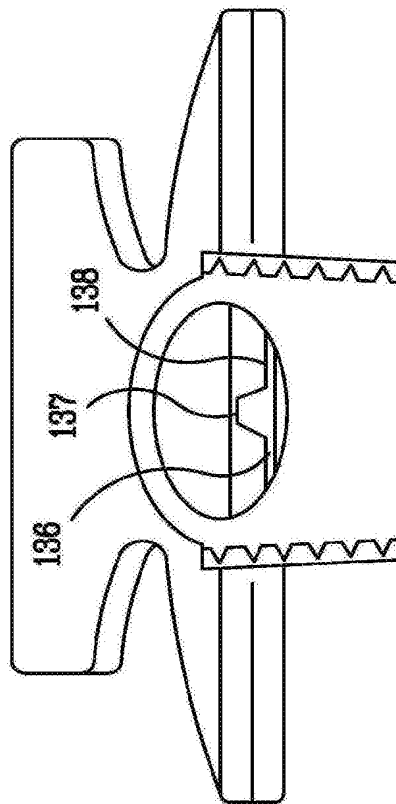


FIG. 8

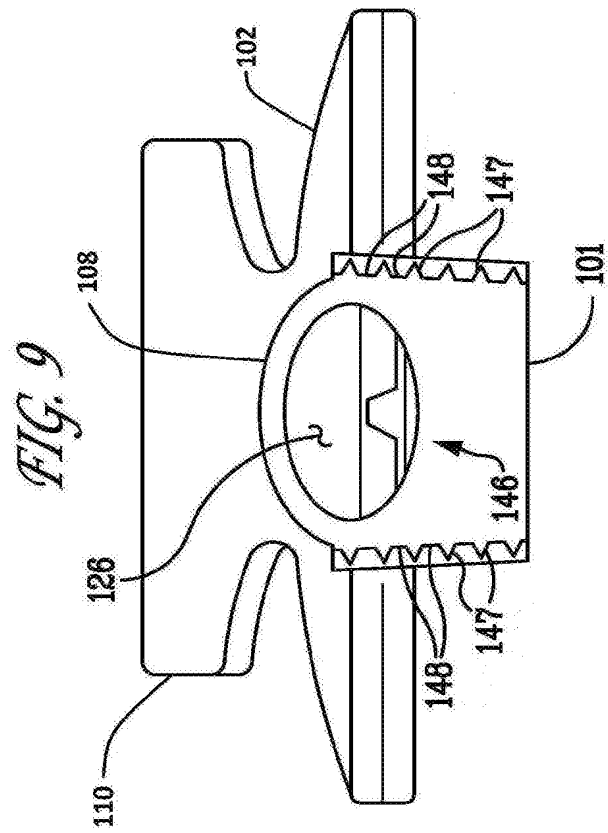


FIG. 9

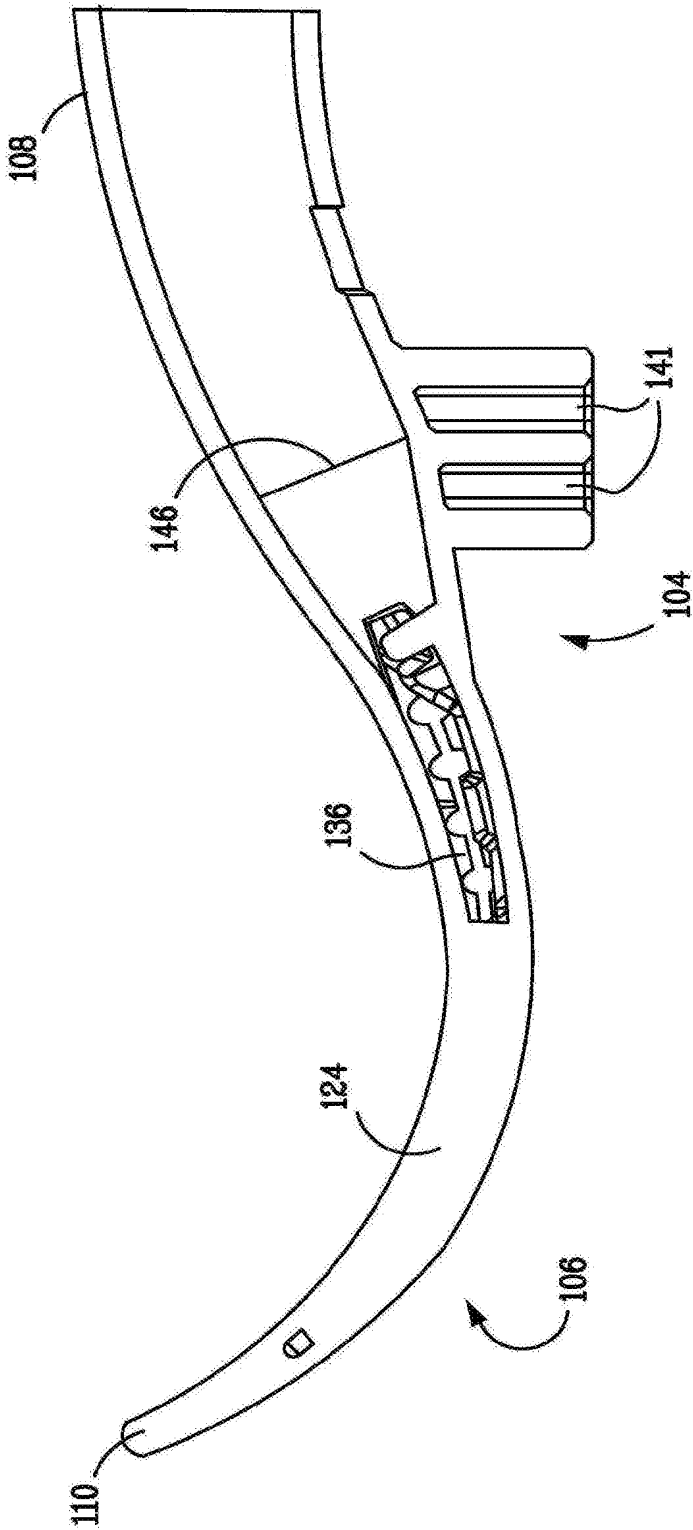


FIG. 10

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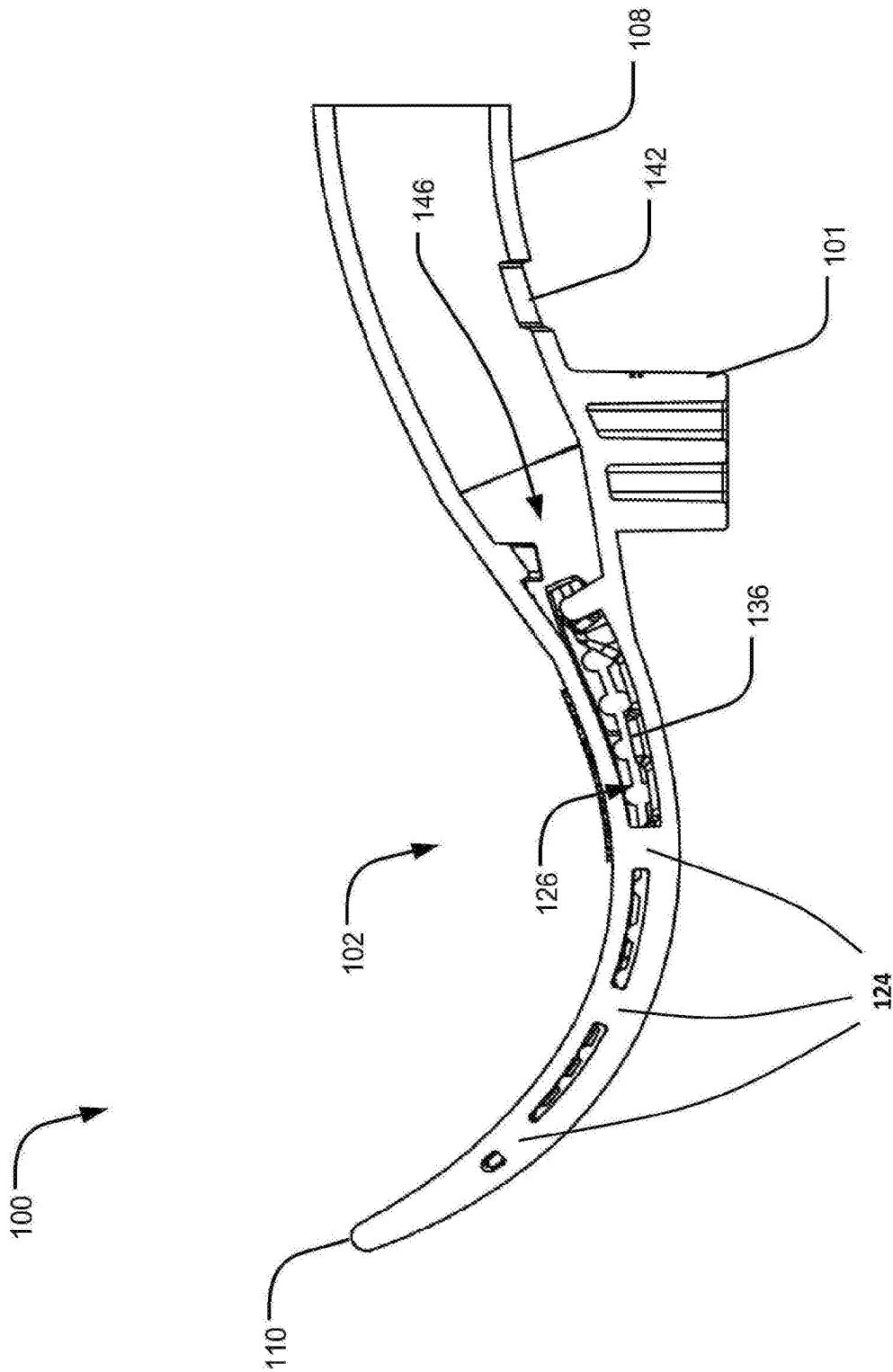


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/32228

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61B 1/24, A61C 17/00, A61C 17/06, A61C 17/10, A61C 5/14 (2020.01)

CPC - A61B 1/24, A61C 17/00, A61C 17/06, A61C 17/10, A61C 5/14, A61C 5/90

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2017/0156832 A1 (Reyes) 8 June 2017 (08.06.2017), entire document	1-20
Y	US 2014/0212838 A1 (Incept, Inc.) 31 July 2014 (31.07.2014), entire document	1-20
A	US 2015/0335409 A1 (Innerlite, Inc.) 26 November 2015 (26.11.2015), entire document	1-20
A	US 2009/0274991 A1 (Black et al.) 5 November 2009 (05.11.2009), entire document	1-20
A	US 2001/0008752 A1 (Hirsch et al.) 19 July 2001 (19.07.2001), entire document	1-20

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 JULY 2020

Date of mailing of the international search report

12 AUG 2020

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Lee Young

Telephone No. PCT Helpdesk: 571-272-4300

Form PCT/ISA/210 (second sheet) (July 2019)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 3772

Examiner: Not Yet Assigned

Serial No.: 16/870,745

Filed: May 8, 2020

In re Application of: Thien Nguyen

Confirmation No.: 7491

Customer No.: 138718

Title: DENTAL MOUTHPIECE

**List of Co-Pending Patents or Patent Applications That May Be Directed Towards Similar
Subject Matter**

Examiner's Initials	Application Number	Docket Number	First- Named Inventor	Title	Filing Date
	29/782,645	INCEP- 006D	Thien Nguyen	MOUTHPIECE	May 7, 2021
	29/780,960	INCEP- 007D	Thien Nguyen	MOUTHPIECE MOUTH PROP	April 27, 2021
	29/782,638	INCEP- 008D	Thien Nguyen	MOUTHPIECE	May 7, 2021
	29/782,644	INCEP- 009D	Thien Nguyen	MOUTHPIECE	May 7, 2021
	29/782,643	INCEP- 010D	Thien Nguyen	MOUTHPIECE	May 7, 2021
Examiner's Signature:					Date:

Respectfully submitted,
POL SINELLI LLP

Dated: May 12, 2021

By: _____/Ruby L. Chung/_____
Ruby L. Chung (Reg. No. 76,809)
Polsinelli LLP
Three Embarcadero Center, Suite 2400
San Francisco, CA 94111
415-248-2100 (Main)
patentdocketing@polsinelli.com

Electronic Acknowledgement Receipt

EFS ID:	42695519
Application Number:	16870745
International Application Number:	
Confirmation Number:	7491
Title of Invention:	DENTAL MOUTHPIECE
First Named Inventor/Applicant Name:	Thien Nguyen
Customer Number:	138718
Filer:	Ruby Lim Chung/Lea Fong
Filer Authorized By:	Ruby Lim Chung
Attorney Docket Number:	INCEP-005
Receipt Date:	12-MAY-2021
Filing Date:	08-MAY-2020
Time Stamp:	19:16:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	INCEP-005_IDS_Statement_5-1 2-21.pdf	96031 45a3ec1fef29361394295c77bds87746e380181b	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	INCEP-005_IDS_1449_5-12-21. pdf	224647 a68daf4777e97425db7b6b76d5254eb4a03b33cc	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO_2020231864.pdf	1224937 94e93fe92cca10548ae9e2f8b8607c11d618a5ef	no	29
Warnings:					
Information:					
4	Transmittal Letter	INCEP-005_List_of_Copending _Apps_5-12-21.pdf	100419 3f6743f3b33dbfa64817ea4f1338d1746887d230	no	1
Warnings:					
Information:					
Total Files Size (in bytes):			1646034		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 3772

Examiner: Not Yet Assigned

Serial No.: 16/870,745

Filed: May 8, 2020

In re Application of: Thien Nguyen

Confirmation No.: 7491

Customer No.: 138718

Title: DENTAL MOUTHPIECE

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Under 37 C.F.R. § 1.56 and 1.97-1.98

Examiner:

Pursuant to the provisions of 37 C.F.R. §§ 1.56 and 1.97-98 of the Rules of Practice in Patent Cases, enclosed herewith is form PTO-SB-08, listing several references. The Examiner is requested to make these references of official record in the application.

The references cited may be material to examination of the application and are submitted in compliance with the Applicant's duty of disclosure as defined by 37 C.F.R. § 1.56.

No representation is made or intended as to the completeness of this list, nor is the inclusion of any reference an admission that it is prior art or pertinent to this application.

Respectfully submitted,
POLSINELLI LLP

Dated: May 12, 2021

By: _____/Ruby L. Chung/_____
Ruby L. Chung (Reg. No. 76,809)
Polsinelli LLP
Three Embarcadero Center, Suite 2400
San Francisco, CA 94111
415-248-2100 (Main)
patentdocketing@polsinelli.com

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16870745
	Filing Date		2020-05-08
	First Named Inventor	NGUYEN; Thien	
	Art Unit	3772	
	Examiner Name	TO, HOLLY T	
	Attorney Docket Number	084892-INCEP-005	

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	D364456		1995-11-21	SOLNIT; Albert et al.	
	2	D663831		2012-07-17	SIDHU; Jessy S. et al.	
	3	3453735		1969-07-08	BURT; Richard E. et al.	
	4	3516160		1970-06-23	LEFFLER; Dennis F. et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20040033468		2004-02-19	FISCHER; Dan E. et al.	
	2	20140349249		2014-11-27	REYES; Hari Mark	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS						
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
Attorney Docket Number	084892-INCEP-005

Examiner Initial*	Cite No	Foreign Document Number	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	None						☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Docket No. INCEP-001COA U.S. Application 14/228, 046; Non-Final Office Action mailed 10-6-21.	☐
	2	Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Office Action mailed 6/25/21.	☐
	3	Docket No. INCEP-001COD U.S. Application 14/228, 057; Final Office Action mailed 11-12-21.	☐
	4	Docket No. INCEP-006D U.S. Application 29/782,645; Non-Final Office Action mailed 10-4-21.	☐
	5	Docket No. INCEP-008D U.S. Application 29/782,638; Non-Final Office Action mailed 10-4-21.	☐
	6	Docket No. INCEP-009D U.S. Application 29/782,644; Non-Final Office Action mailed 10-4-21.	☐
	7	Docket No. INCEP-010D U.S. Application 29/782,643; Non-Final Office Action mailed 10-4-21.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
Attorney Docket Number	084892-INCEP-005

8	Dryshield brochure. Dryshield.com. Publish date: May 2019. Retrieval date: 15 September 2021. Retrieved from internet: https:// dryshield.com/ds/Brochure_May2019.pdf (Year: 2019).	☐
9	"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: 27 October 2014.Retrieval date: 15 September 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).	☐
10	"Dryshield (single-use) vs Zryis/Isolite (single-use) mouthpieces" posted by Mark Frias, RDH. Youtube. Posting date: 18 January 2020. Retrieval date: 15 September 2021. Retrieved from internet: https://www.youtube.com/watch?v=uKX9XahO6EY (Year: 2020).	☐
11	"Dryshield Tutorial - Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: 15 April2015. Retrieval date: 15 September 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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***EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
Attorney Docket Number	084892-INCEP-005

CERTIFICATION STATEMENT

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

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

OR

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

☐ See attached certification statement.

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

☐ A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Ruby L. Chung/	Date (YYYY-MM-DD)	2021-11-24
Name/Print	Ruby L. Chung	Registration Number	76809

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

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

Electronic Acknowledgement Receipt

EFS ID:	44358788
Application Number:	16870745
International Application Number:	
Confirmation Number:	7491
Title of Invention:	DENTAL MOUTHPIECE
First Named Inventor/Applicant Name:	Thien Nguyen
Customer Number:	138718
Filer:	Ruby Lim Chung/Lea Fong
Filer Authorized By:	Ruby Lim Chung
Attorney Docket Number:	INCEP-005
Receipt Date:	24-NOV-2021
Filing Date:	08-MAY-2020
Time Stamp:	12:58:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	INCEP-005_IDS_Statement_11-24-21.pdf	95482	no	2
			a9e2265ebe040d275d23ccfd993a42ca75477b5b		

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	084892- INCEP-005_0_IDS_2021112318 3907.pdf	41717	no	5
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Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	OA_US14228054_25Jun2021_1 1pgs_EFS.pdf	1795566	no	11
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Warnings:					
Information:					
4	Non Patent Literature	DryShield_Brochure.pdf	1012487	no	4
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Warnings:					
Information:					
5	Non Patent Literature	DryShield_single- use_vs_Zyris_Isolite_single- use.pdf	208677	no	1
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Warnings:					
Information:					
6	Non Patent Literature	Dryshield_Presentation_Learn- all_about_Dryshield.pdf	189543	no	1
			0c9bdae9f17fc5017d7b7fed93c89b5659d0ff59		
Warnings:					
Information:					
7	Non Patent Literature	DryShield_Tutorial_Maximize- Your_Dryshields_Experience. pdf	209897	no	1
			4f765735d56cd2ebf102f2a4302dbef76b4548af		
Warnings:					
Information:					
8	Non Patent Literature	INCEP-001COA_Non- Final_OA_10-6-21.pdf	526170	no	15
			c2406b4263281a5ff8f7cd864ed793541231a2f9		
Warnings:					
Information:					
39 of 281					

9	Non Patent Literature	INCEP-001COD_Final_OA_11-12-21.pdf	579142	no	17
			7e941dd719959a82e0d1a131cc95335440bc936c		
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Information:					
10	Non Patent Literature	INCEP-006D_Non-Final_OA_10-4-21.pdf	322509	no	8
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Information:					
11	Non Patent Literature	INCEP-008D_Non-Final_OA_10-4-21.pdf	345010	no	8
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Warnings:					
Information:					
12	Non Patent Literature	INCEP-009D_Non-Final_OA_10-4-21.pdf	560115	no	9
			85a10db6f46ac9cdf5c02cb98ee26951cc94362c		
Warnings:					
Information:					
13	Non Patent Literature	INCEP-010_Non-Final_OA_10-4-21.pdf	520616	no	8
			fd068d9e31c18699763c4c19f4c5558b6e90298a		
Warnings:					
Information:					
Total Files Size (in bytes):			6406931		

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

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 3772

Examiner: Holly T. To

Serial No.: 16/870,745

Filed: May 8, 2020

In re Application of: Thien Nguyen

Confirmation No.: 7491

Customer No.: 138718

Title: DENTAL MOUTHPIECE

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Under 37 C.F.R. § 1.56 and 1.97-1.98

Examiner:

Pursuant to the provisions of 37 C.F.R. §§ 1.56 and 1.97-98 of the Rules of Practice in Patent Cases, enclosed herewith is form PTO-SB-08, listing several references. The Examiner is requested to make these references of official record in the application.

The references cited may be material to examination of the application and are submitted in compliance with the Applicant's duty of disclosure as defined by 37 C.F.R. § 1.56.

No representation is made or intended as to the completeness of this list, nor is the inclusion of any reference an admission that it is prior art or pertinent to this application.

Respectfully submitted,
POLSINELLI LLP

Dated: November 24, 2021

By: _____/Ruby L. Chung/_____
Ruby L. Chung (Reg. No. 76,809)
Polsinelli LLP
Three Embarcadero Center, Suite 2400
San Francisco, CA 94111
415-248-2100 (Main)
patentdocketing@polsinelli.com



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/870,745	05/08/2020	Thien Nguyen	INCEP-005	7491
138718	7590	12/03/2021	EXAMINER	
Polsinelli LLP			TO, HOLLY T	
3 Embarcadero Center			ART UNIT	
Suite 2400			PAPER NUMBER	
San Francisco, CA 94111			3772	
			NOTIFICATION DATE	DELIVERY MODE
			12/03/2021	ELECTRONIC

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

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

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

sfpatent@polsinelli.com
uspt@polsinelli.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Objections

Claim **19** is objected to because of the following informalities:

- Claim 19 recites “the vacuum source” in line 1. For consistency purposes, it should be revised to “the vacuum suction source”.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4, and 18 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph.

Claim 4 recites “the protrusions are battlement-shaped” in line 2. “The protrusion” lacks antecedent basis and as such claim 4 is rejected. For examination purposes, it will be interpreted as “protrusions of the bridge structure are battlement-shaped”.

Claim 18 recites “a vacuum source” in line 1-2. It is unclear as to whether the “vacuum source” is the same as the “vacuum suction source” already required by claim 1, line 11 or if it is a different vacuum source. For examination purposes, it will be interpreted as the same vacuum suction source claimed in claim 1.

Claim Rejections - 35 USC § 102

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

A person shall be entitled to a patent unless –

(a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

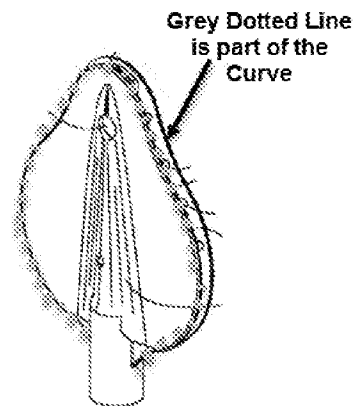
Claim(s) 1-3, 8-11, 13, 15-16, and 18-19 is/are rejected under 35 U.S.C. 102(a)(2) as being anticipated by Reyes (US Publication No. 20170156832 A1).

Regarding Claim 1, Reyes discloses a dental mouthpiece (Abstract) formed in a curve (See Annotated Figure A of Fig. 3 where the mouthpiece is curved at the side and is curved with part 20), the dental mouthpiece comprising:

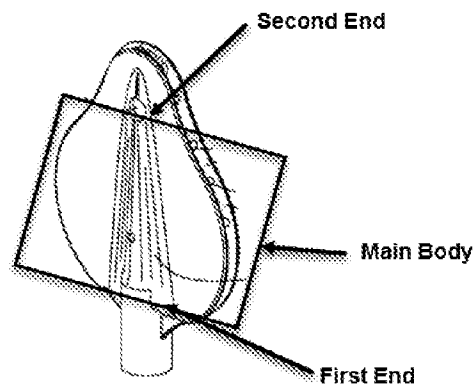
- a main body portion at a central part of the curve having a first end and a second end (See Annotated Figure B of Fig. 3), the main body portion having an anterior wall inside the curve (See Annotated Figure C of Fig. 5 wherein the curve formed by label 20 wherein the anterior wall is inside the curve) and a posterior wall outside the curve (See Annotated Figure C of Fig. 5 wherein the posterior curve is outside from the curve), the anterior wall and the posterior wall defining an interior space (Fig. 3), at least one connector (Fig. 1, labels 36 and 38) connecting the anterior wall to the posterior wall (Par. [0032]), at least one anterior intervening wall extending from the anterior wall partially towards the posterior wall (Fig. 4, label 8; Par. [0024] - [0025]), and at least one posterior intervening wall extending from the posterior wall partially towards the anterior wall (Fig. 4, label 10; Par. [0024] - [0025]), the at least one anterior intervening wall and the at least one posterior intervening wall each having

alternating crests and troughs (Fig. 4, label 12 would be considered the crests and what is made in between the crests are the troughs; Par. [0034]);

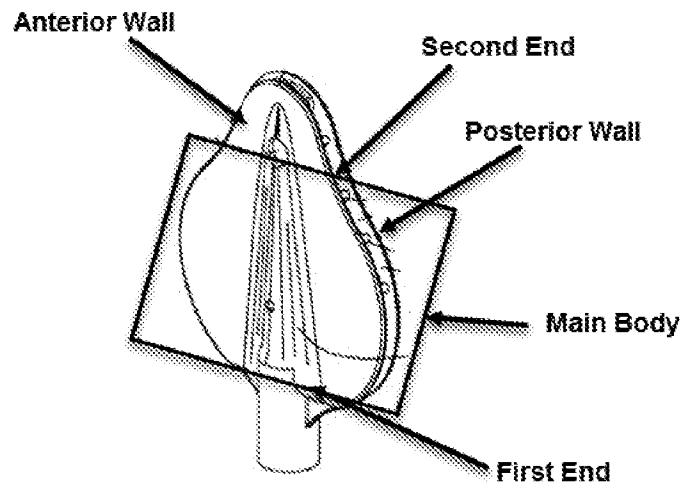
- a suction connector portion (Fig. 2, label 28) connected to the first end (See Annotated Figure B of Fig. 3), the connector portion connecting the interior space to a vacuum suction source (Fig. 1-3 shows that the connector portion is connected to a vacuum suction source at the interior space between the label 24); and
- a cheek retractor portion connected to the second end (See Annotated Figure D of Fig. 3).



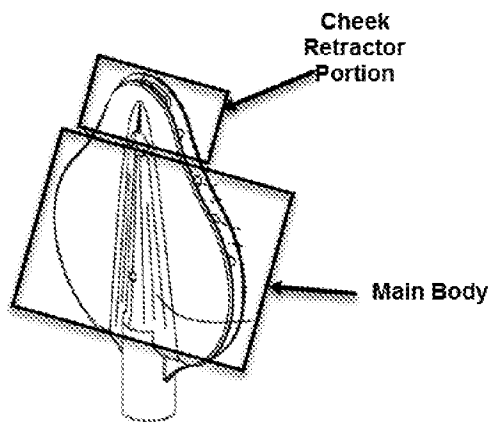
Annotated Figure A



Annotated Figure B



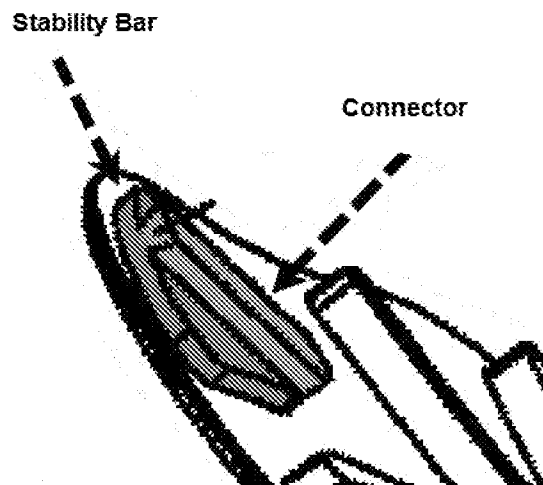
Annotated Figure C



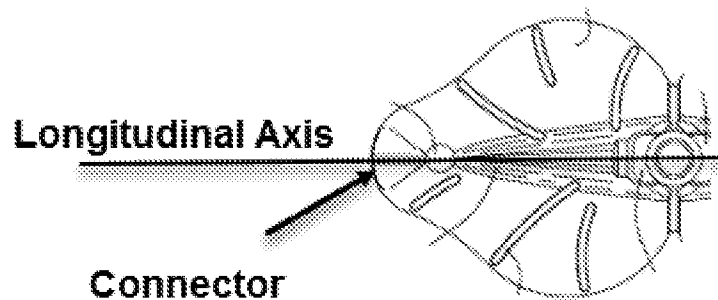
Annotated Figure D

Regarding Claim **2**, Reyes teaches the disclosed dental mouthpiece and further discloses the at least one connector is a cylindrical shaped pillar (Fig. 1, label 36).

Regarding Claim **3**, Reyes teaches the disclosed dental mouthpiece and further discloses the at least one connector is a wall spanning longitudinally in the main body portion in the interior space (See Annotated Figure E of Fig. 2 and Annotated Figure E of Fig. 4).



Annotated Figure E



Annotated Figure F

Regarding Claim **8**, Reyes teaches the disclosed dental mouthpiece and further discloses the anterior intervening wall and the posterior intervening wall have varying heights to maintain integrity of the main body portion (Fig. 3 shows that the main body tapers towards the cheek retractor portion. As such, the crest will be thicker than the trough as it will also taper in this direction; Par. [0027]).

Regarding Claim **9**, Reyes teaches the disclosed dental mouthpiece and further discloses the wherein the troughs of the anterior intervening wall and the posterior intervening wall decrease in size as the troughs approach the cheek retractor portion (Fig. 3 shows that the main body tapers towards

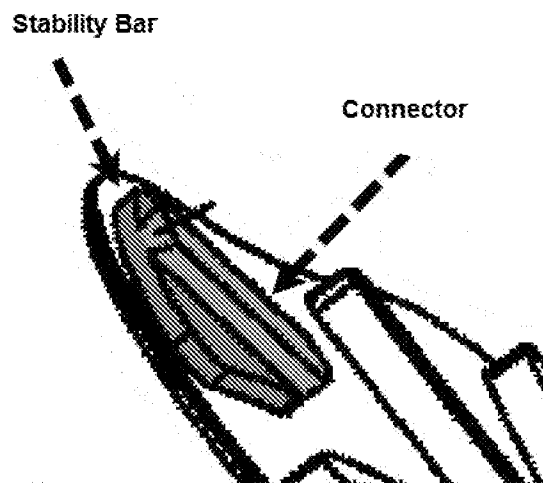
the cheek retractor portion. As such, the crest will be thicker than the trough as it will also taper in this direction; Par. [0027]).

Regarding Claim **10**, Reyes teaches the disclosed dental mouthpiece and further discloses the anterior intervening wall and the posterior intervening wall meet at a point where the suction connector meets the main body (Fig. 3, Par. [0034]).

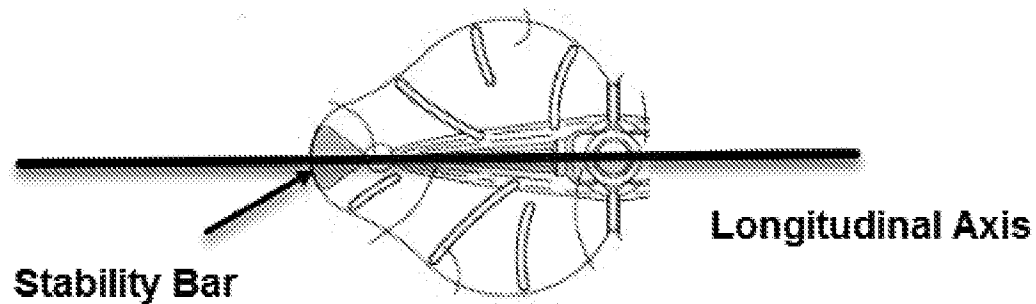
Regarding Claim **11**, Reyes teaches the disclosed dental mouthpiece and further discloses the anterior intervening wall and the posterior intervening wall meet at a point where the main body meets the cheek retractor portion (Fig. 3, Par. [0034]).

Regarding Claim **13**, Reyes teaches the disclosed dental mouthpiece and further discloses the main body portion, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece (Par. [0035]).

Regarding Claim **15**, Reyes teaches the disclosed dental mouthpiece and further discloses the posterior wall further includes a stability bar protruding from an interior surface of the posterior wall and along a longitudinal axis of the main body (See Annotated Figure G of Fig. 2 and Annotated Figure H of Fig. 4).

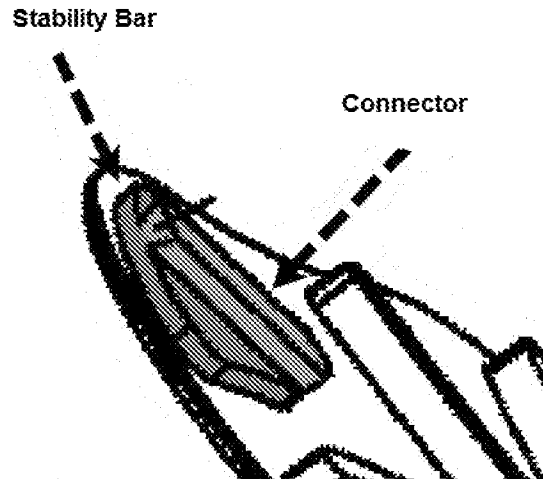


Annotated Figure G



Annotated Figure H

Regarding Claim **16**, Reyes teaches the disclosed dental mouthpiece and further discloses the at least one connector lies evenly spaced along the stability bar (See Annotated Figure I of Fig. 2 where the darker grey is the stability bar and the lighter grey is the connector. It shown that the connector lies evenly spaced along the stability bar in Fig. 4).



Annotated Figure I

Regarding Claim **18**, Reyes teaches the disclosed dental mouthpiece and further discloses the suction connector portion connects to the vacuum suction source, wherein activation of the vacuum suction source provides suction of fluids from the interior space of the main body (Par. [0031], Abstract).

Regarding Claim **19**, Reyes teaches the disclosed dental mouthpiece and further discloses the activation of the vacuum source draws fluids from an exterior of the main body through the crests and troughs of the anterior intervening wall and the posterior intervening wall, into the interior space of the main body (Par. [0031], [0034]; Abstract).

Claim Rejections - 35 USC § 103

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-7, 12, 14, 17, and 20 is/are rejected under 35 U.S.C. 103 as being unpatentable over Reyes (US Publication No. 20170156832 A1).

Regarding Claim **4**, Reyes teaches the disclosed dental mouthpiece. However, Reyes is silent to a bridge structure in the interior space protruding from the posterior wall, wherein protrusions of the bridge structure are battlement-shaped, with spaced crests.

Incept discloses a similar dental mouthpiece and further discloses a bridge structure in the interior space protruding from the posterior wall, wherein protrusions of the bridge structure are battlement-shaped, with spaced crests (Fig. 1E of Incept, label 180, Par. [0042]) to improve the suction of material (Par. [0042]).

It would have been obvious to someone of ordinary skill in the art before the effective filing date of the claimed invention to have modified the dental mouthpiece of Reyes to have a bridge structure with battlement-shaped protrusions of Incept to provide a structure bridging the interior space for support which also improves the suction of material.

Regarding Claim **5**, Reyes and Incept teaches the disclosed dental mouthpiece and Incept further discloses the protrusions near the suction connector is in greater height and length (Fig. 1E of Incept shows that the main body becomes enlarge near the suction connector and tapers as it goes towards the cheek retractor portion. As such, it is shown that the protrusion would be greater in height and length).

Regarding Claim **6**, Reyes and Incept teaches the disclosed dental mouthpiece and Incept further discloses spaces between the crests are troughs of the battlement- shape (Fig. 1E of Incept).

Regarding Claim **7**, Reyes and Incept teaches the disclosed dental mouthpiece, but are silent to the alternating crests and troughs on the anterior intervening wall and the posterior intervening wall are semi-circle shaped. Reyes discloses the crest and troughs being curved.

It would have been obvious to someone of ordinary skill in the art before the effective filing date of the claimed invention to have modified the alternating crests and troughs on the anterior intervening wall and the posterior intervening wall of Reyes are semi-circle shaped to prevent discomfort to the user from sharp edges.

Regarding Claim **12**, Reyes and Incept teaches the disclosed dental mouthpiece and Reyes is silent to a bite block integrated to the suction connector portion, wherein the bite block provide additional crush-resistance and decreased compressibility during biting by a patient.

Incept discloses the usage of a bite block (Claims 18-19 and Par. [0005]) for various dental operations and used to prevent compression of the mouthpiece.

It would have been obvious to someone of ordinary skill in the art before the effective filing date of the claimed invention to have modified the mouthpiece of Reyes to include the bite block to have a bite block of Incept as it is known in the art to prevent the compression of the mouthpiece while in use. As such, it is capable of providing additional crush-resistance and decrease compressibility during biting as that is the function of a bite block.

Regarding Claim **14**, and Incept Reyes teaches the disclosed dental mouthpiece and Reyes is silent to a material that forms the main body, the suction connector portion, and the cheek retractor portion is a flexible, translucent, high heat-resistant, autoclavable silicon-based material.

Incept discloses a material that forms the main body, the suction connector portion, and the cheek retractor portion is a flexible, translucent, high heat-resistant, autoclavable silicon-based material to allow the mouthpiece to be reusable (Abstract).

It would have been obvious to someone of ordinary skill in the art before the effective filing date of the claimed invention to have modified the mouthpiece of Reyes to be made by a material that forms the main body, the suction connector portion, and the cheek retractor portion is a flexible, translucent, high heat-resistant, autoclavable silicon-based material as taught by Incept.

Regarding Claim **17**, and Incept Reyes teaches the disclosed dental mouthpiece. However, Reyes is silent to the suction connector portion comprising a cutout corresponding to a protrusion on a vacuum adapter interlocking fit.

Incept teaches a cutout corresponding to a protrusion on a vacuum adapter interlocking fit (Fig. 2A, label 230; Par. [0045]) to provide extra locking (Par. Par. [0045]).

It would have been obvious to someone of ordinary skill in the art before the effective filing date of the claimed invention to have modified the suction connector of Reyes to have a cutout of Incept to provide extra locking.

Regarding Claim **20**, and Incept Reyes teaches the disclosed dental mouthpiece and further discloses the cheek retractor portion includes a surface that applies pressure based on resilience of the cheek retractor portion.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See Form PTO-892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOLLY T TO whose telephone number is (571)272-0719. The examiner can normally be reached Monday - Thursday 6:30 - 4:30.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacqueline Johanas can be reached on (571)270-5085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/HOLLY T. TO/
Examiner, Art Unit 3772
/JACQUELINE T JOHANAS/
Supervisory Patent Examiner, Art Unit 3772

<i>Notice of References Cited</i>	Application/Control No. 16/870,745		Applicant(s)/Patent Under Reexamination Nguyen et al.	
	Examiner HOLLY T TO		Art Unit 3772	Page 1 of 2

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*	B	US-20200155284-A1	05-2020	BAKER; GARY	A61C17/10	1/1
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*	D	US-20090274991-A1	11-2009	Black; Brian P.	A61C17/08	433/93
*	E	US-20140212841-A1	07-2014	Nguyen; Thien	A61C17/0208	433/92
*	F	US-20170156832-A1	06-2017	Reyes; Hari Mark	A61C17/08	1/1
*	G	US-20120015317-A1	01-2012	Milo; Anton G. C.	A61C17/08	433/29
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*	I	US-20150335409-A1	11-2015	Hirsch; James A.	A61C5/90	433/93
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	O	WO-2018126150-A1	07-2018	WO	URRUTIA FABIAN PEDRO	A61C5/82
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	Examiner HOLLY T TO		Art Unit 3772	Page 2 of 2

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
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	Examiner HOLLY T TO	Art Unit 3772

CPC - Searched*		
Symbol	Date	Examiner
A61C5/90	11/22/2021	HT
A61C17/08	11/22/2021	HT
A61B1/24	11/22/2021	HT

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US Classification - Searched*			
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433	92	11/22/2021	HT

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Search Notes		
Search Notes	Date	Examiner
Conducted Inventor, Assignee, USPC and CPC search (with text in PE2E); *denotes cursory review of the search areas listed above	11/22/2021	HT
Consulted With Home SPE Jacqueline Johanas in Dentistry (Class 433)	11/29/2021	HT

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Substitute for Form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>				Complete if Known		
				Application Number	16/870,745	
				Filing Date	May 8, 2020	
				First Named Inventor:	Thien Nguyen	
				Art Unit	3772	
				Examiner Name	Not Yet Assigned	
Sheet	1	of	2	Attorney Docket Number	INCEP-005	
U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (If known)				
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		US-	2017/0156832	6/8/2017	Reyes	
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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

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	Filing Date		2020-05-08
	First Named Inventor	NGUYEN; Thien	
	Art Unit	3772	
	Examiner Name	TO, HOLLY T	
	Attorney Docket Number	084892-INCEP-005	

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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		16870745
Filing Date		2020-05-08
First Named Inventor	NGUYEN; Thien	
Art Unit	3772	
Examiner Name	TO, HOLLY T	
Attorney Docket Number	084892-INCEP-005	

Examiner Initial*	Cite No	Foreign Document Number	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Docket No. INCEP-001COA U.S. Application 14/228, 046; Non-Final Office Action mailed 10-6-21.	☐
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
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9	"Dryshield Presentation (Learn all about Dryshield)" posted by Dryshield Isolation System. Youtube. Posting date: 27 October 2014. Retrieval date: 15 September 2021. Retrieved from internet: https://www.youtube.com/watch?v=fcbpz3ixvis (Year: 2014).	☐
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11	"Dryshield Tutorial - Maximize Your Dryshield Experience" posted by Dryshield Isolation System. Youtube. Posting date: 15 April 2015. Retrieval date: 15 September 2021. Retrieved from internet: https://www.youtube.com/watch?v=L2OSYPS8Rc4 (Year: 2015).	☐

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(Not for submission under 37 CFR 1.99)

Application Number	16870745
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Art Unit	3772
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CONTINUING DATA

This application has PRO of 62846353 05/10/2019

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(21) International Application Number: PCT/US00/01577 (22) International Filing Date: 21 January 2000 (21.01.00) (30) Priority Data: 09/234,588 21 January 1999 (21.01.99) US (71)(72) Applicant and Inventor: ENGERON, Michael, G. [US/US]; 206 Mystic Boulevard, Houma, LA 70360-2762 (US). (74) Agents: SMITH, Gregory, C. et al.; Garvey, Smith, Nehrbass & Doody L.L.C., 3 Lakeway Center, Suite 3290, 3838 North Causeway Boulevard, Metairie, LA 70002 (US).		(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (Utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: IMPROVED RETRACTOR APPARATUS		
(57) Abstract This invention is a improved retractor apparatus for conducting orthodontic procedures in a dry field, the retractor including a first arm portion (12) for extending along the outer surface of a patient's cheek that can be grasped by the orthodontist performing the procedure; a second lower lip depressor portion (22) concavely formed for pressing against the lower lip as the orthodontist grasps the handle portion, a third cheek retractor portion (24) extending from the bridge (lip retractor) portion into the mouth of the patient and formed in a biconvex fashion to curve along the inner surface of the cheek of the patient; an upper lip retractor portion (29) that retracts, and elevates the upper lip as the apparatus is manipulated by the dentist; a bridge member situated at the confluence of the first arm, (handle) portion; the second arm (lower lip depressor) portion; the third arm (cheek retractor) portion; and the fourth arm (upper lip retractor) portion.		

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TITLE OF THE INVENTION

"IMPROVED RETRACTOR APPARATUS"

5 CROSS-REFERENCE TO RELATED APPLICATIONS

Priority of US Patent Application Serial No. 09/234,588 filed January 21, 1999, incorporated herein by reference, is hereby claimed.

10 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

REFERENCE TO A "MICROFICHE APPENDIX"

Not applicable

BACKGROUND OF THE INVENTION

15 1. Field of the Invention

The apparatus of the present invention relates to dental appliances. More particularly, the present invention relates to an improved retractor apparatus for retracting certain areas of a patient's mouth such as the lips and the cheek in order to allow greater access to the patient's mouth during dental work such as orthodontics.

20 2. General Background

Quite often in conducting dental work on a patient, such as orthodontics or the like type of operation, there is a requirement that the patient's lip and cheek be positioned so as to allow the dentist maximum access to the area of the mouth in which the operation will be conducted, which in most cases is in the area of the rear teeth such as the wisdom
25 teeth or molars. Furthermore, during certain procedures such as those conducted by an orthodontist, it is important to retract the soft tissue away from the teeth undergoing the orthodontic procedure in order to provide comfortable access to a dry field, including the buccal surfaces of maxillary and mandibular second molars simultaneously, for allowing

bonding of orthodontic appliances, such as braces, to the teeth.

While this is an important aspect of an appliance that would be utilized in order to meet these requirements, it is also important that the patient who is normally awake and aware and unanesthetized, be in as much comfort as possible during the procedure.

5 For example, there are appliances known in the art which have been utilized for affording access into a patient's mouth during a procedure. One of the more common types of retractors is called a Bishop Retractor, which is a surgical instrument apparatus which is grasped by a standing surgeon or an assistant who holds the cheek of the patient out with one hand while he, the surgeon, conducts a surgical procedure with the other
10 hand. The Bishop retractor is a rather simple instrument, and is used primarily, if not exclusively, in surgical procedures while the patient is anesthetized.

Secondly, U.S. Patent No. 5,730,597, which was patented by Clifford Luttrell, and assigned to the United States of America, teaches a flat, buccal retractor which attempts to solve the problem in the art. However, this instrument butt or end is quite narrow and
15 sharp which would lead to discomfort for the patient, and also would not allow for keeping soft tissue and saliva out of the field in an orthodontic procedure. The narrow sharp-ended cheek retractor of Luttrell is designed to be used in an operating room setting by a standing surgeon on a fully anesthetized patient. It is designed to retract unsurgerized tissue to allow access to that soft tissue on the stretch to facilitate
20 surgerizing the stretched tissue. Furthermore, it could be used to retract surgerized tissue to allow visualization of, and access to, the bony maxilla beneath the soft tissue in order to allow instrumentation, irrigation, and cutting of the bony jaw with a rotary or reciprocating instrument. Again, these procedures are normally done in a wet field on an anesthetized patient by a standing surgeon.

25 The Luttrell instrument, in one embodiment, retracts either the left upper lip or the right lower lip, but not simultaneously. The other, mirror form of the instrument retracts the left lower lip or right upper lip, but again, not simultaneously. Therefore, there is a need in the industry for providing an improved retractor apparatus which would allow a dentist to work in a dry field for doing, in particular, orthodontic procedures, and
30 shaped in order to have greater comfort for the patient. and so constructed so that the instrument allows the left upper and lower lips, as well as the lip commissure and cheek, to be retracted simultaneously by the orthodontist. The mirror image instrument would

be used to retract the right upper and lower lips, as well as the right commissure and cheek. Furthermore, there is a need to allow such a device to be utilized wherein the dentist or orthodontist may conduct the procedure while being seated rather than having to hover over the patient, which one may have to do if one utilized the Luttrell device in the procedure.

BRIEF SUMMARY OF THE INVENTION

The apparatus of the present invention solves the shortcomings in the art in a simple and straightforward manner. What is provided is an improved retractor apparatus for conducting orthodontic procedures in a dry field, the retractor including a first arm portion for extending along the outer surface of a patient's cheek that can be grasped by the orthodontist performing the procedure; a second lower lip depressor portion concavely formed for pressing against the lower lip as the orthodontist grasps the handle portion, a third cheek retractor portion extending from the bridge (lip retractor) portion into the mouth of the patient and formed in a biconvex fashion to curve along the inner surface of the cheek of the patient; a fourth upper lip retractor portion that retracts and elevates the upper lip as the apparatus is manipulated by the dentist, a bridge member situated at the confluence of the first arm, (handle) portion, the second arm (lower lip depressor) portion, the third arm (cheek retractor) portion and the fourth arm (upper lip retractor) portion. The long axis of the handle portion extends at an incline relative to the lip depressor and cheek retractor portions for defining a thin waist portion on the handle so that the end of the handle may be grasped to depress the patient's lower lip, retract the upper lip, and to extend the cheek of the patient outward so as to provide an increased volume of space for conducting the orthodontic procedure in a dry field.

Therefore, it is a principal object of the present invention to provide a dental appliance which allows an orthodontist to conduct procedures on a patient who is awake while in greater comfort and retracting the lips and cheek portions away from the patient's teeth in order to establish a dry field comfortably within the mouth;

It is a further principal object of the present invention to provide an improved retractor apparatus for placement in a patient's mouth so that the apparatus may be held by a handle portion while the orthodontist is sitting, and as the handle portion is pulled on a slight incline, there is provided a lower lip depressor portion, an upper lip retractor

portion, and cheek retractor portion for establishing greater access to the patient's dry teeth while the patient is awake and substantially comfortable;

It is a further object of the present invention to provide an improved retractor apparatus which provides for substantially greater operational features in the prior art, and allows an orthodontist to undertake procedures while being seated yet while simultaneously having access to the patient's mouth in a dry field.

BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the nature, objects, and advantages of the present invention, reference should be had to the following detailed description, read in conjunction with the following drawings, wherein like reference numerals denote like elements and wherein:

Figures 1-8 illustrate various views of the preferred embodiment of the improved retractor apparatus of the present invention;

Figures 9A and 9B illustrate views of the apparatus placed in a patient's mouth during an orthodontic procedure;

Figure 10 illustrates a view of the apparatus in a patient's mouth while the apparatus is held by the orthodontist;

Figures 11A and 11B illustrate the lower lip depressor portion, the bridge portion, the upper lip retractor portion and the cheek retractor portion respectively of the apparatus of the present invention;

Figures 12A and 12B illustrates the apparatus of the present invention being utilized with a dental appliance such as a polishing instrument;

Figure 13 illustrates an isolated view of the apparatus retracting the lower lip of a patient during use and

Figure 14 illustrates a bottom view of the apparatus being utilized to retract the cheek and lower lip of a patient as the teeth are being polished with a dental instrument.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1-14 illustrated the preferred embodiment of the apparatus of the present invention by the numeral 10. As illustrated in various views of the apparatus, particularly as seen in Figures 1-8, there is illustrated improved retractor apparatus 10 which would comprise various portions, some portions which are more clearly illustrated in certain

figures than others. For example, in Figure 1 there is illustrated apparatus 10 having the exterior handle portion 12, handle portion 12 having an enlarged end portion 14 and a center waist portion 16 which then would emerge into a substantially centralized bridge portion 18. The handle portion 12 is shaped so that the thin waist portion 16 allows for
5 firmly grasping the handle during use and retraction without allowing the fingers to slip from the handle 12.

For purposes of further explanation of the construction of handle portion 12, reference is made to Figure 3 where handle portion 12 is illustrated, and it is seen that the handle portion 12 is substantially elongated and terminates in the enlarged portion 14,
10 the handle portion being somewhat thin in overall thickness along edge 19, and having an overall arcuate shape along line 20 as seen in Figure 3. Again, it is seen as the handle portion terminates at bridge portion 18 there is formed the three other principal portions of the apparatus 10. There is first seen the lower lip depressor portion 22 and as seen clearly in Figure 1, the cheek retractor portion 24 as seen more clearly in Figure 2, and
15 the upper lip retractor portion 29 as seen in Figures 1, 2 and 3. As seen in Figures 1-8, the lower lip depressor portion 22 includes an arcuate extended member 25 having an outer convex surface 26 and an interior concave surface 28. The concavity 28 is formed the length of the lip depressor portion 22 and would essentially engage the lower lip during use of the apparatus as will be explained further. The upper lip retractor portion
20 29 is also concave along surface 31 to engage and retract the upper lip comfortably. The bridge portion serves to retract the commissure of the mouth and as the confluence of the handle, upper lip retractor, lower lip retractor, and cheek retractor portions.

Turning now to the cheek retractor portion 24, it is seen that the cheek retractor portion 24 is seen clearly for example in Figure 6. Again, as seen in Figure 6 there is
25 illustrated the handle portion 12, the lower lip depressor portion 22, the cheek retractor portion 24 and the upper lip retractor portion 29. As illustrated, cheek retractor portion 24 is formed from the bridge portion 18 of the apparatus 10, and forms substantially a U shape extending substantially in the same direction of handle 12. The cheek retractor portion 24 has a concave surface 26 and a substantially convex surface 28 as seen in
30 Figures 6-8, the convex surface 28 being inserted into the mouth of the patient and pressing against the interior surface of the cheek as it is placed within the mouth of the patient. Further, which is not clearly seen in Figure 6, but is seen in Figure 7, is that the

cheek retractor portion 24, which illustrates the concave surface 28, would be pressed against the patient's cheek 39 as will be described further. However, as seen more clearly in Figure 7, concave surface 28 terminates in a biconvex end portion 27 which would when placed in the patient's mouth press against the rear wall of the patient's mouth deep in the vestibule 44 while the apparatus is being used. Again, this biconvex portion 27 would be seen again in Figure 9B as will be described further.

For example, turning now to Figure 9A, there is illustrated a patient 30 having the apparatus 10 inserted in the patient's mouth. As clearly seen, the hand 32 of the dentist is holding the handle portion 12 of the apparatus while the lower lip depressor portion 22 is holding the lower lip 35 of the patient 30 in the channel 28 formed by the lip depressor portion 22. Simultaneously, the cheek retractor portion 24 has been inserted and is pressing against the interior surface 38 of the patient's cheek, and retracting the cheek 39 of the patient outward in the direction of arrow 40. In this manner, there is then seen the lower lip 35 being depressed by depressor portion 22 cheek 39 being extended outward by the cheek retractor portion 24, and the upper lip being retracted upward by portion 29. There is defined a dry vestibule 44 within the mouth of the patient 30 for conducting orthodontic procedures. This is seen again in close up view in Figure 9B as was described earlier.

Again, as seen in Figure 10, the apparatus 10 is seen being held again by hand 32 with the patient 30 resting her head back while the apparatus has been inserted within her mouth. The handle portion 12 is grasped by the dentist's hand 32 and the lower lip 35 is being depressed downward while the cheek retractor portion 24 is pushing the cheek 35 outward and the upper lip is being retracted upward so as to have easy access to the buccal surfaces of the patient's upper and lower posterior teeth. It should be noted that because of the position of the handle portion 12 of the apparatus and for example as seen in Figure 3 the long axis of the handle portion 12 is approximately a 15 degree angle from the horizontal line 17. This allows a dentist to conduct work on the patient while being seated because of the angulation of the handle, so that when one pulls back it automatically retracts the cheek slightly outward and the lower lip is pushed further downward while the upper lip is retracted upward

Turning now to Figures 11A and 11B, there is seen, again in 11A, an isolated view of the lower lip depressor portion 22 pressing downward on the lip 35 to provide

a greater volume of space in vestibule 44 for conducting work. As seen in 11B, the cheek retractor portion 24 extends from the bridge portion 18, and pushes the cheek outward while the very end 25 of the cheek retractor portion 24 is curving against the rear 27 of the mouth in the vestibule 44 in order to provide an entire arcuate retraction of the cheek along its inner surface as seen in 11B. In Figures 12A and 12B, the apparatus 10 is again illustrated so that a lip 35 is depressed downward by depressor portion 22, the cheek of the patient is retracted outward by the cheek retractor portion 24 and the upper lip is retracted up and away from the teeth by portion 29 so that the vestibule 44 within the patient's mouth is quite enlarged and an instrument 50, such as the type of instruments that would be used to bond orthodontic appliances can be inserted easily into the vestibule 44 for making direct contact with the patient's teeth 52, particularly the rear most teeth which are normally very difficult to access during the procedure.

Again, as was discussed earlier, Figure 13 is an isolated view of the patient's lower lip 35 being depressed downward by lip depressor portion 22 of apparatus 10 in the view.

In Figure 14, there is seen a substantially bottom view of the apparatus, again showing the linear formation of handle 10 with its slight curvature directed to bridge portion 18 wherein there is seen the lower lip depressor portion 22, the cheek retractor portion 24, and the upper lip retractor portion 29. As seen in this particular view, there is provided in phantom view the cheek 39 of the patient held within the opening 47 formed between the handle 12 and the cheek retractor portion 24 so that as the handle 12 is pulled in the direction of arrow 60, the cheek is pulled outward so that a cleaning instrument 50 of the type as was seen in Figures 12A and 12B may be utilized against the teeth 52 of a patient during use.

In the preferred embodiment, the apparatus of the present invention could be formed of any material such as stainless steel or molded plastic, which would be durable and light weight and would be the type of material that can be sterilized and used in the oral environment during orthodontic work. Of course, when the implement would be used on the left side, it would be a mirror image of a second implement that would have to be used on the right side by the orthodontist during orthodontic procedures or the like. The instruments would be provided in a mirror image pair. The instrument provided for use on the patient's right side would be a mirror image of that provided for use on the left.

The foregoing embodiments are presented by way of example only; the scope of the present invention is to be limited only by the following claims.

CLAIMS

- 1 1. An improved retractor apparatus, for use during dry orthodontic dental
2 procedures on a patient, comprising:
3 a. an elongated handle portion, adapted to extend along the outer cheek
4 for grasping by a person;
5 b. a lower lip depressor portion, further comprising a concave surface for
6 engaging the lower lip;
7 c. a cheek retracting portion, adapted to be positioned against an interior
8 surface of the cheek, and terminating in a biconvex end to conform to a rear portion of
9 the cheek;
10 d. an upper lip retractor portion, for engaging and retracting the upper lip;
11 e. the lower lip depressor portion forcing the lower lip downward, the
12 cheek retracting portion retracting the cheek outward, and the upper lip retractor portion
13 retracting the upper lip outward, all simultaneously, as the handle portion is moved away
14 from the cheek by the person, for providing visualization and access to the buccal
15 surfaces of the teeth during the dry orthodontic procedure, defining a larger patient
16 vestibule and for establishing a dry field for conducting the dental procedure in comfort.
- 1 2. The apparatus in claim 1, wherein a long axis of the handle portion is adapted
2 to extend at an angle approximately 30 degrees from a long axis of the cheek retractor
3 portion.
- 1 3. The apparatus in claim 1, wherein the bridge portion is situated at the
2 commissure of the mouth during use.
- 1 4. The apparatus in claim 2, wherein the angulated position of the handle portion
2 provides use of the apparatus while the user is seated.
- 1 5. The apparatus in claim 1, wherein the cheek retracting portion terminates in
2 a biconvex end portion for conforming to the rear portion of the cheek of the patient, so
3 as to provide a biconvex surface with which to comfortably retract the cheek during use.

1 6. The apparatus in claim 1, wherein the apparatus would be formed of molded
2 plastic or stainless steel to be sterilizable for use in a patient's mouth.

1 7. An improved retractor apparatus, for use during dry orthodontic dental
2 procedures, comprising:

3 a. a first elongated handle portion, adapted to extend along the outer
4 check for grasping by a dentist;

5 b. a second lower lip depressor portion, further comprising a concave
6 surface for engaging the lower lip;

7 c. a third cheek retractor portion, adapted to be positioned against an
8 interior surface of the cheek;

9 d. a fourth upper lip retractor portion, for engaging and retracting the
10 upper lip;

11 e. a bridge portion interconnecting the handle portion to the lower lip
12 depressor portion, the cheek retractor portion, and the upper lip retractor portion; and

13 f. the second lower lip depressor portion forcing the lower lip downward,
14 the cheek retracting portion retracting the cheek outward, and the upper lip retractor
15 portion retracting the upper lip upward, all simultaneously, as the handle portion is pulled
16 away from the cheek by the dentist, for defining a larger vestibule in the patient's mouth
17 to obtain access to the buccal surfaces of the teeth, and for establishing the dry field for
18 conducting the dental procedure.

1 8. The apparatus in claim 7, wherein a long axis of the handle portion is adapted
2 to extend at an angle of approximately 30 degrees upward from the horizontal, using a
3 long axis of the cheek retractor portion as the horizontal.

1 9. The apparatus in claim 7, wherein the angulation of the handle portion
2 provides for use of the apparatus while the user is seated.

1 10. The apparatus in claim 7, wherein the cheek retracting portion terminates in

2 a biconvex end portion for conforming to the rear portion of the cheek of the patient.

1 11. The apparatus in claim 7, wherein the apparatus would be formed of molded
2 plastic or stainless steel to be sterilizable for use in the mouth.

1 12. An improved retractor apparatus, for use during dry orthodontic dental
2 procedures, comprising:

3 a. a first elongated handle portion, is adapted to extend along the outer
4 cheek for grasping by a dentist;

5 b. a second lower lip depressor portion, further comprising a concave
6 surface for engaging the lower lip;

7 c. a third cheek retractor portion, adapted to be positioned against an
8 interior surface of the cheek;

9 d. a fourth upper lip retractor portion, for engaging and retracting the
10 upper lip;

11 e. a bridge portion interconnecting the handle portion to the lower lip
12 depressor portion, the cheek retractor portion, and the upper lip retractor portion and
13 situated at the commissure of the mouth during use; and

14 f. the second lower lip depressor portion forcing the lower lip downward,
15 the cheek retracting portion retracting the cheek outward, and the upper lip retractor
16 portion retracting the upper lip upward, all simultaneously, as the handle portion is pulled
17 away from the cheek by the dentist, for defining a larger vestibule in the patient's mouth,
18 to obtain access to the buccal surfaces of the teeth and for establishing the dry field for
19 conducting the dental procedure in greater comfort for the patient.

1 13. The apparatus in claim 12, wherein the long axis of the handle portion is
2 adapted to extend at an angle of approximately 30 degrees from the long axis of the cheek
3 retractor portion.

1 14. The apparatus in claim 12, wherein the angulated position of the handle
2 portion provides for use of the apparatus while the user is seated and the patient is

3 essentially supine in a dental chair.

1 15. The apparatus in claim 12, wherein the apparatus would be formed of molded
2 plastic or stainless steel so as to be sterilizable for use in the mouth.

1 16. The apparatus in claim 12, wherein the handle portion further comprises
2 a thin waist portion terminating in a broader end portion of the handle, for allowing use
3 of the apparatus yet preventing the hand grasping the handle from slipping off of the
4 handle during use.

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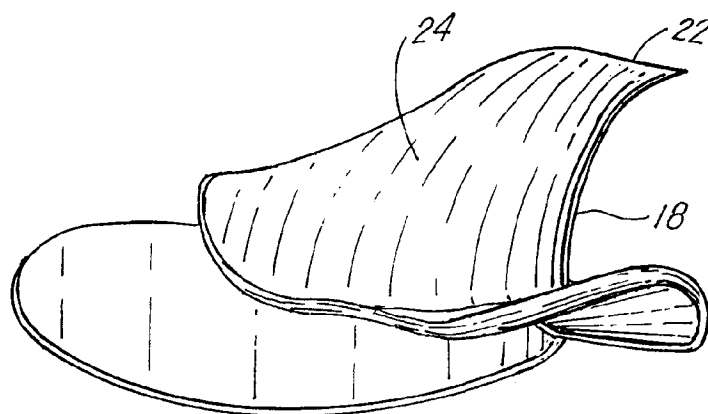
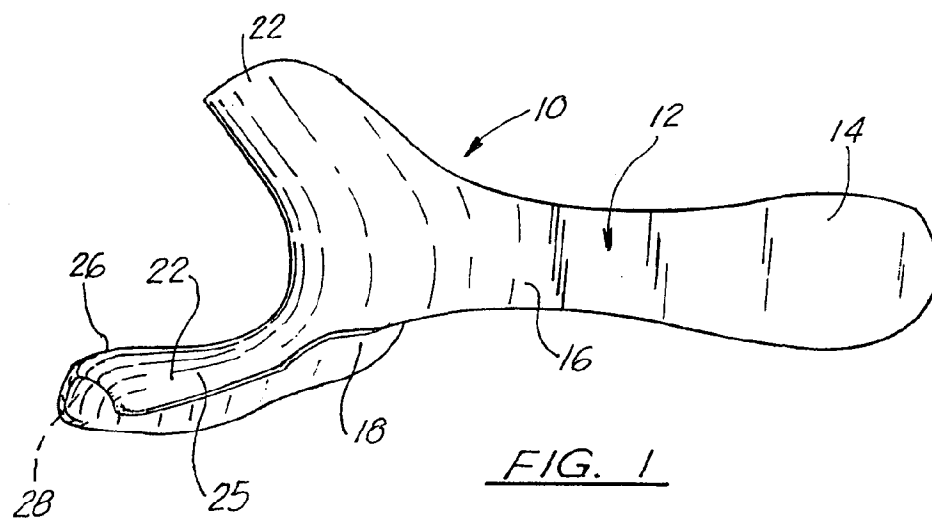


FIG. 2

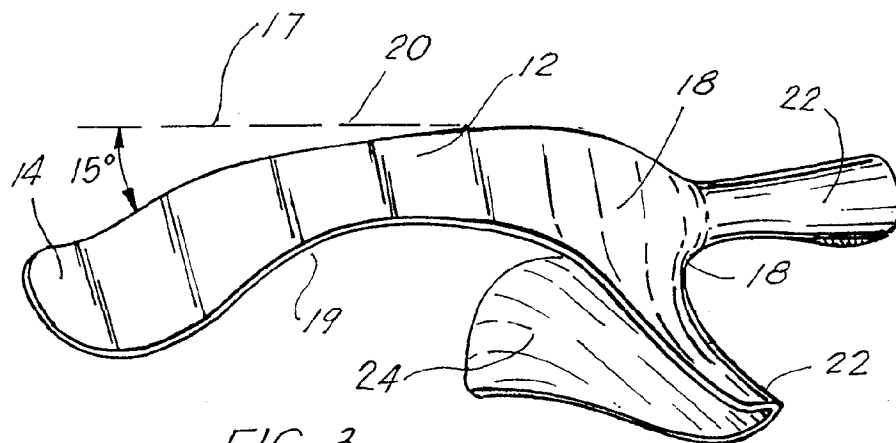


FIG. 3

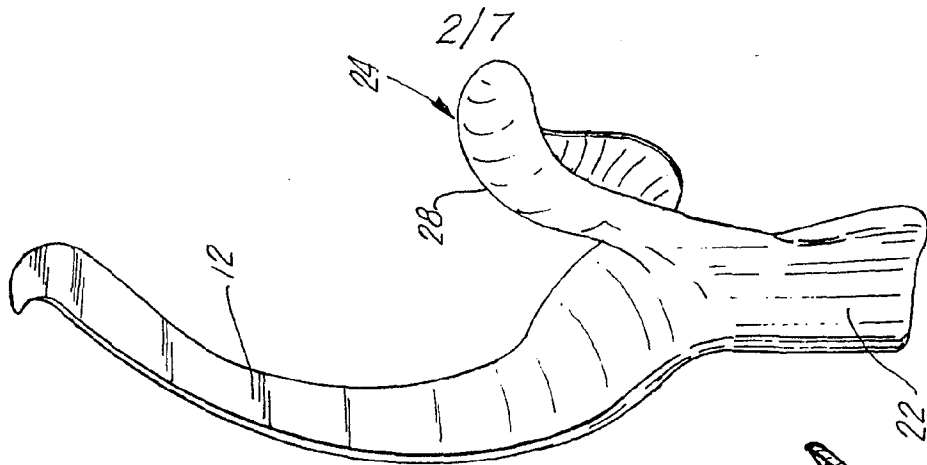


FIG. 8

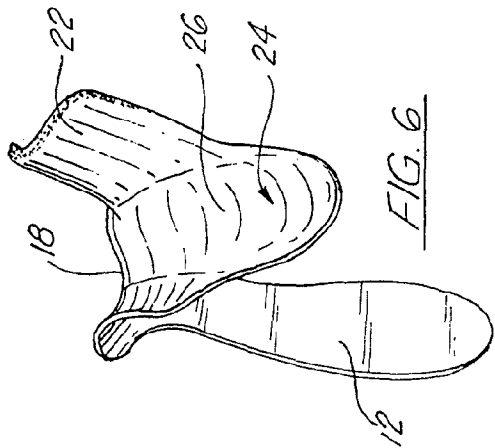


FIG. 6

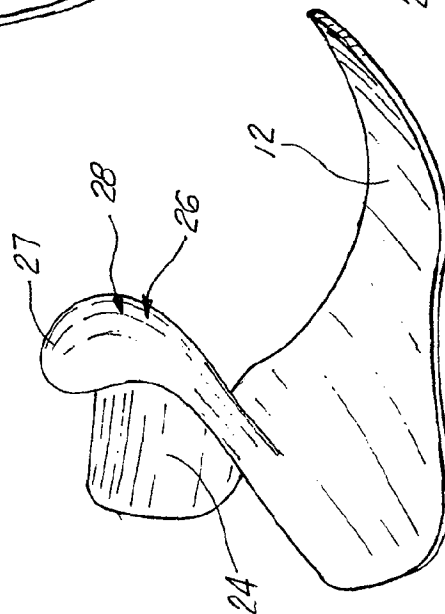


FIG. 7

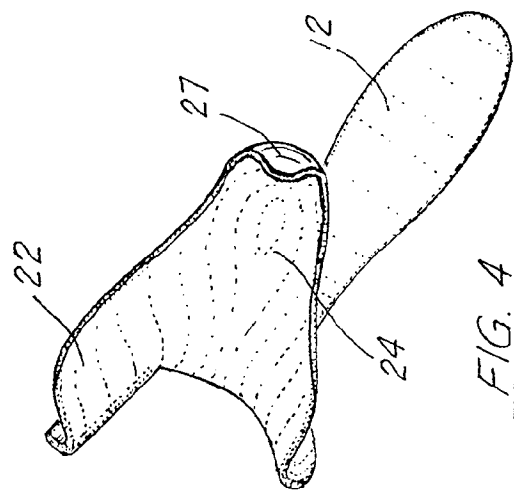


FIG. 4

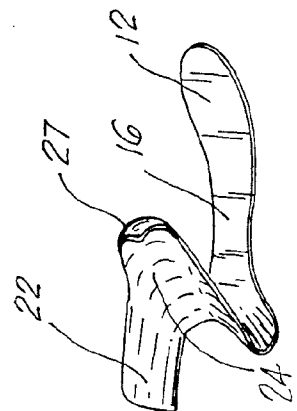
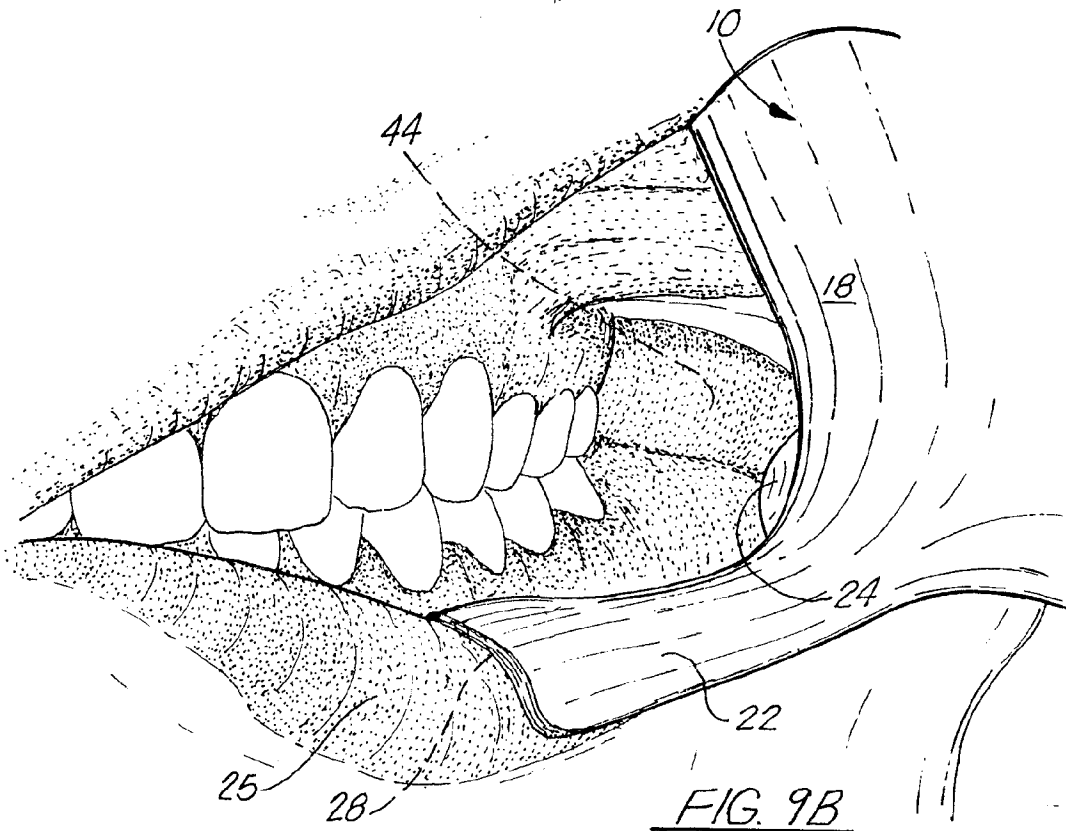
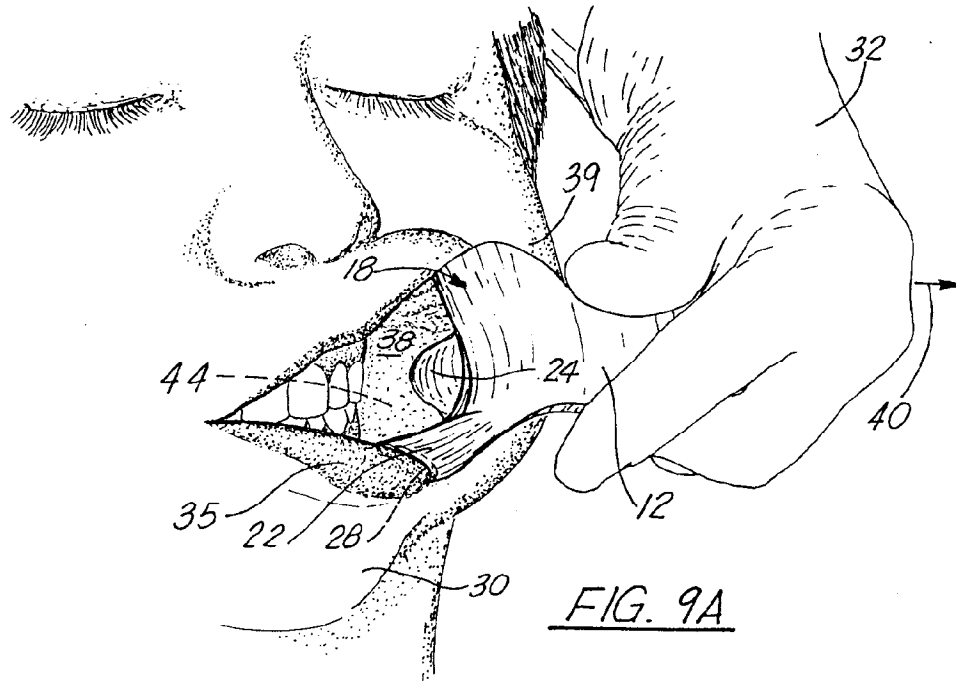


FIG. 5

3/7



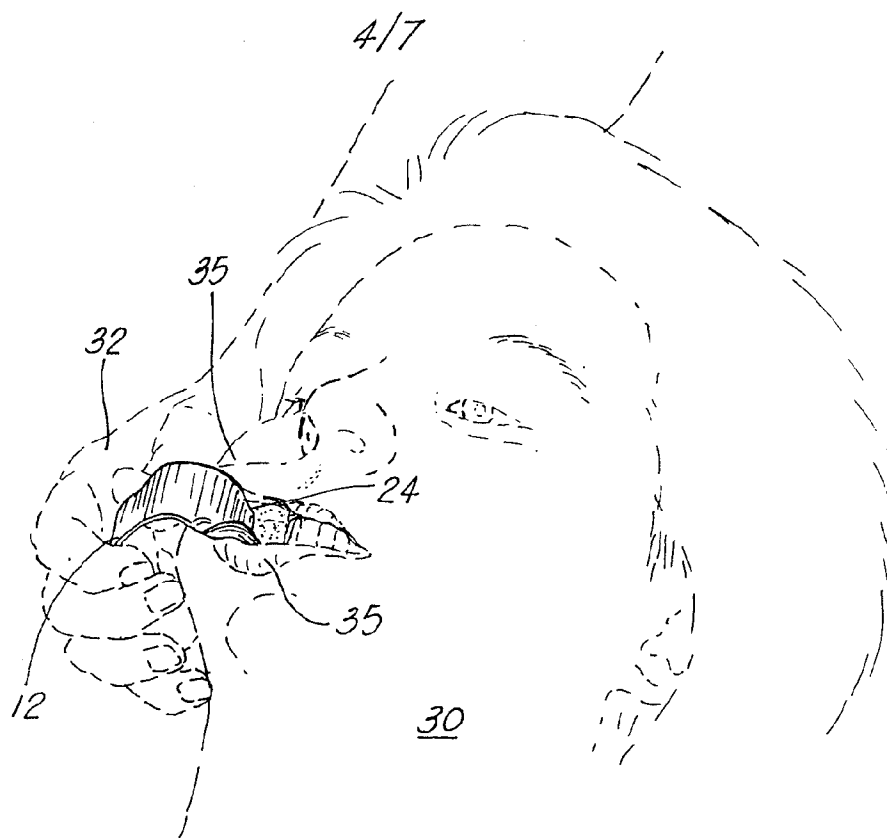


FIG. 10

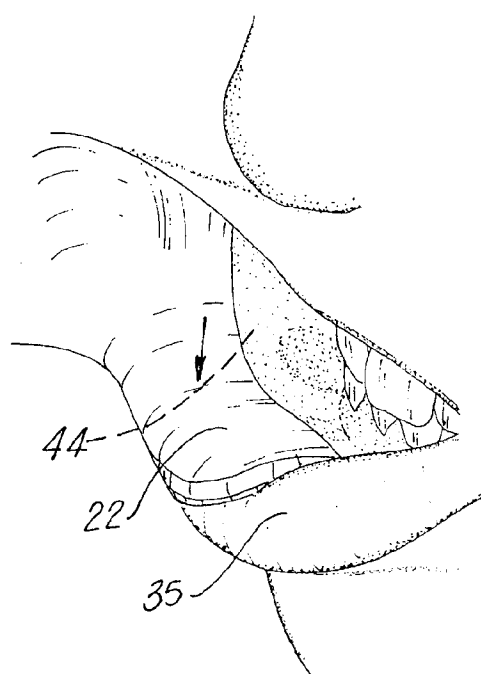


FIG. 11A

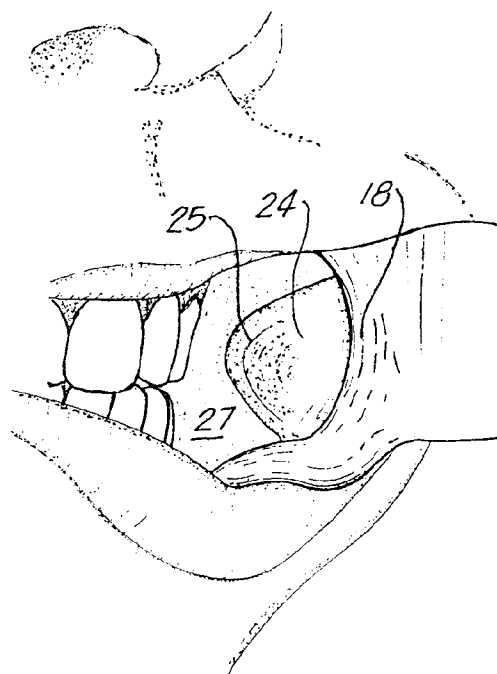


FIG. 11B

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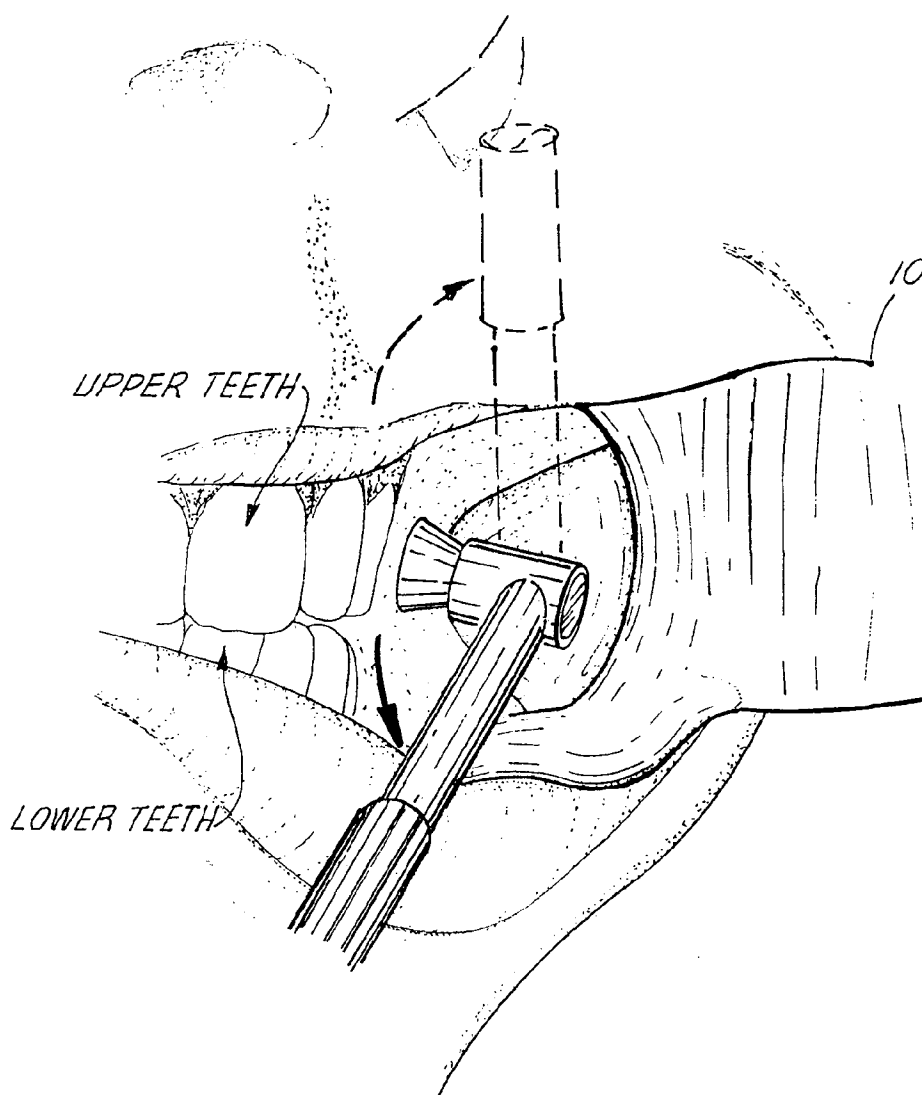
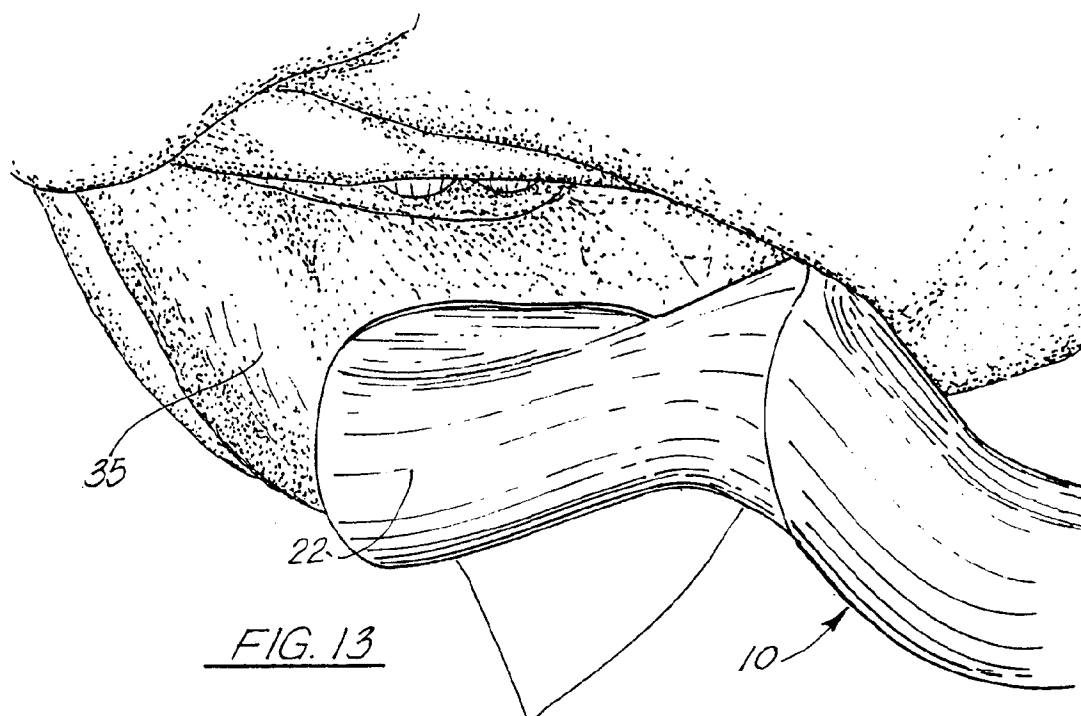
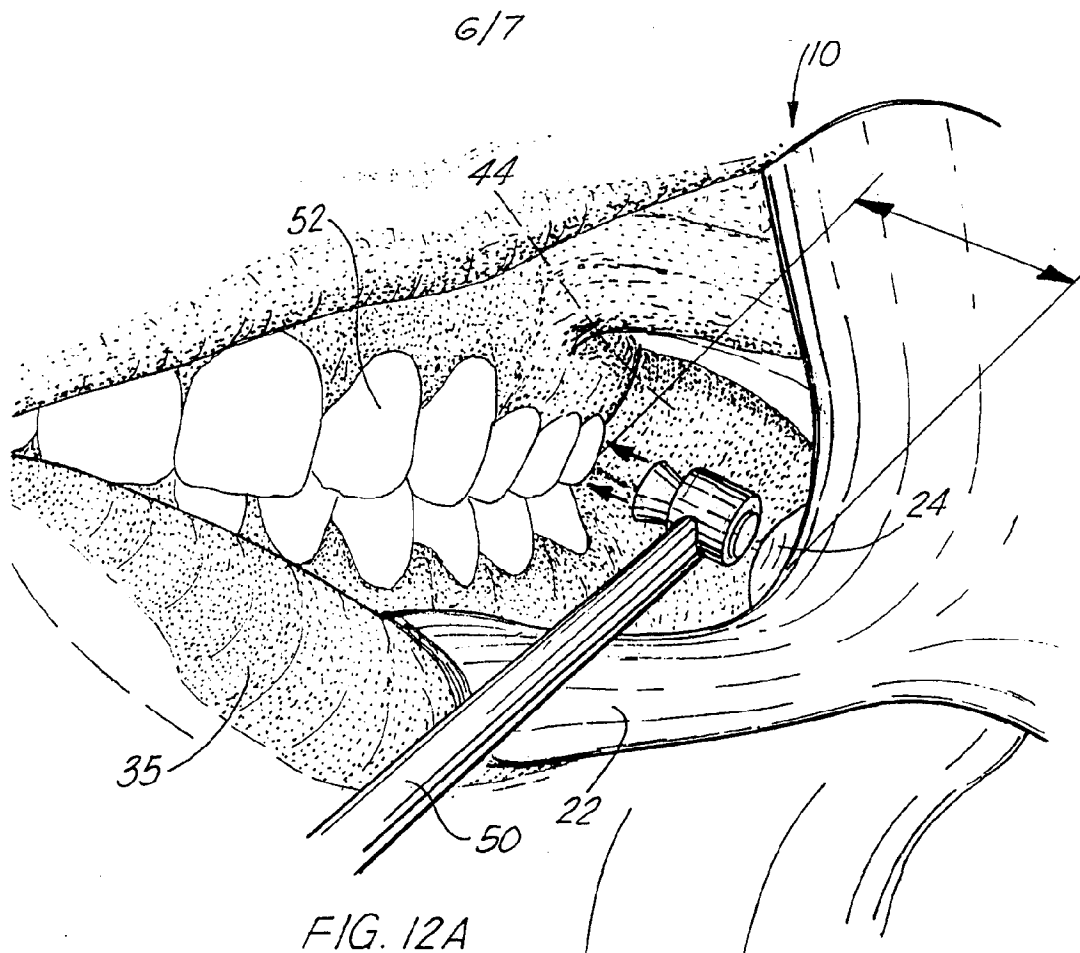


FIG. 12B



7/7

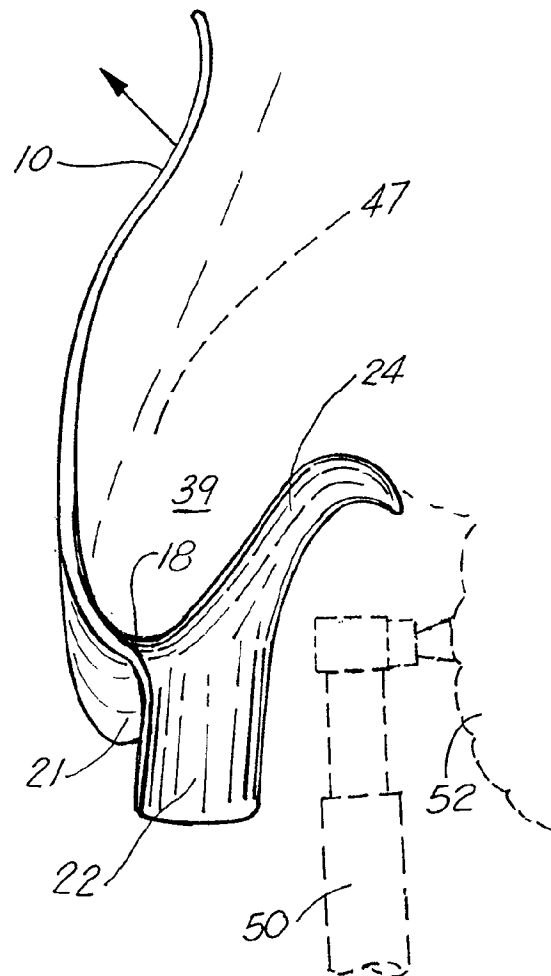


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/01577

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A61C 5/00

US CL :433/140; 600/237

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 433/140; 600/237, 238, 242

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,730,597 A (LUTTRELL) 24 March 1998, entire document.	1-16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

21 APRIL 2000

Date of mailing of the international search report

03 MAY 2000

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Authorized officer

NICK LUCCHESI

Telephone No. (703) 308-2698

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					Application Number	16/870,745
					Filing Date	May 8, 2020
					First Named Inventor:	Thien Nguyen
					Art Unit	3772
					Examiner Name	Not Yet Assigned
					Attorney Docket Number	INCEP-005
Sheet	1	of		9		
U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (If known)				
		US-	D495,799	9/7/2004	Hirsch et al.	
		US-	D497,426	10/19/2004	Hirsch et al.	
		US-	D615,203	5/4/2010	Hirsch et al.	
		US-	D696,779	12/31/2013	Hirsch et al.	
		US-	D734,851	7/21/2015	Nguyen	
		US-	D809,660	2/6/2018	Nguyen	
		US-	D876,627	2/25/2020	Nguyen	
		US-	50,461	10/17/1865	Dibble	
		US-	1,471,207	10/16/1923	Napoleon	
		US-	2,019,612	11/5/1935	Langhans et al.	
		US-	2,937,445	5/24/1960	Erickson	
		US-	3,090,122	5/21/1963	Erickson	
		US-	3,768,477	10/30/1973	Anders et al.	
		US-	3,802,081	4/9/1974	Rogers	
		US-	3,857,181	12/31/1974	Rappaport	
		US-	3,877,691	4/15/1975	Foster	
		US-	3,924,333	12/9/1975	Erickson	
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		US-	4,083,115	4/11/1978	McKelvey	
		US-	4,167,814	9/18/1979	Schubert	
		US-	4,192,071	3/11/1980	Erickson	
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		US-	4,822,278	4/18/1989	Oliva et al.	
		US-	5,037,298	8/6/1991	Hickham	
		US-	5,078,602	1/7/1992	Honoshofsky	
		US-	5,460,524	10/24/1995	Anderson	
		US-	5,516,286	5/14/1996	Kushner	

Examiner Signature	Date Considered
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Substitute for Form 1449/PTO					Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>					Application Number	16/870,745
					Filing Date	May 8, 2020
					First Named Inventor:	Thien Nguyen
					Art Unit	3772
					Examiner Name	Not Yet Assigned
Sheet	2	of	9	Attorney Docket Number	INCEP-005	
U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (If known)				
		US-	5,762,496	6/9/1998	Albertsson et al.	
		US-	5,890,899	4/6/1999	Sciafani	
		US-	6,022,214	2/8/2000	Hirsch et al.	
		US-	6,213,772	4/10/2001	Costello	
		US-	6,267,591	7/31/2001	Barstow	
		US-	6,338,627	1/15/2002	Hirsch et al.	
		US-	6,575,746	6/10/2003	Hirsch et al.	
		US-	6,908,308	6/21/2005	Hirsch et al.	
		US-	6,974,321	12/13/2005	Hirsch et al.	
		US-	7,287,981	10/30/2007	Hirsch	
		US-	7,293,990	11/13/2007	Hirsch et al.	
		US-	7,611,354	11/3/2009	Hirsch et al.	
		US-	7,748,981	7/6/2010	Hirsch et al.	
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		US-	8,057,227	11/15/2011	Hirsch et al.	
		US-	8,057,228	11/15/2011	Hirsch et al.	
		US-	8,075,310	12/13/2011	Hirsch et al.	
		US-	8,297,973	10/30/2012	Hirsch et al.	
		US-	8,529,256	9/10/2013	Hirsch et al.	
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		US-	8,911,232	12/16/2014	Nguyen	
		US-	9,084,656	7/21/2015	Hirsch	
		US-	9,089,389	7/28/2015	Hirsch et al.	
		US-	9,358,086	6/7/2016	Hirsch	
		US-	9,788,924	10/17/2017	Nguyen	
		US-	2003/0134253	7/17/2003	Hirsch et al.	
		US-	2006/0063126	3/23/2006	Aloise et al.	
		US-	2006/0063129	3/23/2006	Hirsch	
		US-	2006/0084031	4/20/2006	Hirsch et al.	
		US-	2008/0166684	7/10/2008	Kanas	

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		Application Number	16/870,745
		Filing Date	May 8, 2020
		First Named Inventor:	Thien Nguyen
		Art Unit	3772
Examiner Name		Not Yet Assigned	
Sheet	5	of	9
Attorney Docket Number		INCEP-005	

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		PCT Application No. PCT/US2014/032892 International Search Report and Written Opinion dated 9/4/14	
		Australian Patent Application No. 2014202637; AU Examination Report dated 1/23/15	
		Brazilian Patent Application No. BR1120140116377 Preliminary Office Action 1/7/20	
		Canadian Patent Application No. 2,919,142; CA Examination Report dated 5/31/16	
		Chinese Patent Application No. 201480039991.2 First Office Action dated 12/29/16	
		European Patent Application No. 14721736.8; Extended European Search Report dated 10/20/15	
		European Patent Application No. 17150671.0; Extended European Search Report dated 5/29/17	
		~~Docket No. INCEP-001 U.S. Patent Application 14/100,323; Final Office Action mailed 10/24/14~~	
		~~Docket No. INCEP-001 U.S. Patent Application 14/100,323; Office Action mailed 5/6/14~~	
		~~Docket No. INCEP-001 COA U.S. Patent Application 14/228,046; Office Action mailed 1/10/20~~	
		~~Docket No. INCEP-001 COA U.S. Patent Application 14/228,046; Final Office Action mailed 7/15/19~~	
		~~Docket No. INCEP-001 COA U.S. Patent Application 14/228,046; Office Action mailed 10/5/18~~	

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		Application Number	16/870,745		
		Filing Date	May 8, 2020		
		First Named Inventor:	Thien Nguyen		
		Art Unit	3772		
		Examiner Name	Not Yet Assigned		
Sheet	6	of	9	Attorney Docket Number	INCEP-005

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		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Final Office Action mailed 1/16/18	
		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Office Action mailed 6/5/17	
		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Office Action mailed 11/7/16	
		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Final Office Action mailed 6/6/16	
		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Office Action mailed 11/6/15	
		Docket No. INCEP-001COB U.S. Patent Application 14/228,050; Office Action mailed 11/4/16	
		Docket No. INCEP-001COB U.S. Patent Application 14/228,050; Final Office Action mailed 5/20/16	
		Docket No. INCEP-001COB U.S. Patent Application 14/228,050; Office Action mailed 11/6/15	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Office Action mailed 1/13/20	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Final Office Action mailed 8/8/19	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Office Action mailed 11/29/18	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Final Office Action mailed 11/2/17	

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		Application Number	16/870,745		
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		First Named Inventor:	Thien Nguyen		
		Art Unit	3772		
		Examiner Name	Not Yet Assigned		
Sheet	7	of	9	Attorney Docket Number	INCEP-005

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		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Office Action mailed 4/24/17	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Office Action mailed 12/3/15	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Final Office Action mailed 5/19/20	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Office Action mailed 10/7/19	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Final Office Action mailed 3/22/19	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Office Action mailed 9/7/18	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Final Office Action mailed 11/2/17	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Office Action mailed 4/13/17	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Final Office Action mailed 6/7/16	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Office Action mailed 11/20/15	
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(21) International Application Number: PCT/US00/10219 (22) International Filing Date: 14 April 2000 (14.04.00) (30) Priority Data: 09/291,763 14 April 1999 (14.04.99) US (71)(72) Applicant and Inventor: COSTELLO, William, J. [US/US]; 904 Pebblebrook Lane, East Lansing, MI 48823 (US). (74) Agents: KNECHTEL, Robert, L. et al.; Knechtel, Demeur & Samlan, Suite 2810, 30 South Wacker Drive, Chicago, IL 60606 (US).		(81) Designated States: AU, BR, CA, CN, CZ, FI, HU, JP, KP, KR, NO, NZ, PL, RU, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: ORAL ISOLATION DEVICE WITH EVACUATION CHAMBERS		
(57) Abstract An essentially U shaped oral isolation device (20) having a tongue arm (50), a buccal arm (52), and a hinge section (54) is provided. The device is an essentially hollow member having an upper suction chamber (46), and a lower suction chamber (48) within the hollows of the oral isolation device (20). Each chamber further comprises suction inlet apertures (62, 64) through which saliva, fluid, aerosol mist, and debris can be evacuated from the operative site; and a suction outlet chamber (56) through which the collected saliva, fluid, and debris are removed from the device. A U-shaped hinge member (54) joins the buccal arm (52), and the tongue arm (50). It has position memory which permits the user to squeeze the arm members toward one another for placement in the mouth; and upon release, the arm members exert opposing positional influence against the tongue, and cheek resulting in retraction of the tongue, the cheek, thereby, creating a clear operative field.		

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Oral Isolation Device with Evacuation Chambers

I. TECHNICAL FIELD

The present invention relates to oral isolation devices for use in dental procedures and, more particularly, to an oral isolation device which optimizes the size of the operating field, provides unobstructed cheek and tongue retraction, and further includes fluid, aerosol, and debris evacuation chambers adapted to attach to suction devices, thereby keeping the operative field dry without causing tissue damage to surrounding tissue.

II. BACKGROUND OF THE INVENTION AND PRIOR ART

During oral procedures, the dentist encounters many unique surgical difficulties. For instance, the oral cavity is a small space within which to work; it is bacteria laden and rich in blood supply; there is saliva, debris and applied fluid and aerosol buildup; and, finally, many patients have difficulty in keeping their tongues from entering the operative field.

Over the years, many appliances have been devised to assist in maintaining a clear and clean operative field. One example is seen in U. S. Patent No. 1042133 to Marshall. This patent discloses a device for working on a patient's lower front teeth. This device includes a saliva ejector and a lower lip deflector and consists of a hollow double-bow tube having an exterior portion and an interior portion. The interior portion passes over

1 the lower front teeth and rests below the tongue. The exterior portion has a lower lip
2 deflector which hooks over the patient's lower lip exposing the front lower teeth. While
3 this device is suitable for working on the front lower teeth, it has no application for use
4 with the upper teeth or on lower teeth other than the front teeth. An additional
5 shortcoming of this device is that it only provides for evacuation of fluid collecting near
6 the lingual mucosa at the base of the tongue.

7 Two more examples are seen in U. S. Patent No. 1401646 to Roan (a saliva
8 ejector for use in dental procedures involving the lower jaw; it consists of two perforated
9 tubular portions, one of which is disposed on the lingual side of the alveolar ridge and the
10 other on the buccal side of the alveolar ridge. Optionally included is a tongue deflection
11 plate) and U. S. Patent No. 2830371 to Dahl (a variation of a hollow tube saliva ejector
12 system having a tongue holder; this device further including a chin plate). While these two
13 devices offer certain advances, they are not without shortcomings. First, they are
14 satisfactory for use only in lower jaw procedures. They have no application for upper jaw
15 procedures. Second, while the devices offer some tongue retraction capabilities, they do
16 so by tongue depression. Tongue depression can be quite uncomfortable for the patient
17 and is only a marginally effective technique since a patient's tongue can slip from beneath
18 the depressor. Third, both devices only provide for evacuation of pooled saliva and fluid,
19 with Dahl doing so only on the buccal side of the gums. Finally, neither device permits
20 retraction of the cheeks. Thus, the devices do not significantly increase the size of the

1 operating field.

2 Another example is seen in U. S. Patent No. 3090122 to Erickson which teaches a
3 dental appliance that provides for the collection and drainage of liquid and debris, partial
4 retraction of an adjacent cheek and depression of the tongue, and a bite support to
5 maintain the device's position and the patient's mouth open. A shortcoming of this device
6 is that it requires the patient bite down on the device to hold it into place. This can lead to
7 patient discomfort and movement of the device. A further shortcoming of this device is the
8 placement system may cause obstruction of the operative field. A further shortcoming of
9 this device is that it only retracts a small portion of the tongue and provides essentially no
10 retraction of the cheek, thereby only slightly increasing the operative field. A final
11 shortcoming of this device is that it collects only collected fluid and debris.

12 A further example is seen in U. S. Patent No. 4215984 to Moss. This patent
13 teaches a mouth prop consisting of upper and lower U-shaped sections, the sections
14 having apertures for extracting fluid and debris, cheek deflectors, a tongue depressor, and
15 upper and lower lip deflectors. While this device is an improvement in the art field, it is
16 not without its shortcomings.

17 A first shortcoming is that the device provides for tongue depression instead of
18 retraction; the drawback of which is discussed above. A second shortcoming is that the
19 device fits around the front of a patient's mouth, thereby creating a potential obstruction
20 to the operating field. Another shortcoming of the device is that while providing for cheek

1 retraction, it does so only passively, thus it only minimally increases the size of the
2 operating field. A last but significant shortcoming of the device is that while providing for
3 fluid and debris evacuation at not only the mandibular level but also the maxillary level, it
4 does so at only one suction volume. Thus, there is no ability to adjust suction flow
5 volumes to maintain the optimum flow for a given area.

6 Examples of other prior art are found in U. S. Patent Nos. 4259067, 4260378,
7 4632093, 4992046, 5037298, 5232362, and 5460524.

8 While the prior art provides certain advances in isolating oral tissue and evacuating
9 saliva from an operative field, the prior art suffers five general shortcomings. First, while
10 increasing the size of the operative field somewhat, none of the prior art maximizes the
11 size of the operative field. The prior art generally provides only discomfort causing
12 tongue depression and, at best, minimal cheek retraction. Second, the prior art, in some
13 fashion or another, obstructs the operative field in which a dentist must work. Third, the
14 prior art is all designed to be fixed in shape. It forces the patient's mouth to conform to it
15 as opposed to the device conforming to the patient's mouth. Fourth, the devices which
16 provide for saliva evacuation generally do so only in a passive sense. The devices are
17 designed to fit on either the lingual or buccal mucosa near the base of the alveolar ridge.
18 These designs only enable the devices to extract saliva and debris which have, through
19 gravitational flow, settled in the bottom of the mouth. This is often ineffective inasmuch
20 as a comfortable operating angle requires that a patient's head be tilted somewhat

1 backwards. Thus, the saliva and debris do not always congregate or collect in a position
2 convenient for evacuation by the device.

3 Fifth, the prior art that does provide an evacuation means other than in the floor of
4 the mouth, does so only at the same suction volume as that of the lower jaw saliva
5 evacuation. This invariably leads to a situation in which the misting aerosol spray, which
6 keeps drill bits and teeth cool and clears away debris, is not efficiently evacuated from the
7 operating field. If the suction flow rate is increased sufficiently to remove the misting spray,
8 the suction apparatus positioned near the base of the mouth will create a seal with
9 surrounding tissue, resulting in tissue damage and preventing removal of collected saliva and
10 debris. If, on the other hand, suction flow is decreased to a level in which accumulated fluid
11 can be extracted, the suction flow rate is ineffective at evacuating misting aerosol spray.

12 There is need, therefore, for an oral isolation device which provides an optimal size
13 to the operative field by retracting both the tongue and the cheek adjacent to preselected
14 oral tissue, maintains a clear operative field by creating no obstructions, and enables
15 efficient simultaneous evacuation of saliva, aerosol, and debris from the base of the mouth
16 and from the oral cavity.

17 **III. OBJECTS OF THE INVENTION**

18 It is an object of the present invention to provide an oral isolation device which
19 optimally retracts the tongue and adjacent cheek away from teeth and surrounding oral
20 tissue on which work is to be performed.

1 It is a further object of the present invention to provide such an oral isolation
2 device which has a spring action which enables the device to self-adjust to the patient's
3 mouth.

4 It is a further object of the present invention to provide such an oral isolation
5 device which minimizes operative field obstruction.

6 It is another object of the present invention to provide such an oral isolation device
7 that is essentially hollow and contains chambers having a plurality of suction inlet
8 apertures and a suction outlet aperture for each chamber, the suction outlet apertures
9 being adapted to be removably affixed to suction devices, thereby permitting each chamber
10 to be individually adjusted as to suction flow.

11 It is yet a further object of the present invention to provide such an oral isolation
12 device which is easy to use, causes no or minimal patient discomfort, and relieves the
13 dentist or dental assistant from the need to reposition suctioning devices during a dental
14 procedure.

15 **IV. SUMMARY OF THE INVENTION**

16 The above objects of the invention are provided for in an improved oral isolation
17 device. According to the invention, the oral isolation device is essentially a U-shaped
18 member having a tongue arm, a buccal arm, and a hinge section. The device is an
19 essentially hollow member preferably made of two complementary essentially U-shaped
20 halves. In the preferred embodiment, when the complementary halves are joined, an upper

1 suction chamber and a lower suction chamber are created within the hollows of the oral
2 isolation device. Each chamber further comprising suction inlet apertures through which
3 saliva, fluid, and debris can be evacuated from the operative site, and a suction outlet
4 chamber through which the collected saliva, fluid, and debris are removed from the
5 device.

6 The arms of the oral isolation device are preferably ovoid in shape, with one arm
7 being disposed against the tongue, and the opposite arm being disposed against the buccal
8 mucosa. The arm disposed against the tongue is concave with respect to the tongue, and
9 the arm disposed against the buccal mucosa is convex with respect to the buccal mucosa.
10 The two arms are sized such that they create a barrier to the tongue and cheek entering
11 the operative field, and are of a height sufficient to prevent the patient's mouth from
12 closing.

13 A U-shaped hinge member joins the buccal arm and the tongue arm. The hinge member
14 is smaller in height than the arm members. It has position memory which permits the user to
15 pinch the arm members toward one another for placement in the mouth and upon release, the
16 arm members directional induce the tongue and cheek away from the operative field.

17 Also provided is a method of use for the device in which the tongue arm and
18 buccal arms are forced toward one another. The hinged member is then inserted into the
19 patient's oral cavity and placed around the rearmost tooth, and preferably, posterior to the
20 alveolar ridge, of that side of the mouth on which work is to be performed. Upon proper

1 placement of the device, the user releases the pressure on the arms of the device, the arms
2 thereby exerting retraction pressure to the cheek and tongue, resulting in retraction of the
3 tongue and cheek, thereby creating a clear operative field.

4 A reduced pressure high volume device is then attached to the upper chamber
5 suction outlet and a low pressure reduced volume device is attached to the lower chamber
6 outlet.

7 In an alternative embodiment, the device is a solid member containing no chambers
8 and is used for cheek and tongue retraction during dental procedures wherein saliva and
9 debris evacuation is not required.

1 **V. BRIEF DESCRIPTION OF THE DRAWINGS**

2 Figure 1 depicts an top view of the inventive device.

3 Figure 2 depicts an exploded version of the device illustrating the two major sections
4 which comprise the device as viewed from the side.

5 Figure 3 depicts a cross section view of the tongue retraction arm of the device.

6 Figure 4 depicts a cross section of the cheek retraction arm of the device.

7 Figure 5 depicts a lateral perspective view of the anterior of the device.

8 Figure 6 illustrates placement of the inventive device in a patient's mouth.

9 Figure 7 depicts an alternate embodiment of the inventive device wherein the device is a
10 solid member having no suction outlet arm.

11 **VI. DESCRIPTION OF THE PREFERRED EMBODIMENT**

12 The following description of the preferred embodiment will be better understood
13 with reference to the appended drawings. As those skilled in the art understand, the oral
14 cavity is a difficult area within which to perform procedures. The dentist and patient are
15 best served when the size of the operative field is optimized. The primary goal is to isolate
16 the area in which a procedure is to be performed. A secondary goal is to keep that area as
17 free as possible from collected saliva, fluid, aerosol, and debris. The present invention
18 addresses those problems and concerns in an improved Oral Isolation Device (device) 20.

19 Turning to Figure 1, a top view of device 20 is depicted. Turning to Figure 2, it
20 can be seen that in its preferred embodiment, device 20 is comprised of two sections,

1 outer section 22 and inner section 24. While the preferred embodiment envisions an outer
2 section and an inner section, this is done for manufacturing purposes only. The scope and
3 spirit of the inventive device can be fully realized through other means such as, but not
4 limited to, an upper half and a lower half. Outer section 22 further comprises outer wall
5 26 and inner side 28. Inner section 24 further comprises inner wall 30 and outer side 32.
6 The perimeter 34 of outer section 22 curves slightly toward inner side 28 while the
7 perimeter 34 of inner section 24 curves toward outer side 32. Thus, when outer section
8 22 and inner section 24 are coformed together, they form a hollow space within inner side
9 28 and outer side 32. Turning to Figure 1, it can be seen that divider 38 extends along the
10 horizontal length of device 20. As depicted in Figure 2, divider 38 is shown positioned on
11 inner side 28 of outer section 22. While divider 38 is shown in such a position for
12 explanatory purposes, it is to be understood that divider 30 could be located also on outer
13 side 32. Also, while divider 38 is shown in the drawings as essentially a uniform line, it is
14 to be further understood that divider 38 may also be wider, creating a smaller space
15 between divider 38 and edge 40. Divider 38 may also be formed into device 20 after outer
16 section 22 and inner section 24 are coformed together.

17 During the manufacturing process, outer section 22 and inner section 24 may be
18 coformed together through any conventional means such as ultrasonic welding. Other
19 molding means such as thermal forming can also be used to manufacture the device.
20 However, due to the complexity of creating an essentially hollow U-shaped device, the

1 inventor found that welding two complementary sections to one another is preferred.

2 Device 20 is preferably made of a semi-rigid material; plastic is ideal.

3 Turning to Figure 3, it can be seen that once outer section 22 and inner section 24
4 are coformed together, an upper seam 42 and lower seam 44 create an edge 40 (Figure 1).
5 As also seen in Figures 3 and 4, divider 38 defines an upper chamber 46 and a lower
6 chamber 48. Thus, three dimensional space is created: a vertical space extending from
7 lower seam 42 and upper seam 44, a front-to-back created by the U-shaped configuration
8 of device 20, and a horizontal space created within the side wall. Thus, a hollow space
9 defining the chambers is created.

10 Returning to Figure 1, the completed apparatus can be broken down into
11 essentially three sections; a tongue retraction arm 50, a cheek retraction arm 52, and a
12 hinge member 54. As can be seen in Figure 2, tongue retraction arm 50 and cheek
13 retraction arm 52 are essentially ovoid in shape. Cheek retraction arm 52 further includes
14 suction outlet member 56. At its free end, suction outlet member 56 further divides into
15 low volume suction arm 58 and high volume suction arm 60. As seen in Figure 2, low
16 volume suction arm 58 and high volume suction arm 60 continue at separate passageways
17 62, 64 through the interior of suction outlet member 56. Low volume suction arm 58
18 terminates in lower chamber 48 and high volume suction arm 60 terminates in upper
19 chamber 46.

20 As seen in Figure 1, a posterior view of device 20, tongue retention arm 50 is
21 concave with respect to the tongue and as seen in Figures 3 and 4, cheek retraction arm 52

1 is convex with respect to the cheek. The inventor found that these geometric
2 configurations optimize the retraction ability of tongue retractor arm 50 in retracting the
3 tongue and cheek retraction arm 52 in retracting the cheek to create an optimum sized
4 operating field while at the same time creating a comfortable fit for the patient.

5 Tongue retraction arm 50 and cheek retraction arm 52 are preferably ovoid in
6 shape. This shape also adds to the retraction and comfort attributes of device 20. It is
7 also preferable that tongue retraction arm 50 and cheek retraction arm 52 are of such a
8 vertical size as to encourage a patient to keep his mouth open during a dental procedure.

9 As described above, in the preferred embodiment, device 20 is manufactured as a
10 two piece device. For purposes of the preferred embodiment, however, the device is
11 broken down into the tongue retraction arm 50, cheek retraction arm 52, and hinge 54. It
12 is to be understood that while hinge 54 is described as a separate section of the device and
13 can be viewed as a separate section in use of the device, in the preferred embodiment,
14 hinge 54 is part and parcel of the overall apparatus. As can be seen in Figures 1, 3, and 4,
15 hinge 54 is of a height less than that of tongue retraction arm 50 and cheek retraction arm
16 52. This is beneficial in that it makes hinge 54 easier to position and more comfortable for
17 the patient than if hinge 54 were the same height as the retraction arms. Hinge 54 has
18 position memory, which is beneficial in placement of the device 20, as more fully described
19 below. Upper chamber 46 and lower chamber 48 continue unobstructed through hinge 54
20 from cheek retraction arm 52 to tongue retraction arm 50.

1 As can be seen in Figures 1 and 2, inner section 24 also includes a plurality of ports
2 62 in upper chamber 46 and a plurality of slots 64 in lower chamber 48. While the
3 drawings depict the plurality of ports 62 near the upper edge 64 of divider 38, the
4 placement in this area is not critical. Likewise, the depiction of slot 64 near edge 40 of
5 lower chamber 48 is not critical. As described more fully below in use of device 20, ports
6 62 should be positioned so that they create optimum suctioning power for the removal of
7 aerosol mist and debris floating within the oral cavity during a dental procedure. Slots 64
8 should be positioned in an area of lower chamber 48 such that they are most effective in
9 evacuating accumulated saliva, fluid, and debris from the lower portion of the jaw during a
10 dental procedure.

11 As those skilled in the arts will quickly realize, however, port 62 should be placed
12 along the plane of occlusion since this placement optimizes the area in which aerosol mist and
13 floating debris are found and also is in the field of vision for a dentist during procedures.

14 To use device 20, the dentist or dental assistant grasps device 20 so that hinge 54
15 faces the posterior of the oral cavity and tongue retraction arm 50 and cheek retraction
16 arm 52 face the anterior of the oral cavity. The dentist or dental assistant then applies
17 compression pressure to tongue retraction arm 50 and cheek retraction arm 52, squeezing
18 the two arms close to one another. Device 20 is then placed in a patient's mouth so that
19 hinge 54 is inserted first and is fitted around the rear most teeth, and preferably around the
20 posterior edge of the alveolar ridge. When in proper position, hinge 54 will be behind the

1 rear most tooth, cheek retraction arm 52 will be on the buccal side of the alveolar ridge,
2 and tongue retraction arm 50 will be on the lingual side of the alveolar ridge. Once device
3 20 is placed in proper anterior - posterior position, the dentist or dental assistant then
4 releases the compression on tongue retraction arm 50 and cheek retraction arm 52. Upon
5 release of the compression pressure, the position memory of hinge 54 causes the tongue
6 retraction arm and cheek retraction arm to move in opposing directions, the tongue
7 retraction arm thereby retracting the tongue and the cheek retraction arm thereby
8 retracting the adjacent cheek. Placement of device 20 can be visualized in Figure 6. As
9 also seen in Figure 6, the only portion of device 20 that protrudes from the patient's
10 mouth is suction outlet member 56 which extends in a downward position near the most
11 lateral side of the patient's mouth.

12 High volume suction arm 60 is removably attached to a high volume suction
13 apparatus and low volume suction arm 58 is removably attached to a low volume suction
14 apparatus. In this manner, a high volume of suction can be applied to the upper chamber,
15 thus resulting in effective removal of aerosol mist and debris free-floating in the oral
16 cavity. At the same time, low volume of suction pressure can be applied to the lower
17 chamber, thus effectively removing collected saliva, fluid, and debris from the lingual and
18 buccal base of the mouth without causing damage to the surrounding mucosa.

19 In an alternate embodiment, as depicted in Figure 7, the inventor contemplates use
20 of the device without the necessity of attaching it to suction apparatus. In such use, the

1 device as described above can be used without attaching high volume suction arm 60 and
2 low volume suction arm 58 to a suction apparatus. However, the inventor contemplates
3 that the device can be made so that it is a solid or hollow member having no internal
4 chambers, ports, slots or suction outlet member. In this alternative embodiment, device 20
5 is positioned in the same manner as describe above, with the only exception being that
6 suction outlet member 56 will not be extending from the mouth and, obviously, no suction
7 apparatus being applied to device 20.

8 The above description of the preferred embodiment is for illustration purposes
9 only. As those skilled in he arts will quickly realize, there are many variations of the
10 inventive device which are possible yet remain within the scope and spirit of the invention.
11 Accordingly, the inventive device is only to be limited by the appended Claims.

VII. CLAIMS

What is claimed:

- 1 1. An oral isolation device for use in dental procedures comprising:
2 an essentially U-shaped retraction member, the retraction member further
3 being an essentially hollow member having an inner wall and an outer wall, and further
4 including a divider within the hollow area, the divider defining an upper chamber and a
5 lower chamber, the upper chamber having a first suction outlet for removably attaching to
6 a suction device and a plurality of ports extending through the inner wall, the lower
7 chamber having a second suction outlet for removably attaching to a suction device and a
8 plurality of apertures extending through the inner wall.
- 1 2. The oral isolation device of Claim 1 further including means for retracting a cheek.
- 1 3. The oral isolation device of Claim 2 wherein the means for retracting the cheek is
2 essentially oval in shape.
- 1 4. The oral isolation device of Claim 2 wherein the means for retracting the cheek is
2 convex in relation to the cheek.

1 5. The oral isolation device of Claim 1 further including means to retract the tongue.

1 6. The oral isolation device of Claim 5 wherein the means for retracting the tongue is
2 generally oval in shape.

1 7. The oral isolation device of Claim 5 wherein the means for retracting the tongue is
2 generally concave with respect to the tongue.

1 8. An essentially U-shaped retraction device for retracting a cheek and tongue away
2 from teeth comprising an inner portion and an outer portion, the inner portion and outer
3 portion defining an essentially hollow area, the hollow area further characterized by
4 including at least one chamber, a passageway connecting the at least one chamber to a
5 suction outlet, and a plurality of ports extending through the inner portion.

1 9. The essentially U-shaped device of Claim 8 further including means for retracting a
2 cheek.

1 10. The essentially U-shaped device of Claim 8 wherein the means for retracting the
2 cheek is essentially ovoid in shape.

1 11. The essentially U-shaped device of Claim 8 wherein the means for retracting the
2 cheek is convex in relation to the cheek.

1 12. The essentially U-shaped device of Claim 8 further including means to retract the
2 tongue.

1 13. The essentially U-shaped device of Claim 12 wherein the means for retracting the
2 tongue is generally ovoid in shape.

1 14. The essentially U-shaped device of Claim 12 wherein the means for retracting the
2 tongue is generally concave with respect to the tongue.

1 15. An oral isolation device for use in dental procedures to isolate preselected oral
2 tissue by retracting a cheek and tongue adjacent to the preselected oral tissue comprising
3 an essentially U-shaped member having a cheek retraction portion, a tongue retraction
4 portion, and a hinge member, the cheek retraction portion and tongue retraction portion
5 be co-joined to each other by the hinge member.

1 16. The oral isolation device of Claim 15 further including means for retracting a
2 cheek.

1 17. The oral isolation device of Claim 16 wherein the means for retracting the cheek is
2 essentially ovoid in shape.

1 18. The oral isolation device of Claim 16 wherein the means for retracting the cheek is
2 convex in relation to the cheek.

1 19. The oral isolation device of Claim 15 further including means to retract the tongue.

1 20. The oral isolation device of Claim 19 wherein the means for retracting the tongue
2 is generally ovoid in shape.

1 21. The oral isolation device of Claim 19 wherein the means for retracting the tongue
2 is generally concave with respect to the tongue.

1 22. The oral isolation device of Claim 15 wherein the hinge member is of a height less
2 than the cheek retraction portion and the tongue retraction portion.

1 23. The oral isolation device of Claim 15 wherein the hinge has position memory.

1 24. An oral isolation device for dental procedures which isolates preselected teeth by
2 retracting a patient's tongue and cheek adjacent to the preselected teeth comprising:
3 a first wall member for retracting the tongue;
4 a second wall member for retracting the cheek;
5 a substantially U-shaped center member connecting the first wall portion to
6 the second wall portion, the essentially U-shaped center member having a memory which
7 causes opposing lateral pressure on the first wall member and the second wall member;
8 an upper vacuum chamber extending within the first wall member, second
9 wall member, and U-shaped center member, the upper vacuum chamber further having an
10 inner wall portion, an outer wall portion, and a free end, the inner wall portion further
11 including a plurality of apertures and the free end further including a vacuum outlet
12 member;
13 a lower vacuum chamber extending within the first member, second wall
14 member, and U-shaped center member, the lower vacuum chamber further including an
15 inner portion, an outer portion, and a free end, the inner portion further containing a
16 plurality of apertures and the free end containing a vacuum outer member; and
17 means for supplying a vacuum to the upper chamber and the lower vacuum
18 chamber.

1 25. The apparatus according to Claim 24 wherein the first wall member extends from
2 the front of the mouth to the rear of the mouth and is substantially oval in shape along its
3 vertical axis, the first wall member inner portion and outer portion being concave with
4 respect to the cheek.

1 26. The apparatus according to Claim 24 wherein the second wall member extends
2 from the front of the mouth to the rear of the mouth and is substantially oval in shape
3 along its vertical axis, the first wall member inner portion and outer portion being convex
4 with respect to the cheek.

1 27. A method of creating a dental operating field comprising the steps of:
2 exerting squeezing pressure upon an oral isolation device having a tongue
3 retraction portion and a cheek retraction portion, the tongue retraction portion and cheek
4 retraction portion each having a free end and a hinged end, the tongue retraction portion
5 and cheek retraction portion hinged to one another at a hinge, thereby forming an
6 essentially U-shaped device, so that the tongue retraction portion and cheek retraction
7 portion move toward one another;
8 inserting the oral isolation device into a patient's mouth in such a manner
9 that the hinge is inserted into the patient's mouth before the free ends of the tongue
10 retraction portion and cheek portion retraction;
11 positioning the hinge around the posterior teeth on one side of the
12 patient's' mouth; and
13 releasing the exertional force on the tongue retraction portion and the
14 cheek retraction portion thereby retracting the tongue with the tongue retraction portion
15 and the cheek with the cheek retraction portion.

28. A method of creating a dental operating field comprising the steps of:

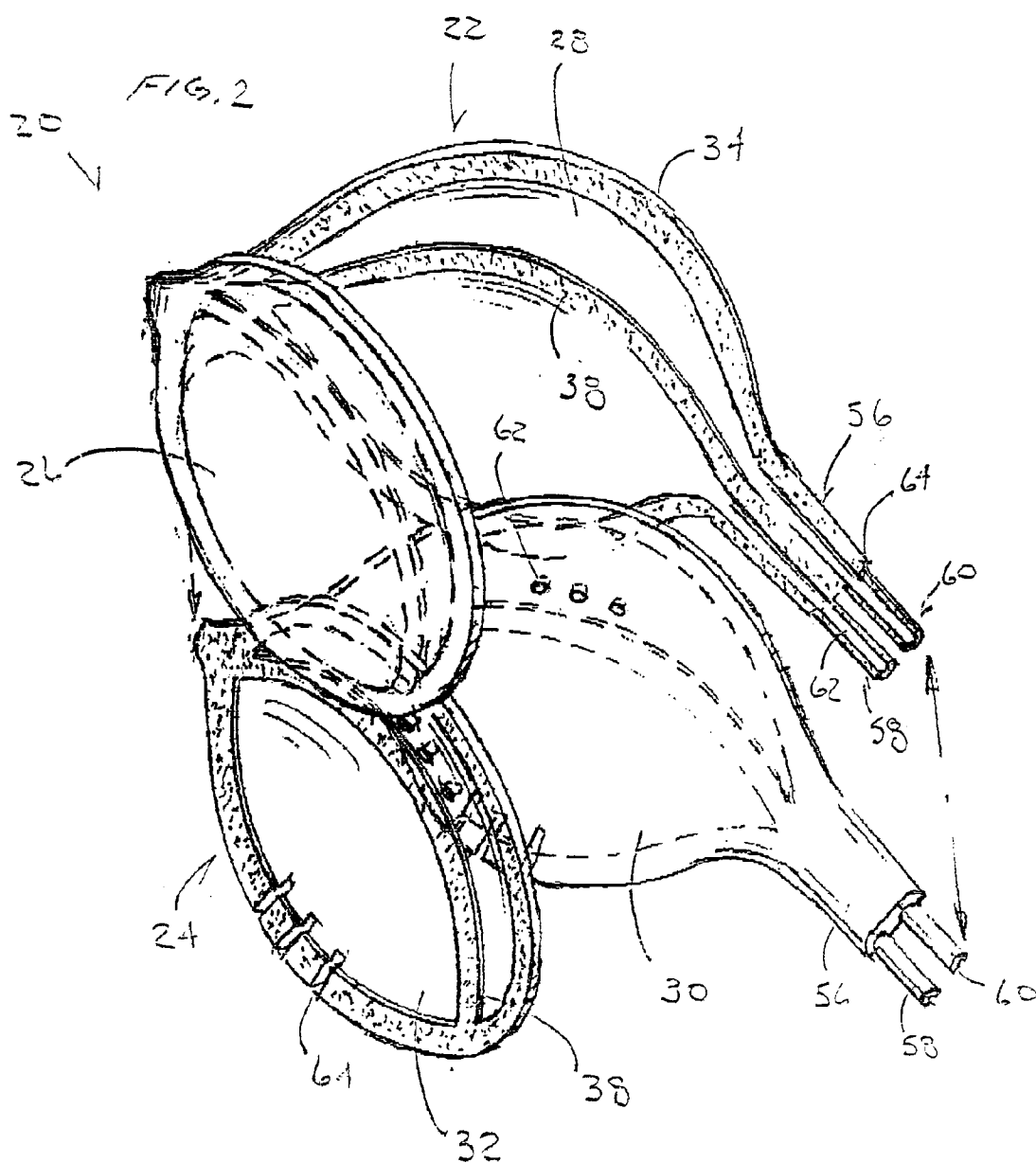
exerting a squeezing closing force upon an oral isolation device having a tongue retraction portion and a cheek retraction portion, the tongue retraction portion and cheek retraction portion each having a free end and a hinged end, the tongue retraction portion and cheek retraction portion hinged to one another at a hinge, thereby forming an essentially U-shaped device, the oral isolation device further being characterized by being an essentially hollow member having an upper chamber and a lower chamber, the upper chamber further comprising a plurality of ports and a suction outlet member, and the lower chamber further comprising a plurality of apertures and a second suction outlet member;

inserting the oral isolation device into a patient's mouth in such a manner that the hinge is inserted into the patient's mouth before the free ends of the tongue retraction portion and cheek portion retraction;

positioning the hinge around the posterior teeth on one side of the patient's' mouth;

releasing the exertional force on the tongue retraction portion and the cheek retraction portion thereby retracting the tongue with the tongue retraction portion and the cheek with the cheek retraction portion; and,

attaching the upper chamber suction outlet to a vacuum device and the lower chamber second suction outlet member to a second suction device.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/10219**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :A61C 17/06

US CL :433/93

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 433/91, 93, 94, 136, 140; 600/206, 238

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 4,053,984 A (MOSS) 18 October 1977, entire document.	8, 9, 11-14 ----- 10
X --- Y	US 590,460 A (MEHLIG) 21 September 1897, entire document.	15-23 ----- 10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier document published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

12 JUNE 2000

Date of mailing of the international search report

12 JUL 2000

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
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Washington, D.C. 20231

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Telephone No. (703) 305-0740

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	3	((("DRYSHIELD") near3 ("LLC"))).AS,AANM.	(USPAT)	OR	ON	ON	2021/11/22 01:53 PM
L2	12	((("DRYSHIELD") near3 ("LLC"))).AS,AANM.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/22 01:53 PM
L3	367	((("NGUYEN") near3 ("Thien")) OR ("PHAM") near3 ("Tam") near3 ("Thanh")) OR ((("NGUYEN") near3 ("Ethan")) OR ((("NGUYEN") near3 ("Lauren"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/11/22 02:05 PM
L4	1359	((("NGUYEN") near3 ("Thien")) OR ("PHAM") near3 ("Tam") near3 ("Thanh")) OR ((("NGUYEN") near3 ("Ethan")) OR ((("NGUYEN") near3 ("Lauren"))).INV.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/22 02:05 PM
L5	2	(US "20200352680" A1).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2021/11/22 02:06 PM

L7	380	(433/92).ccls.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/22 02:07 PM
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L21	4	20210068922-A1 OR US-20200046478-A1 OR US-20090123886- A1 OR US- 20080166684-A1 OR US-20030017433-A1 OR US-20180228643- A1 OR US- 20170156833-A1 OR US-20170156831-A1 OR US-20170156832- A1 OR US- 20160175067-A1 OR US-20150335409-A1 OR US-20060234187- A1 OR US- 20060063129-A1 OR US-20210346125-A1 OR US-20210085438- A1 OR US- 20200155284-A1 OR US-20190298163-A1 OR US-20170245843- A1 OR US- 20160375183-A1 OR US-20140349249-A1 OR US-20130288196- A1 OR US- 20120199135-A1 OR US-20120015317-A1 OR US-20090274991- A1 OR US- 20090204065-A1).did. AND PGPB.dbnm.) OR ((GB-2581794-A OR WO-2018126150-A1 OR WO-2017192676- A1 OR FR-2992161-A1 OR KR-100654392-B1 OR WO-2006052756- A1 OR WO-0061031- A1 OR WO-0042939- A1 OR FR-3073137-A1 OR FR-3043906-A1 OR DE-102013110302-A1 OR WO-2014209504- A1 OR FR-2989267-A1 OR EP-1543791- A1).did. AND FTDB.dbnm.) OR ((CA- 2851861-A1).did. AND DWPI.dbnm.)) AND ((reinforcement OR stability) ADJ bar) (((US-11179225-B2 OR US-D809660-S OR US- 9788924-B2 OR US- 10390916-B1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2021/11/29 06:19 AM
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		9044293-B2 OR US- 9956062-B2 OR US- 8852169-B2 OR US- 8221316-B2 OR US- 8012141-B2 OR US- 6672305-B2 OR US- 5720275-A OR US- D615203-S OR US- 5460524-A OR US- 10952831-B1).did. AND USPT.dbnm.) OR ((US- 20140212841-A1 OR US-20140162209-A1 OR US-20160067022- A1 OR US- 20210068922-A1 OR US-20200046478-A1 OR US-20090123886- A1 OR US- 20080166684-A1 OR US-20030017433-A1 OR US-20180228643- A1 OR US- 20170156833-A1 OR US-20170156831-A1 OR US-20170156832- A1 OR US- 20160175067-A1 OR US-20150335409-A1 OR US-20060234187- A1 OR US- 20060063129-A1 OR US-20210346125-A1 OR US-20210085438- A1 OR US- 20200155284-A1 OR US-20190298163-A1 OR US-20170245843- A1 OR US- 20160375183-A1 OR US-20140349249-A1 OR US-20130288196- A1 OR US- 20120199135-A1 OR US-20120015317-A1 OR US-20090274991- A1 OR US- 20090204065-A1).did. AND PGPB.dbnm.) OR ((GB-2581794-A OR WO-2018126150-A1 OR WO-2017192676- A1 OR FR-2992161-A1 OR KR-100654392-B1 OR WO-2006052756- A1 OR WO-0061031- A1 OR WO-0042939- A1 OR FR-3073137-A1	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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L22	4	OR FR-3043906-A1 OR DE-102013110302-A1 OR WO-2014209504-A1 OR FR-2989267-A1 OR EP-1543791-A1).did. AND FTDB.dbnm.) OR ((CA-2851861-A1).did. AND DWPI.dbnm.)) AND ((reinforc\$5 OR stability) ADJ bar) ((US-11179225-B2 OR US-D809660-S OR US-9788924-B2 OR US-10390916-B1 OR US-9044293-B2 OR US-9956062-B2 OR US-8852169-B2 OR US-8221316-B2 OR US-8012141-B2 OR US-6672305-B2 OR US-5720275-A OR US-D615203-S OR US-5460524-A OR US-10952831-B1).did. AND USPT.dbnm.) OR ((US-20140212841-A1 OR US-20140162209-A1 OR US-20160067022-A1 OR US-20210068922-A1 OR US-20200046478-A1 OR US-20090123886-A1 OR US-20080166684-A1 OR US-20030017433-A1 OR US-20180228643-A1 OR US-20170156833-A1 OR US-20170156831-A1 OR US-20170156832-A1 OR US-20160175067-A1 OR US-20150335409-A1 OR US-20060234187-A1 OR US-20060063129-A1 OR US-20210346125-A1 OR US-20210085438-A1 OR US-20200155284-A1 OR US-20190298163-A1 OR US-20170245843-A1 OR US-20160375183-A1 OR US-20140349249-A1 OR US-20130288196-A1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:19 AM
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L23	40	20120199135-A1 OR US-20120015317-A1 OR US-20090274991-A1 OR US- 20090204065-A1).did. AND PGPB.dbnm.) OR ((GB-2581794-A OR WO-2018126150-A1 OR WO-2017192676-A1 OR FR-2992161-A1 OR KR-100654392-B1 OR WO-2006052756-A1 OR WO-0061031-A1 OR WO-0042939-A1 OR FR-3073137-A1 OR FR-3043906-A1 OR DE-102013110302-A1 OR WO-2014209504-A1 OR FR-2989267-A1 OR EP-1543791-A1).did. AND FTDB.dbnm.) OR ((CA- 2851861-A1).did. AND DWPI.dbnm.)) AND ((reinforc\$5 OR stability OR stabilizer) ADJ bar) ((US-11179225-B2 OR US-D809660-S OR US- 9788924-B2 OR US- 10390916-B1 OR US- 9044293-B2 OR US- 9956062-B2 OR US- 8852169-B2 OR US- 8221316-B2 OR US- 8012141-B2 OR US- 6672305-B2 OR US- 5720275-A OR US- D615203-S OR US- 5460524-A OR US- 10952831-B1).did. AND USPT.dbnm.) OR ((US- 20140212841-A1 OR US-20140162209-A1 OR US-20160067022-A1 OR US- 20210068922-A1 OR US-20200046478-A1 OR US-20090123886-A1 OR US- 20080166684-A1 OR US-20030017433-A1 OR US-20180228643-A1 OR US- 20170156833-A1 OR US-20170156831-A1 OR US-20170156832-A1 OR US- 20160175067-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:22 AM
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L26	1	US-20150335409-A1 OR US-20060234187-A1 OR US-20060063129-A1 OR US-20210346125-A1 OR US-20210085438-A1 OR US-20200155284-A1 OR US-20190298163-A1 OR US-20170245843-A1 OR US-20160375183-A1 OR US-20140349249-A1 OR US-20130288196-A1 OR US-20120199135-A1 OR US-20120015317-A1 OR US-20090274991-A1 OR US-20090204065-A1).did. AND PGPB.dbnm.) OR ((GB-2581794-A OR WO-2018126150-A1 OR WO-2017192676-A1 OR FR-2992161-A1 OR KR-100654392-B1 OR WO-2006052756-A1 OR WO-0061031-A1 OR WO-0042939-A1 OR FR-3073137-A1 OR FR-3043906-A1 OR DE-102013110302-A1 OR WO-2014209504-A1 OR FR-2989267-A1 OR EP-1543791-A1).did. AND FTDB.dbnm.) OR ((CA-2851861-A1).did. AND DWPI.dbnm.)) AND (stability OR support OR assist) (US "D364456").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:43 AM
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L27	1	(US D663831).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:44 AM
L28	8	(US "3453735").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:44 AM
L29	11	(US "3516160").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:44 AM
L30	4	(US "20040033468").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2021/11/29 06:45 AM

L31	2	(US "20140349249").pn.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:46 AM
L32	1	(US "D666726").pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:46 AM
L33	1	(US "D735858").pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:47 AM
L34	1	(US "D737964").pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2021/11/29 06:47 AM

L35	1	(US "D782047").pn.	AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:49 AM
L36	1	(US "D782048").pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:49 AM
L37	1	(US "D787069").pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:49 AM

L38	1	(US "D787070").pn.	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:50 AM
L39	17	(US "1731322").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:50 AM
L40	1	(US "D868958").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:50 AM
L41	6	(US "3758950").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2021/11/29 06:51 AM

L42	7	(US "5009595").pn.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:51 AM
L43	5	(US "5588836").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:51 AM
L44	5	(US "6241521").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:52 AM

L45	2	(US "9968341").pn.	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:52 AM
L46	3	(WO "2020231864").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 06:52 AM
L47	4	(US "20010008752").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:01 AM
L49	2	(US "20170156832").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2021/11/29 07:01 AM

L50	1	(US D495799).pn.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:02 AM
L51	1	(US D497426).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:02 AM
L52	1	(US D615203).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:03 AM

L53	1	(US D696779).pn.	IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:03 AM
L54	1	(US D734851).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:03 AM
L55	1	(US D809660).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:03 AM
L56	1	(US D876627).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2021/11/29 07:04 AM

L57	25	(US "50461").pn.	MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:04 AM
L58	20	(US "1471207").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:04 AM
L59	24	(US "2019612").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:04 AM
L60	18	(US "2937445").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29

			USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				07:05 AM
L61	16	(US "3090122").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:05 AM
L62	8	(US "3768477").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:05 AM
L63	10	(US "3802081").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO,	OR	ON	ON	2021/11/29 07:05 AM

L64	6	(US "3857181").pn.	NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:05 AM
L65	6	(US "3877691").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:06 AM
L66	18	(US "392433").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:06 AM
L67	11	(US "4017975").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2021/11/29 07:06 AM

L68	12	(US "4024642").pn.	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:06 AM
L69	5	(US "4083115").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:07 AM
L70	5	(US "4167814").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:08 AM

L71	9	(US "4192071").pn.	TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:08 AM
L72	5	(US "4511329").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:08 AM
L73	5	(US "4718622").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:08 AM
L74	5	(US "4802851").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2021/11/29 07:09 AM

L75	5	(US "4822278").pn.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:09 AM
L76	8	(US "5037298").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:09 AM
L77	6	(US "5078602").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:09 AM

L78	5	(US "5460524").pn.	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:10 AM
L79	5	(US "5516286").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:10 AM
L80	5	(US "5762496").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:10 AM
L81	6	(US "5890899").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2021/11/29 07:11 AM

L82	7	(US "6022214").pn.	IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:13 AM
L83	5	(US "6213772").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:13 AM
L84	16	(US "627591").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:13 AM

L85	5	(US "6338627").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:14 AM
L86	5	(US "6575746").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:14 AM
L87	6	(US "6908308").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:14 AM
L88	3	(US "7287981").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2021/11/29 07:14 AM

L89	2	(US "7293990").pn.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:14 AM
L90	5	(US "7611354").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:14 AM
L91	3	(US "7748981").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM
L92	4	(US "8029280").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2021/11/29 07:15 AM

L93	2	(US "8057227").pn.	AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM
L94	2	(US "8057228").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM
L95	2	(US "8075310").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM

L96	2	(US "8297973").pn.	RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM
L97	2	(US "8529256").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:15 AM
L98	2	(US "8535056").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:16 AM
L99	6	(US "8911232").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2021/11/29 07:16 AM

L100	2	(US "9084656").pn.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:16 AM
L101	2	(US "9089389").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:16 AM
L102	2	(US "9358086").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:16 AM

L103	2	(US "9788924").pn.	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:16 AM
L104	2	(US "20030134253").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:17 AM
L105	4	(US "20060063126").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:17 AM
L106	4	(US "20060063129").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2021/11/29 07:17 AM

L107	4	(US "20060084031").pn.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:17 AM
L108	2	(US "20080166684").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:17 AM
L109	2	(US "20080318183").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:17 AM

L110	4	(US "20090123886").pn.	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:18 AM
L111	2	(US "20090274911").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:18 AM
L112	2	(US "20110207076").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:18 AM
L113	2	(US "20110311942").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2021/11/29 07:18 AM

L114	4	(US "20120015320").pn.	IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:18 AM
L115	2	(US "20120237894").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:19 AM
L116	4	(US "20130095450").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:20 AM

L117	2	(US "20130252193").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:20 AM
L118	6	(US "20140004478").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:21 AM
L119	2	(US "20140162209").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:21 AM
L120	2	(US "20140212837").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2021/11/29 07:21 AM

L121	2	(US "20140212838").pn.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:21 AM
L122	2	(US "20140212839").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:21 AM
L123	2	(US "20140212840").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:22 AM
L124	2	(US "20140212841").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:22 AM

L125	2	(US "20140212842").pn.	AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:22 AM
L126	2	(US "20140305842").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:22 AM
L127	2	(US "20150335409").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:22 AM

L129	19	(CA "2851861").pn.	RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:25 AM
L130	4	(CN "102026587").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:25 AM
L131	3	(CN "102247140").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:25 AM
L132	0	(CN "105578986 A").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2021/11/29 07:25 AM

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L142	2	US-20120015317-A1 OR US-20090274991-A1 OR US-20090204065-A1).did. AND PGPB.dbnm.) OR ((GB-2581794-A OR WO-2018126150-A1 OR WO-2017192676-A1 OR FR-2992161-A1 OR KR-100654392-B1 OR WO-2006052756-A1 OR WO-0061031-A1 OR WO-0042939-A1 OR FR-3073137-A1 OR FR-3043906-A1 OR DE-102013110302-A1 OR WO-2014209504-A1 OR FR-2989267-A1 OR EP-1543791-A1).did. AND FTDB.dbnm.) (US "20140212838" A1).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/11/29 07:42 AM
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		"8029280" "8057227" "8057228" "8075310" "8297973" "8529256" "D696779" "20060063129" "20080166684" "20080318183" "20090123886" "20090274991" "20110207076" "20110311942" "20140212837" "20140212838" "20140212839" "20140212840" "20140212841").pn. OR ("8911232").urpn. AND (PGPB USPT USOC).dbnm.					
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There are no Interference searches to show.

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: POLYMER DENTAL DAM CLAMP AND RELATED ASSEMBLIES AND METHODS

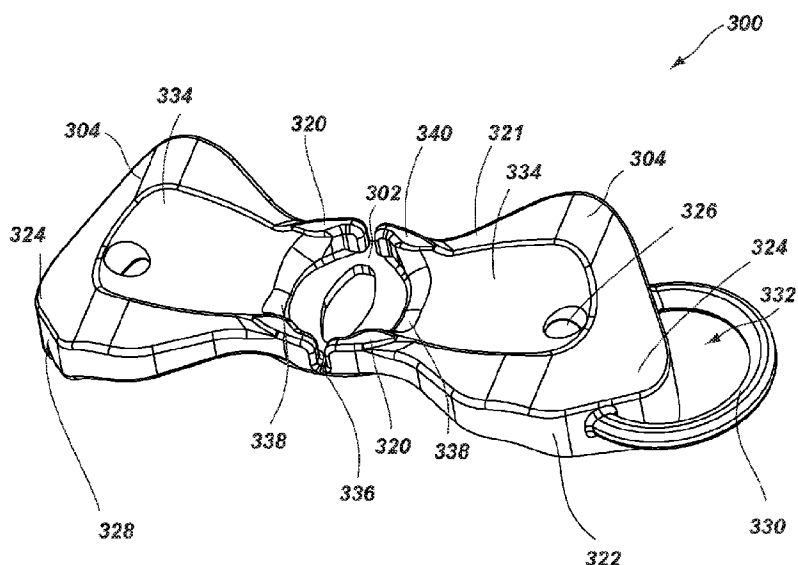


FIG. 7

(57) Abstract: A device for retaining a dental dam includes a flexible clamp including a central portion for receiving at least one tooth of a subject. Dental dam assemblies and methods for forming and using the clamps in dental dam assemblies are also disclosed.

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*

- 1 -

**POLYMER DENTAL DAM CLAMP AND
RELATED ASSEMBLIES AND METHODS**

PRIORITY CLAIM

5 This application claims the benefit of the filing date of United States Provisional Patent Application Serial No. 62/440,189, filed December 29, 2016, for “POLYMER DENTAL DAM CLAMP AND RELATED ASSEMBLIES AND METHODS,” the disclosure of which is hereby incorporated herein in its entirety by this reference.

TECHNICAL FIELD

10 The disclosure relates generally to the field of dental devices and related assemblies and methods. In particular, the disclosure relates to a flexible retaining device that couples with a portion of a subject's mouth (*e.g.*, teeth), such as a polymer dental clamp, for retaining a dental dam, and related assemblies and methods.

BACKGROUND

15 Dental dams are employed in many dental procedures. The rubber dental dam is known in the art and has been utilized in dentistry since 1864. It comprises a thin, flexible piece of rubber employed to isolate one or more teeth during various dental procedures.

20 The purpose for using the rubber dental dam is to provide an optimum working environment for the dentist while protecting the patient during operative procedures.

 The dam minimizes or eliminates saliva from the field of operation and may mildly retract the soft tissue around the tooth. Most procedures in operative dentistry are performed more efficiently by employing a dental dam, as it assures a dry working area

25 during all steps of the procedure. Another advantage to operating in a dry field is that dental restorative materials do not develop their full properties in a wet operating environment. The rubber dam then permits a dentist to obtain the expected physical properties of materials because of the dry field.

 The dental dam also protects the patient and the practitioner. The rubber dental

30 dam protects the patient from the possibility of aspirating or swallowing debris. In addition, the dam will permit prompt recovery of any instruments dropped during the operative procedure. The dental dam also affords the practitioner protection from any infectious disease that may be present in the subject's mouth.

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To employ a dental dam, the dam may first be placed around and attached to a YOUNG™ holder, which is a frame for the dental dam. Holes are subsequently punched in the dam such that each hole corresponds to a tooth for placement thereover. The dental dam is then lubricated to facilitate the passing of the dam through the tooth/crown contact points. Alternatively, the holes may be punched first, the dam is installed over the teeth and is then stretched over the frame. In either order, the dental dam then must be stabilized using a retainer.

A metal retainer clamp is the most common form of stabilizing a dental dam and consists of four prongs and two jaws connected by a bow. The problem with utilizing the metal retainer clamp is that the clamp is not ideally configured for a specific tooth. Due to the variation in teeth across a single mouth, from sharp, thin incisors to broad, wide molars, many types of teeth are encountered. Further, every mouth has different sizes and shapes of teeth. As a result, with specific clamps designed for specific teeth, many types of clamps need to be stocked by the practitioner.

Another disadvantage in employing the metal retainer clamp is that the four prongs must contact a tooth, if they do not, the clamp may need to be modified, a process requiring still more time. Furthermore, even with four-point contact, the retainer can injure the gingiva (*i.e.*, gums), as well as the tooth, resulting in post-operative soreness. Accurate placement of the clamps is difficult to achieve and, as a result, the patient may need to be anesthetized allowing for more comfortable retainer placement on the anchor tooth. The clamp may also create sealing problems on the anchor tooth, which then creates leakage problems of wetness into the work area. Further disadvantages include reprocessing costs associated with utilizing the metal retainer clamps in multiple proceeds, such as the required sterilization of the clamps along with reprocessing and sterilization of any dental tools, such as dental clamp forceps, that are utilized to place the metal retainer clamps (*e.g.*, dental clamp forceps).

Alternatively, practitioners have used elastomeric cords for retaining dental dams. One such cord is disclosed in U.S. Patent 5,104,317, the disclosure of which is hereby incorporated herein in its entirety by this reference. To retain a dental dam with an elastomeric cord, the dental dam is first placed over the subject's teeth as described above. Next, the practitioner elongates a section of elastomeric cord thereby reducing the cross-sectional area of one section of the cord. The practitioner then interposes a portion of the elongated section between at least two adjacent teeth and over the dam. Once the cord is

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positioned, the practitioner allows the cord to expand to its original cross-sectional area, thereby prohibiting the removal of the dam from the teeth.

Although the elastomeric cords have proven useful once they are positioned, problems have arisen when the practitioner is installing and removing the elastomeric
5 cords. One problem has been that the elastomeric cords have been difficult to pick up and grip easily. The difficulty in gripping leads to difficulty when the practitioner must elongate the cord. Another problem is that the installation and removal of the cords requires at least two hands. In view of the limiting working area, the two-handed operation is a disadvantage. Furthermore, because teeth tend to have rounded corners, the
10 elastomeric cord only provides a small wedge where the space between the adjacent teeth is the narrowest.

DISCLOSURE

Described are clamping devices for use in dental procedures. For example, such
15 clamping devices may be utilized for retaining a dental device, such as a flexible clamp (*e.g.*, a polymer clamp) for retaining one or more portions of a dental dam. The flexible clamps may be provided in multiple sizes in order to be utilized on different sizes (*e.g.*, adult, child, *etc.*) and types of teeth (*e.g.*, molars, anterior teeth, *etc.*).

In some embodiments, the device for retaining a dental dam may comprise a
20 flexible clamp circumscribing a central aperture for receiving at least one tooth of a subject in the central aperture.

In some embodiments, the clamp may include a central portion including one or more thin bands and/or one or more bands (*e.g.*, reinforced bands) defining a central aperture. The clamp may also include one or more wings attached to the central portion
25 proximate the one or more reinforced bands, where one or more of the one or more reinforced bands or the one or more wings are configured to provide a surface for retaining the dental dam.

In some embodiments, the clamp may include a raised portion extending linearly across a midsection of the one or more wings transverse to a longitudinal axis of the clamp.
30 The clamp may also include a gripping portion located on the one or more wings between the raised portion of the one or more wings and the central portion of the clamp.

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In some embodiments, the flexible clamp (*e.g.*, polymer clamp) may optionally include one or more reinforcement structures (wires, springs, ribbons, combinations thereof, *etc.*) that are utilized to reinforce the structure of the flexible clamp.

Also disclosed is a dental dam assembly including a dental dam and a clamp. The
5 clamp may comprise a polymer material and may be configured to retain the dental dam. In some embodiments, the clamp may include a central portion including one or more thin bands and/or one or more bands defining a central aperture. The clamp may also include one or more wings attached to the central portion proximate the one or more bands, the one or more wings configured to provide a surface to retain the dental dam relative to a tooth.

10 In some embodiments, the dental dam assembly may include a dental dam and a flexible clamp circumscribing a central aperture and for receiving at least one tooth of a subject in the central aperture to retain the dental dam relative to the at least one tooth.

In some embodiments, the disclosed dental clamps may be utilized with other dental devices and/or procedures. For example, a dental clamp itself, or in conjunction
15 with other devices, may be utilized as dental matrices in a restoration process.

In some embodiments, a dental clamp may include a feature and/or mechanism that interacts with an adjacent structure (*e.g.*, another portion of the clamp) to secure one or more of the wings in a displaced position. The displaced position may enhance the ability of the user to thread a portion of the clamp (*e.g.*, one or more wings) through an aperture in
20 a dental dam. Such a displaced position may be an upward position extending in a direction transverse (*e.g.*, perpendicular) to a major axis of the clamp (*e.g.*, where one or both wings extend from and substantially over the central portion).

In some embodiments, methods of retaining a dental dam include grasping at least one wing of a clamp; applying tension along an axis of the clamp to elongate at least one
25 band proximate an aperture of a central portion of the clamp; centering the aperture of the central portion over an exposed tooth; securing a portion of the at least one band in an intermediate space between adjacent teeth by applying pressure to position the at least one band proximate the gingiva; releasing the applied tension to enable the at least one band to at least partially surround the exposed tooth; and retaining the dental dam proximate the
30 exposed tooth with the at least one wing.

Further disclosed are methods for retaining a dental dam with the clamp and methods of forming the dental dam clamp according to the disclosure.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a top view of a clamp for retaining a dental dam in accordance with an embodiment of the disclosure.

FIG. 2 depicts a front plan view of the clamp of FIG. 1.

5 FIG. 3 depicts an end view of the clamp of FIG. 1.

FIG. 4 depicts a top view of the clamp in use in a dental dam assembly in accordance with an embodiment of the disclosure.

FIG. 5 depicts an isometric view of a clamp for retaining a dental dam in accordance with an embodiment of the disclosure.

10 FIG. 6 depicts a front plan view of the clamp of FIG. 5.

FIG. 7 depicts an isometric view of a clamp for retaining a dental dam in accordance with an embodiment of the disclosure.

FIG. 8 depicts another isometric view of the clamp of FIG. 5.

15 MODE(S) FOR CARRYING OUT THE INVENTION

Illustrations presented herein are not necessarily meant to be actual views of any particular device, assembly, system, method, or components thereof, but are merely idealized representations, which are employed to describe embodiments of the disclosure. Additionally, elements common between figures may retain the same numerical
20 designation.

As used herein, the term “substantially,” in reference to a given parameter, means and includes to a degree that one skilled in the art would understand that the given parameter, property, or condition is met with a small degree of variance, such as within acceptable manufacturing tolerances. For example, a parameter that is substantially met
25 may be at least about 90% met, at least about 95% met, or even at least about 99% met.

FIG. 1 depicts a top view of a clamp for use in a dental procedure, such as, for example, an at least partially flexible clamp 100 for retaining a dental dam. In some embodiments, the clamp 100 may at least partially or entirely comprise a polymer (*e.g.*, rubbers, elastomers, silicon elastomers or rubbers, thermoplastic elastomers, plastics, combinations thereof *etc.*) dental dam clamp for retaining a dental dam (*e.g.*, rubber dental
30 dam) during a dental procedure. In some embodiments, the clamp 100 may be utilized to assist in temporarily retaining the dental dam in a desired position in order to isolate one or more teeth during a dental procedure. The clamp 100 comprises a central portion 102 (*e.g.*,

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a substantially elliptical, circular, or oval-shaped structure), which may comprise one or more thin bands 118 (*e.g.*, bands having a relatively smaller thickness taken in a radial or lateral direction) and one or more thicker or reinforced bands 120 (*e.g.*, bands having a relatively larger thickness taken in a radial or lateral direction). For example, two opposing
5 thin bands 118 and two opposing reinforced bands 120 may define a circumference of the substantially circular or oval-shaped structure of the central portion 102. In some embodiments, the thin bands 118 and/or reinforced bands 120 may be one continuous structure extending about (*e.g.*, surrounding) a central aperture 108 with relatively narrower and thicker portions as depicted in FIG. 1.

10 In some embodiments, the central portion 102 of the clamp 100 may include a cover portion (not shown) extending over the central aperture 108. Such a cover portion may act to cover (*e.g.*, shield, isolate) an upper portion of the subject's tooth or teeth that is received in the central aperture 108.

In some embodiments, the clamp 100, including the thin bands 118 and the
15 reinforced bands 120 of the central portion 102, may be one continuous structure of a single material (*e.g.*, polymer material). In other embodiments, the clamp 100 may be formed of different sections or materials that have been affixed (*e.g.*, using an adhesive, *etc.*) to one another in order to form the clamp 100.

In some embodiments, one or more portions of the clamp 100 may comprise a
20 material that is at least partially transparent in an imaging process. For example, one or more portions of the clamp 100 may comprise a radiolucent material that is at least partially transparent (*e.g.*, substantially entirely transparent) in images (*e.g.*, and/or will not interfere with other structures being imaged) taken by devices, such as, for example, cone beam computed tomography (CBCT) devices, X-rays devices, *etc.*

25 In some embodiments, the clamp 100 may include metal portions (*e.g.*, wire, spring, *etc.*) configured to provide additional support to the polymer material in high strain areas of the clamp 100, for example, in the reinforced bands 120. In other embodiments, each portion of the clamp 100 may be constructed exclusively of non-metallic materials (*e.g.*, rubber, plastic, silicone, polyimide, *etc.*). In addition, an increased thickness and/or
30 strength of material in the reinforced bands 120 enables a relatively higher tensile strength relative to the thin bands 118, while still retaining an at least partial ability to stretch (*e.g.*, elastically deform) around a subject's tooth or teeth. Such an effect enables the clamp 100 to maintain integrity without significantly tearing or damaging the clamp 100 while

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allowing the thin bands 118 to stretch (*e.g.*, elastically deform), thus minimizing a cross-sectional area of the thin bands 118 to enable placement thereof between adjoining teeth. In some embodiments, the clamp 100 may include a single body (*e.g.*, a molded article) consisting essentially of the polymer material. In some embodiments, the clamp 100 may
5 comprise a latex-free material, such as, for example, a radiopaque silicone medical grade material. Additional fillers may also be present in the polymer material. The clamp 100 may not be rigid and may be at least partially moldable, depending on the modulus of elasticity (*i.e.*, stiffness) of the material. The thin bands 118 and/or the reinforced
10 bands 120 may include a band of silicone or elastomer. Selection of specific materials may depend on desired physical properties including, for example, modulus of elasticity, compressive strength, and/or flexural strength. It may be appreciated that any suitable material may be used based on individual requirements.

While FIG. 1 depicts the clamp 100 including the central portion 102 having a generally oval shape with two opposing thin bands 118 (shown at the at top and bottom
15 sides of the central portion 102) and with two opposing reinforced bands 120 (shown at the left and right sides of the central portion 102), in other embodiments, the central portion 102 may be formed as any suitable size and shape, such as, for example, a C-shape or an arc-shape. By way of non-limiting example, a single reinforced band 120 may extend around a majority of the central portion 102, while a single thin band 118 may extend
20 around a minor section of the central portion 102, thereby providing a C-shape.

The central portion 102 of the clamp 100 may comprise the central aperture 108 defined by inner portions of the thin bands 118 and the reinforced bands 120. The central aperture 108 may be symmetric with respect to a longitudinal axis L of the clamp 100 and may be symmetric with respect to an axis transverse to the longitudinal axis L. However,
25 the central aperture 108 may, or may not, be circular or oval in shape. Rather, the central aperture 108 may have a non-uniform shape defined by the proximate locations and thicknesses of the surrounding thin bands 118 and the reinforced bands 120. For example, as shown in the embodiment of FIG. 1, the thin bands 118 have a relatively smaller cross-sectional area than the cross-sectional area of the reinforced bands 120. The cross-
30 sectional area of the thin bands 118 may approximate a cross-sectional area of dental floss. In addition, each of the thin bands 118 and the reinforced bands 120 may have a similar height to one another in a third direction (*i.e.*, out of the page, *see, e.g.*, FIG. 2) providing a coextensive surface with respect to one another. In other embodiments, the relative heights

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of the thin bands 118 and the reinforced bands 120 may be different and may not provide a coextensive surface.

The central portion 102 may include a web portion 106 (*e.g.*, an inner or innermost band) within at least a portion of an interior area of the central aperture 108. The web
5 portion 106 may have a decreased thickness taken in a direction transverse to the longitudinal axis L (*e.g.*, as compared to one or more adjacent portions of the clamp 100, such as, the bands 118, 120) and may easily conform (*e.g.*, elastically deform) around a subject tooth. The central aperture 108 may include an elongated shape (*e.g.*, a slot) having an enlarged central portion 112 and two relatively narrow side portions 114 as defined by
10 the web portion 106. In some embodiments, the enlarged central portion 112 may be concave along a centerline of the central aperture 108. As depicted in FIG. 1, the web portion 106 may extend from and/or be recessed within the inner portions of the thin bands 118 and the reinforced bands 120. In addition, the web portion 106 may be recessed from the upper surface of the central portion 102 (*e.g.*, recessed into the page from the
15 perspective of FIG. 1). In some embodiments, sections of the web portion 106 proximate the thin bands 118 may be relatively narrower than sections of the web portion 106 proximate the reinforced bands 120. The web portion 106 may include a thin, flexible portion of the polymer material of the clamp 100. As depicted, the central aperture 108 may be configured to receive a tooth therethrough, while the web portion 106 hugs the
20 tooth (*e.g.*, restricts around the tooth), providing additional surface area of polymer material to surround the tooth.

The clamp 100 may also comprise one or more wings 104 (*e.g.*, two opposing wings) attached to and generally extending away from the central portion 102 (*e.g.*, in a direction along the longitudinal axis L). The wings 104 may be located proximate the one
25 or more reinforced bands 120. The wings 104 (*e.g.*, handles) may be polygonal in shape where the outer edges of the wings 104 may flare outward and then back inward meeting, for example, at a point. In some embodiments, the wings 104 may be one continuous structure of a single material (*e.g.*, polymer material) with the clamp 100 and the central portion 102, including the thin bands 118 and the reinforced bands 120. In other
30 embodiments, the wings 104 may be formed of different sections or materials and affixed (*e.g.*, using an adhesive, *etc.*) to the central portion 102 of the clamp 100. In addition, the wings 104 may have a similar height with respect to the central portion 102 in the third direction (*i.e.*, out of the page) providing a coextensive surface with respect to the central

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portion 102. In other embodiments, the relative height of the wings 104 may not provide a coextensive surface with respect to the central portion 102, as shown in the embodiment of FIG. 2.

As depicted in FIG. 1, the wings 104 may be sized and shaped to be substantially symmetrical with respect to the central portion 102 or, in other embodiments, the wings 104 may be sized and shaped to be asymmetrical. Each of the wings 104 may include a raised portion 122 extending linearly (*e.g.*, transverse the longitudinal axis L) across a midsection thereof. The raised portion 122 may be located near an enlarged midsection of the wings 104, as depicted in FIG. 1. In some embodiments, the raised portion 122 may be formed to include an additional thickness relative to a thickness of the wings 104. In other embodiments, the raised portion 122 may be of a similar thickness as the wings 104, but may include an area having a heightened feature (*e.g.*, joint, bend, *etc.*) effectively providing an angle relative to a major plane of the wings 104, as shown in FIG. 2. Forming such an angle in the wings 104 may facilitate placement of the clamp 100 and retention of an associated device (*e.g.*, a dental dam).

The wings 104 may also include a gripping portion 124 located approximately between the raised portion 122 of the wings 104 and the central portion 102 of the clamp 100. The gripping portion 124 may provide an additional contour providing strength to the wings 104, along with providing increased grip strength while applying outward tension (*i.e.*, stretching) during application of the clamp 100. In some embodiments, the gripping portion 124 may be configured to express a logo or other such pattern unique to the clamp 100. For example, the gripping portion 124 as depicted in FIG. 1 corresponds to a product name (*i.e.*, “NC” representing the product name “Novoclamp”). Additional shapes and configurations of the wings 104 are contemplated. While the wings 104 are depicted as being two opposing wings 104 located proximate two reinforced bands 120, the wings 104 may also include one or more non-opposing wings for other embodiments of the central portion 102 (*e.g.*, C-shaped or arc-shaped configurations). However, it is to be appreciated that having two opposing wings 104 facilitates stretching of the clamp 100 during application. The wings 104 may also include one or more holes 126 in an outer end thereof remote from the central portion 102. In some embodiments, the one or more holes 126 may be utilized to retrieve and/or remove the clamp 100. For example, another dental device (*e.g.*, floss) may be passed through the one or more holes 126 in order to secure and/or retrieve the clamp 100 in the event it may become dislodged or removed from the

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subject's tooth. In some embodiments, the one or more holes 126 may be located and configured to enable retention of a dental instrument in order to facilitate stretching the wings 104 and to ensure accurate placement of the clamp 100.

In some embodiments, a length (*e.g.*, along the longitudinal axis L) of the clamp 100, including the central portion 102 and the wings 104, may be between about 4 mm and about 10 mm. In some embodiments, the length of the clamp 100 may be between about 5 mm and about 6 mm. In addition, a width (*i.e.*, transverse to the longitudinal axis L) of the clamp 100, may be between about 4 mm and about 10 mm. In some embodiments, the width of the clamp 100 may be between about 8 mm and about 10 mm.

FIG. 2 depicts a front plan view of the clamp 100 of FIG. 1 as viewed from a side surface thereof. As shown in FIG. 2, the clamp 100 may include a non-planar aspect with regard to the major surface of the clamp 100. As depicted, the wings 104 are configured to extend away from the central portion 102. In some embodiments, the wings 104 may be configured to be flush with and provide a coextensive surface with respect to the central portion 102. In other embodiments, the raised portion 122 may extend along a midsection of the wings 104. In other words, portions of the midsection of the wings 104 may slightly flair upward with respect to the major plane of the wings 104. In other embodiments, the raised portion 122 may include an additional thickness of material, as discussed above. In addition, the thickness of a sidewall 128 of the wings 104 may be the same as, or different than, the thickness of the central portion 102. For example, the thickness of the wings 104 may be greater than, or in some embodiments, less than, the thickness of the central portion 102 depending on strength of material requirements in specific locations. It is to be understood that any shape or size of wings 104 may be contemplated.

FIG. 3 depicts an end view of the clamp 100 of FIG. 1 as viewed from a lateral end surface thereof containing the central portion 102 and the wings 104. As depicted in FIG. 3, the wings 104 may also include an angle relative to the longitudinal axis L of the clamp 100. In other words, the wings 104 may include a slight bend or joint as seen from the end view of the clamp 100. In addition, the gripping portion 124 may be configured to include an addition thickness relative the major plane of the wings 104, as shown in FIGS. 2 and 3.

FIG. 4 depicts a top view of the clamp 100 in use in a dental dam assembly 130. The dental dam assembly 130 including the clamp 100 may be utilized to provide a support structure for retaining a dental dam proximate to an exposed tooth 138 (*e.g.*, a molar). The

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dental dam assembly 130 may include a dental dam 132 (*e.g.*, a rubber or latex dental dam) including a dental dam frame 134. The dental dam 132 may include one or more apertures 136 configured to expose and isolate one or more teeth during a dental procedure. As shown in FIG. 4, the exposed tooth 138 may extend through the one or more
5 apertures 136 in the dental dam 132. In order to facilitate retention of the dental dam 132 using the clamp 100, a support structure with sufficient strength of material is required to retain the dental dam 132 proximate the exposed tooth 138 without damaging the exposed tooth 138 and/or surrounding tissue.

While conventional metal retention clamps also retain the dental dam 132
10 proximate the exposed tooth 138, the metal clamps often require multiple attachment points thereto. In addition, metal retention clamps tend to be uncomfortable to the patient, often requiring the need to anaesthetize the gums proximate the clamps. However, embodiments of the instant disclosure may enable ease of use by surrounding the exposed tooth 138 with the clamp 100 constructed of a polymer material in combination with the unique physical
15 characteristics (*i.e.*, shape and size) as disclosed herein. Such configurations enable the clamp 100 to provide suitable support structure to retain the dental dam 132 without damaging teeth and/or crowns along with surrounding tissue. In addition, use of the clamp 100 including the polymer material enables placement without tearing or otherwise damaging the dental dam 132. Also, as a result of the position of the clamp, which is
20 closer to the gum, without any metal rim interfering, the dentist is enabled to preform an occlusal bite check while the dam is in place without any interference from the metal rim or other portion of the clamp.

In addition, metal retention clamps may require help from an assistant and may require placement with forceps. In contrast, the clamp 100 may be positioned without
25 requiring assistance (*e.g.*, the assistance of another practitioner, such as an assistant). Further, the one or more holes 126 of the clamp 100 may be located and configured to enable retention of a dental instrument in order to facilitate stretching the wings 104 and to ensure accurate placement of the clamp 100. In this manner, the clamp 100 may permit the dental dam 132 to be safely retained within the mouth of the subject during the procedure.
30 The clamp 100 may be available in more than one size, for example, a smaller size for incisors and/or canines (*i.e.*, front teeth) or pediatric molars and a larger size for molar and premolar teeth, providing a sensible alternative to multiple size options of the metal retainer clamps. Another advantage over metal retention clamps includes the clamp 100

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using relatively inexpensive materials and manufacturing processes, enabling an affordable single use (*i.e.*, disposable) article. Further, the clamp 100 involves an easy learning curve as the clamp 100 is easily and quickly positioned, thereby saving time during a procedure.

Conventional devices for shielding teeth may also include a DMG MINIDAM®
5 commercially available from DMG America, of Englewood, NJ. However, the DMG MiniDam itself constitutes a smaller version of a dental dam rather than a clamp to hold a traditional dental dam in place. Therefore, the DMG MiniDam may not protect a subject from inhalation of materials and may not completely isolate teeth from the oral environment. The DMG MiniDam is disclosed in International Publication No.
10 WO 2015/124785, the disclosure of which is hereby incorporated herein in its entirety by this reference. Another device for retaining a dental dam is disclosed in International Publication No. WO 96/39984, the disclosure of which is hereby incorporated herein in its entirety by this reference.

With continued reference to FIG. 4, the aperture 136 of the dental dam 132 may be
15 aligned over an occlusal surface (*i.e.*, bite side) of the exposed tooth 138. In some embodiments, the dental dam 132 may be attached to the dental dam frame 134 for stability in handling and to add tension to the fabric of the dental dam 132. In some embodiments, application of the clamp 100 includes positioning the clamp 100 (*e.g.*, after positioning the dental dam 132) by grasping the wings 104 of the clamp 100 and applying tension in a
20 tensioning direction along the longitudinal axis L to elongate the thin bands 118 proximate the central aperture 108 of the clamp 100. The central aperture 108 of the clamp 100 may then be centered over the exposed tooth 138. The thin bands 118 may be secured in an intermediate space between adjacent teeth by applying pressure in a downward direction in order to position the thin bands 118 proximate the base of the exposed tooth 138 and
25 proximate the gingiva (*i.e.*, gums). In other words, stretching the clamp 100 will enable the thin bands 118 to fully extend in order to elongate the thin bands 118 reducing the cross-sectional area thereof to any suitable size (*e.g.*, longer, thinner, *etc.*) relative to the resting position of the thin bands 118 in order to facilitate insertion between adjacent teeth.

Once positioned, the applied tension of the thin bands 118 may be released by
30 releasing the wings 104. The thin bands 118 may then return to their resting position, filling intermediate spaces around the exposed tooth 138. As depicted, surface areas of the wings 104 are configured to retain the dental dam 132 proximate the exposed tooth 138 while the thin bands 118 remain located between interproximal surface of the exposed

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tooth 138 and adjacent teeth during the dental procedure. Stated in another way, the clamp 100 may provide structural support to retain the dental dam 132 in place during the procedure by allowing the wings 104 to engage the fabric of the dental dam 132.

Following the procedure, the clamp 100 may be released from the dental dam 132 by grasping the wings 104 and applying tension along the tensioning direction of the longitudinal axis L in order to re-stretch the thin bands 118 to facilitate removal thereof. Once the clamp 100 has been removed, the dental dam 132 may also be removed.

In other embodiments, the clamp 100 may be placed prior to placement of the dental dam 132. For example, the clamp 100 may be placed in a similar manner to that discussed above. Thereafter, the dental dam 132 may be placed by moving (*e.g.*, bending, rotating) the wings 104 and passing (*e.g.*, threading) the wings 104 through the aperture 136. The wings 104 may be released and returned back in their original configuration in order to secure the dental dam 132.

In some embodiments, the clamp 100 may be utilized to at least partially prevent cement from entering the gingival tissue of a subject by separating excess cement from the tissue of the subject. Such a feature may be utilized while cementing a crown on an implant abutment or prepped tooth and/or as an aid on the cementation of onlays, inlays, or veneers, *etc.*

In some embodiments, the clamp 100 may be utilized to at least partially prevent gingival crevicular fluid (GCF) and/or blood from contaminating and interfering during cementation, bonding a restoration at the cervical part of the tooth or crown.

FIG. 5 depicts an isometric view of a clamp for use in a dental procedure, such as, for example, an at least partially flexible clamp 200 for retaining a dental dam that may be at least partially similar to the clamp 100 discussed above in relation to FIGS. 1 through 4. FIG. 6 depicts a front plan view of the clamp of FIG. 5. As shown in FIGS. 5 and 6, the clamp 200 comprises a central portion 202. The clamp 200 may also comprise one or more wings 204 (*e.g.*, two opposing wings) attached to and generally extending away from the central portion 202.

The wings 204 may include an inner portion 220, a raised portion 222, and an end portion 224 (*e.g.*, gripping portion) extending outward from the central portion 202. The raised portion 222 may be located near an enlarged midsection of the wings 204 and the end portion 224 may extend (*e.g.*, downward) from the raised portion 222 and inner portion 220 at an angle. For example, and as depicted, the end portion 224 may extend

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downward at a relatively greater angle than the clamp 100 (FIG. 1) (*e.g.*, 45 degrees or more, 50 degrees or more, *etc.*) from a midline (*e.g.*, similar to axis L (FIG. 1)) of the clamp 200. One or more of the end portions 224 may include a terminal end 228 having a reduced cross section. For example, the end portion 224 may taper to the terminal end 228, which may end in the form of a point (*e.g.*, a rounded point) that extends substantially in the same angled direction as the end portion 224 from the raised portion 222.

As depicted, the wings 204 may each include a respective hole 226 in an outer end thereof remote from the central portion 202 (*e.g.*, proximate the raised portion 222). As above, one or more of the holes 226 may be utilized with another dental instrument to manipulate the clamp 200.

In some embodiments, the clamp 200 may include a feature and/or mechanism that interacts with an adjacent structure (*e.g.*, another portion of the clamp 200) to secure one or more of the wings 204 in a displaced position (*e.g.*, a displaced position that enhances the ability of the user to thread the wing(s) 204 through an aperture in the dental dam 132 (FIG. 4)). Such a displaced position may be an upward position extending in a direction transverse (*e.g.*, perpendicular) to the axis L (FIG. 1) (*e.g.*, where one or both wings 204 extend from and substantially over the central portion 202).

For example, the clamp 200 may include one or more retention features (*e.g.*, ring 230) on a portion of the clamp 200 (*e.g.*, on a portion of one of the wings 204, such as, for example, the end portion 224). For example, the ring 230 may be coupled to (*e.g.*, partially embedded within) one of the wings 204. In some embodiments, the ring 230 may be substantially continuous and extend through at least a majority of (*e.g.*, an entirety) of the wing 204 (*e.g.*, in a lateral direction). In some embodiments, the ring 230 may be discontinuous (*e.g.*, a split ring) and extend only into a portion of the wing 204 to secure the ring 230 to the clamp 200. In some embodiments, the ring 230 may be coupled to the clamp 200 to enable the ring 230 to move (*e.g.*, rotate) relative to a portion of the clamp 200 (*e.g.*, the wing 204).

In other embodiments, a portion of the clamp 200 (*e.g.*, one or more of the wings 204) may include other retention and/or attachment features that interact with an another adjacent structure of the clamp 200 (*e.g.*, the other wing 204) to secure one or more of the wings 204 in the displaced position, for example, an upward position extending in a direction transverse (*e.g.*, perpendicular) to the axis L (FIG. 1). For example, one or more of the wings 204 (*e.g.*, both wings 204) may include attachment features, such as,

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complementary fastening features, buttons, latches, hook-and-loop connectors, adhesives, combinations thereof, or other suitable features, to place the wing(s) 204 in the displaced position (*e.g.*, where both wings extend over the center portion 202).

In operation, the ring 230 (or other fastening feature) may be utilized to secure one or more of the wings 204 (*e.g.*, both wings 204) in the displaced positioned over (*e.g.*, substantially in vertical alignment with) the central portion 202. For example, the wings 204 may be lifted over the central portion 202 and the ring 230 may be rotated to capture a portion of the opposing wing 204 (*e.g.*, the wing 204 lacking the ring 230) in an opening 232 of the ring 230. For example, at least a portion of the end portion 224 (*e.g.*, the raised portion 222 and, optionally, the inner portion 222) of the opposing wing 204 lacking the ring 230 may be threaded through the opening 232. Once in the opening 232, a portion of the wings 204 (*e.g.*, the terminal end or portion 228, the end portion 224, the raised portion 222, or combinations thereof) may contact the ring 230 and secure the wings 204 in the displaced position.

In some embodiments, the wings 204 may be biased in the extended position (*e.g.*, as shown in FIGS. 5 and 6) in order to secure the wing 204 that is inserted into the ring 230 by applying an outward force on the ring 230 that is countered by the bias of the other wing 204 having the ring 203.

As noted above, the moving and securing the wings 204 in such a manner may enhance the ability of the user to thread the wing(s) 204 through an aperture in the dental dam 132 (FIG. 4). For example, such a feature minimizes the cross-sectional area of the clamp 200 in order for the clamp 200 to be threaded through the dental dam 132 without requiring substantially increasing the size of an aperture in the dam 132 that is to be fitted around a tooth and/or teeth.

In some embodiments, the ring 230 may be utilized to manipulate the clamp 200 during placement of the clamp 200 (*e.g.*, using the ring 230 to assist in placing the clamp 200 over a tooth) and/or may be used to manipulate the clamp 200 during placement of the dental dam 132 (FIG. 4) (*e.g.*, using the ring 230 to thread to a portion of the clamp 200 through the dental dam 132).

FIG. 7 depicts an isometric view (*e.g.*, a top view) of a clamp for use in a dental procedure, such as, for example, an at least partially flexible clamp 300 for retaining a dental dam that may be at least partially similar to the clamps 100, 200 discussed above in relation to FIGS. 1 through 6. FIG. 8 depicts another isometric view (*e.g.*, a bottom view) of

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the clamp of FIG. 7. As shown in FIGS. 7 and 8, the clamp 300 comprises a central portion 302. The clamp 300 may also comprise one or more wings 304 (*e.g.*, two opposing wings) attached to and generally extending away from the central portion 302 along a longitudinal axis of the clamp 300. The central portion 302 may include one or more bands 320 (*e.g.*, two
5 reinforced, semicircular bands 320, similar to the bands discussed above) at least partially surrounding a web portion 306. A central aperture 308 may be defined within at least a portion of an interior area of the web portion 306 (*e.g.*, a thin band). The web portion 306 may have a decreased thickness (*e.g.*, as compared to one or more adjacent portions of the clamp 300, such as, portions of the wings) and may easily conform (*e.g.*, elastically deform)
10 around a subject tooth. The central aperture 308 may include an elongated shape (*e.g.*, an elliptical or oval slot) having an enlarged central portion and two relatively narrow side portions as defined by the web portion 306.

In some embodiments, one or more recesses 336 may be defined at the central portion 302 (*e.g.*, in bands 320 providing a thickness similar or the same as the web portion 306).
15 Such recesses 336 may act to enable the central portion 302 to be elongated in order to be positioned over a tooth or teeth.

In some embodiments, the wings 304 may include recessed portions 336 (*e.g.*, concave) extending along the length (*e.g.*, a majority of the length) of the wings 304. Such recessed portions 334 may act to enhance the ability of the clamp 300 to be stretched (*e.g.*, by
20 providing a reduced thickness and/or by providing additional areas for a user to grasp the clamp 300).

In some embodiments, the bands 320 may include raised portions 340 at lateral sides of the central portion 302 (*e.g.*, bordering the recesses 336) and transition portions 338 (*e.g.*, portions that are rounded, tapered, chamfered, sloped, etc.) that gradually transition from the
25 central portion 302 (*e.g.*, the web portion 306) to a portion of the wings 304 (*e.g.*, the recessed portions 336). In other embodiments, the bands 320 may include raised portions 340 along a majority or an entirety of the bands 320.

As above, the wings 304 may include an inner portion 321, a raised portion 322, and an end portion 324 (*e.g.*, gripping portion, which may be used in conjunction with the
30 recessed portions 334) extending outward from the central portion 302. The raised portion 322 may be located near an enlarged midsection of the wings 304 and the end portion 324 may extend (*e.g.*, downward) from the raised portion 322 and inner portion 321 at an angle. One or more of the end portions 324 may include a terminal end 328 having a reduced

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cross section. For example, the end portion 324 may taper to the terminal end 328, which may end in the form of a point (*e.g.*, a rounded point) that extends substantially in the same angled direction as the end portion 324 from the raised portion 322.

As depicted, the wings 304 may each include a respective hole 326 in an outer end thereof remote from the central portion 302 (*e.g.*, proximate the raised portion 322). As
5 above, one or more of the holes 326 may be utilized with another dental instrument to manipulate the clamp 300.

In some embodiments, the clamp 300 may include a feature and/or mechanism that interacts with an adjacent structure (*e.g.*, another portion of the clamp 300) to secure one or
10 more of the wings 304 in a displaced position (*e.g.*, a displaced position that enhances the ability of the user to thread the wing(s) 304 through an aperture in the dental dam 132 (FIG. 4)). Such a displaced position may be an upward position extending in a direction transverse (*e.g.*, perpendicular) to the axis L (FIG. 1) (*e.g.*, where one or both wings 304 extend from and substantially over the central portion 302).

For example, the clamp 300 may include one or more retention features (*e.g.*, ring
15 330) on a portion of the clamp 300 (*e.g.*, on a portion of one of the wings 304, such as, for example, the end portion 324). For example, the ring 330 may be coupled to (*e.g.*, partially embedded within) one of the wings 304. In some embodiments, the ring 330 may be substantially continuous and extend through at least a majority of (*e.g.*, an entirety) of the
20 wing 304 (*e.g.*, in a lateral direction). In some embodiments, the ring 330 may be discontinuous (*e.g.*, a split ring) and extend only into a portion of the wing 304 to secure the ring 330 to the clamp 300. In some embodiments, the ring 330 may be coupled to the clamp 300 to enable the ring 330 to move (*e.g.*, rotate) relative to a portion of the clamp 300 (*e.g.*, the wing 304).

In other embodiments, a portion of the clamp 300 (*e.g.*, one or more of the wings
25 304) may include other retention and/or attachment features that interact with an another adjacent structure of the clamp 300 (*e.g.*, the other wing 304) to secure one or more of the wings 304 in the displaced position, for example, an upward position extending in a direction transverse (*e.g.*, perpendicular) to the axis L (FIG. 1). For example, one or more
30 of the wings 304 (*e.g.*, both wings 304) may include attachment features, such as, complementary fastening features, buttons, latches, hook-and-loop connectors, adhesives, combinations thereof, or other suitable features, to place the wing(s) 304 in the displaced position (*e.g.*, where both wings extend over the center portion 302).

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In operation, the ring 330 (or other fastening feature) may be utilized to secure one or more of the wings 304 (*e.g.*, both wings 304) in the displaced positioned over (*e.g.*, substantially in vertical alignment with) the central portion 302. For example, the wings 304 may be lifted over the central portion 302 and the ring 330 may be rotated to capture a portion of the opposing wing 304 (*e.g.*, the wing 304 lacking the ring 330) in an opening 332 of the ring 330. For example, at least a portion of the end portion 324 (*e.g.*, the raised portion 322 and, optionally, the inner portion 322) of the opposing wing 304 lacking the ring 330 may be threaded through the opening 332. Once in the opening 332, a portion of the wings 304 (*e.g.*, the terminal end or portion 328, the end portion 324, the raised portion 322, or combinations thereof) may contact the ring 330 and secure the wings 304 in the displaced position. For example, the ring 330 may be retained in a notch 329 defined in the terminal portion 328 of the wing 304.

In some embodiments, the wings 304 may be biased in the extended position (*e.g.*, as shown in FIGS. 7 and 8) in order to secure the wing 304 that is inserted into the ring 330 by applying an outward force on the ring 330 that is countered by the bias of the other wing 304 having the ring 303.

As noted above, the moving and securing the wings 304 in such a manner may enhance the ability of the user to thread the wing(s) 304 through an aperture in the dental dam 132 (FIG. 4). For example, such a feature minimizes the cross-sectional area of the clamp 300 in order for the clamp 300 to be threaded through the dental dam 132 without requiring substantially increasing the size of an aperture in the dam 132 that is to be fitted around a tooth and/or teeth.

In some embodiments, the ring 330 may be utilized to manipulate the clamp 300 during placement of the clamp 300 (*e.g.*, using the ring 330 to assist in placing the clamp 300 over a tooth) and/or may be used to manipulate the clamp 300 during placement of the dental dam 132 (FIG. 4) (*e.g.*, using the ring 330 to thread to a portion of the clamp 300 through the dental dam 132).

Embodiments of the present disclosure including a clamp including the polymer material may provide benefits and advantages of retaining the dental dam to allow retention thereof while avoiding damage to healthy teeth and gums. In contrast, many conventional metal retention clamps require rigid attachment to sidewalls of the teeth. Embodiments of the dental dam assembly described herein may be used by pediatric dentists, general

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dentists, orthodontists, implant surgeons and/or periodontists and may be employed in many oral surgery and orthodontic procedures.

As noted above, while dental clamps are discussed herein primarily in use with a dental dam assembly, the dental clamps may be utilized with other dental devices and/or procedures. For example, a dental clamp itself, or in conjunction with other devices, may be utilized as dental matrices in a restoration process. Such matrices may be utilized, for example, to form the interproximal surfaces of a tooth during fabrication of a direct restoration. In some embodiments, matrix bands or forms may be held in place by the dental clamp and/or may be integral to the body of the dental clamp. Once the clamp is positioned, the bands or forms may be utilized in forming a restoration on one or more adjacent teeth and/or on the tooth that is surrounded by the dental clamp.

Once being apprised of the instant disclosure, one of ordinary skill in the art will be able to make and use the devices and assemblies disclosed herein.

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CLAIMS

What is claimed is:

- 5 1. A dental device, comprising:
a clamp comprising a polymer material, the clamp further comprising:
 a central portion including at least one band defining a central aperture; and
 at least one wing attached to the central portion proximate the at least one band, the
 at least one wing configured to provide a surface for retaining a portion of
10 another dental device.
2. The device of claim 1, wherein the clamp further comprises:
a raised portion extending linearly across a midsection of the at least one wing transverse to
 a longitudinal axis of the clamp; and
15 a gripping portion located on the at least one wing between the raised portion of the at least
 one wing and the central portion of the clamp.
3. The device of claim 1, wherein the clamp further comprises a web portion
proximate the central aperture of the central portion, wherein the web portion restricts at
20 least a portion of the central aperture, the central aperture configured to receive a tooth
 therethrough proximate the web portion.
4. The device of claim 3, wherein the clamp includes at least two bands and
the central portion includes at least one recess defined between the at least two bands.
25
5. The device of claim 1, wherein the at least one band comprises two bands,
and wherein the central portion includes two recesses positioned between the two bands at
two lateral locations of the clamp, wherein each of the two bands and the two recesses each
define a portion of the central aperture.
30
6. The device of claim 1, further comprising at least one hole in an outer end of
the at least one wing remote from the central portion, wherein the at least one hole is
located and configured to enable retention of a dental instrument.

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7. The device of any one of claims 1 through 6, further comprising a retention feature on the at least one wing configured to position the at least one wing at least partially over the central portion.

5

8. The device of claim 7, wherein the at least one wing comprises two wings, and wherein the retention feature is configured to secure the two wings together at least partially over the central portion.

10 9. The device of claim 8, wherein the retention feature comprises a ring on one of the two wings, wherein the ring is configured to receive the other one of the two wings through an opening in the ring in order to secure the two wings together at least partially over the central portion.

15 10. The device of any one of claims 1 through 6, wherein a majority of the central portion and the at least one wing extends along a longitudinal axis of the clamp in a normal position and further comprising a retention feature on the at least one wing configured to position the at least one wing in a direction extending transverse to the longitudinal axis in a retained position.

20

11. A dental dam assembly, comprising:
a dental dam; and
a flexible clamp configured to retain the dental dam, the flexible clamp comprising:
a central portion including at least one band defining a central aperture; and
25 at least one wing attached to the central portion proximate the at least one band, the
at least one wing configured to provide a surface to retain the dental dam
relative to a tooth.

12. The dental dam assembly of claim 11, wherein the clamp comprises the
30 device of any one of claims 1 through 10.

13. A method of retaining a dental dam, comprising:
grasping at least one wing of a clamp;

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applying tension along an axis of the clamp to elongate at least one band proximate an
aperture of a central portion of the clamp;
centering the aperture of the central portion over an exposed tooth;
securing a portion of the at least one band in an intermediate space between adjacent teeth
5 by applying pressure to position the at least one band proximate the gingiva;
releasing the applied tension to enable the at least one band to at least partially surround the
exposed tooth; and
retaining the dental dam proximate the exposed tooth with the at least one wing.

10 14. The method of claim 13, further comprising positioning an aperture of the
dental dam over the exposed tooth prior to placing the clamp.

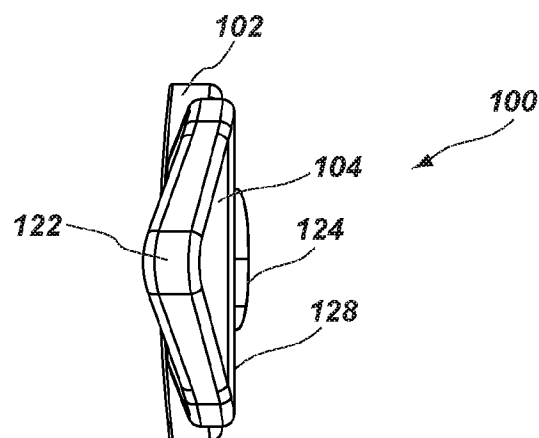
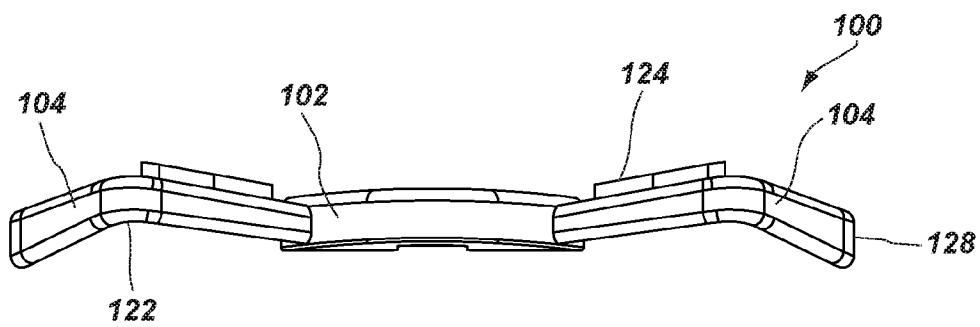
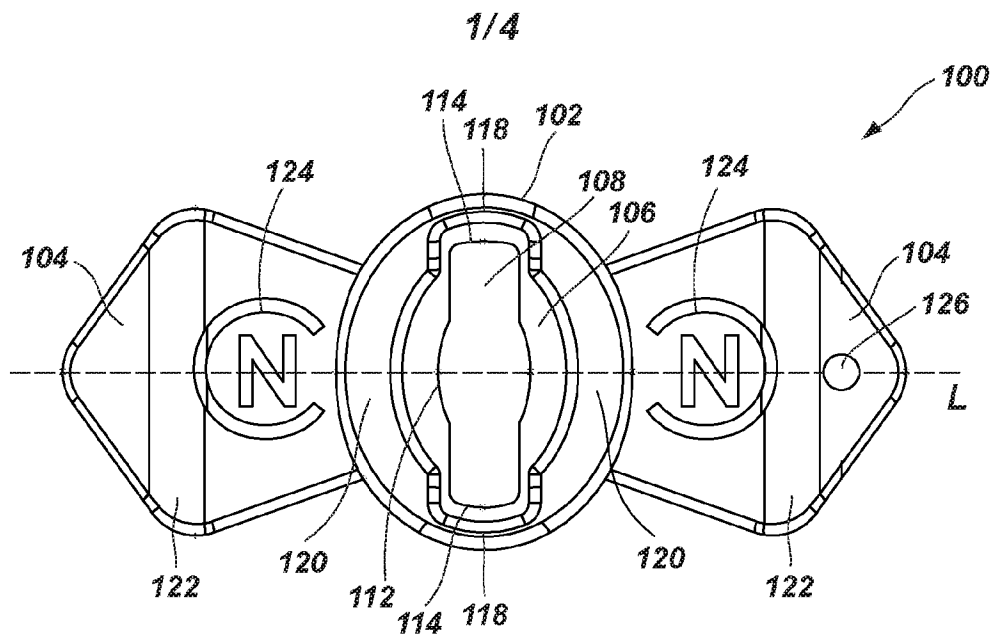
15 15. The method of claim 13, further comprising placing the clamp over the
tooth prior to positioning an aperture of the dental dam over the exposed tooth.

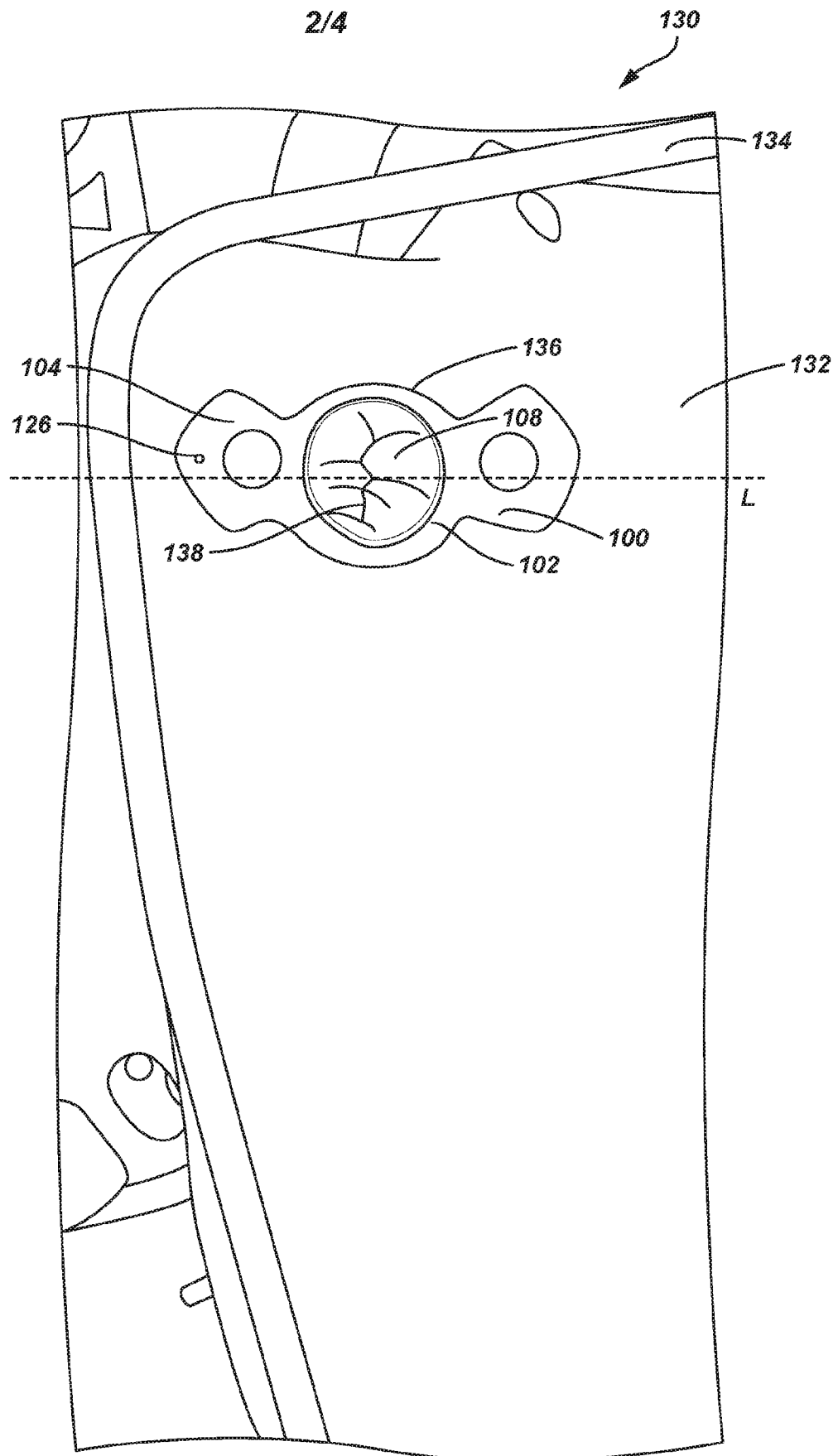
16 16. The method of any one of claims 13 through 15, further comprising:
moving the at least one wing to a displaced position extending at least partially over the
central portion; and
retaining the at least one wing in the displaced position with a retention feature.

20 17. A device for retaining a dental dam comprising a flexible clamp
circumscribing a central aperture and for receiving at least one tooth of a subject in the
central aperture.

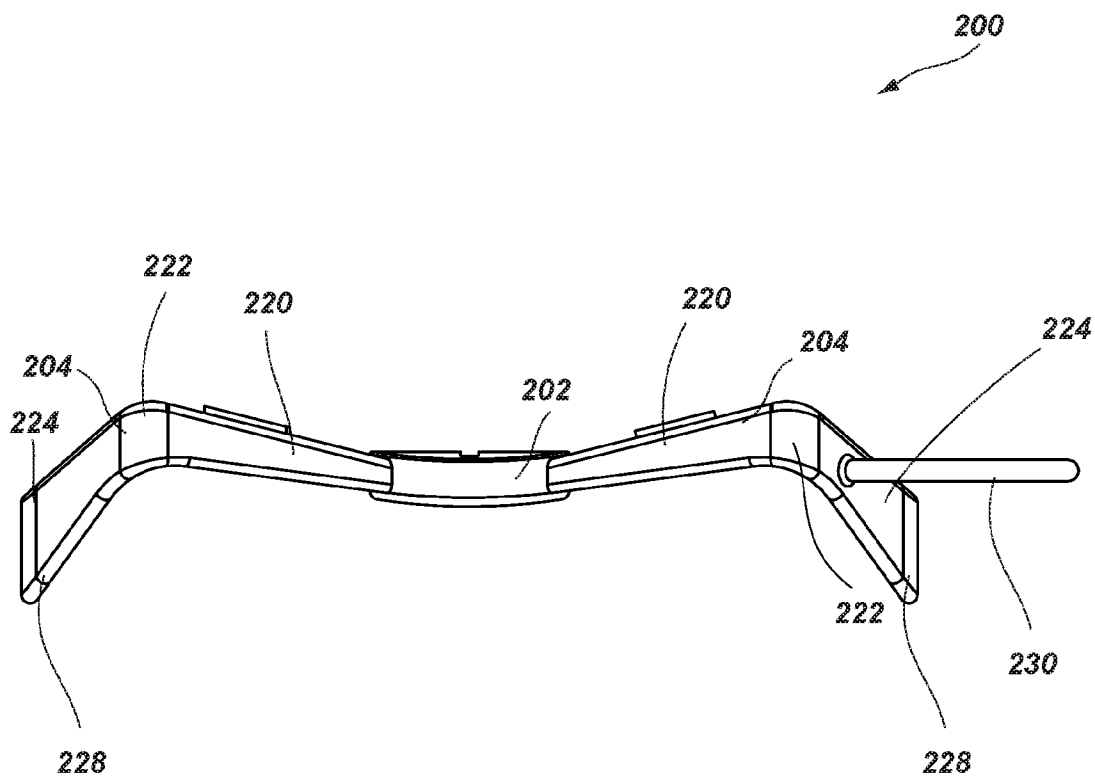
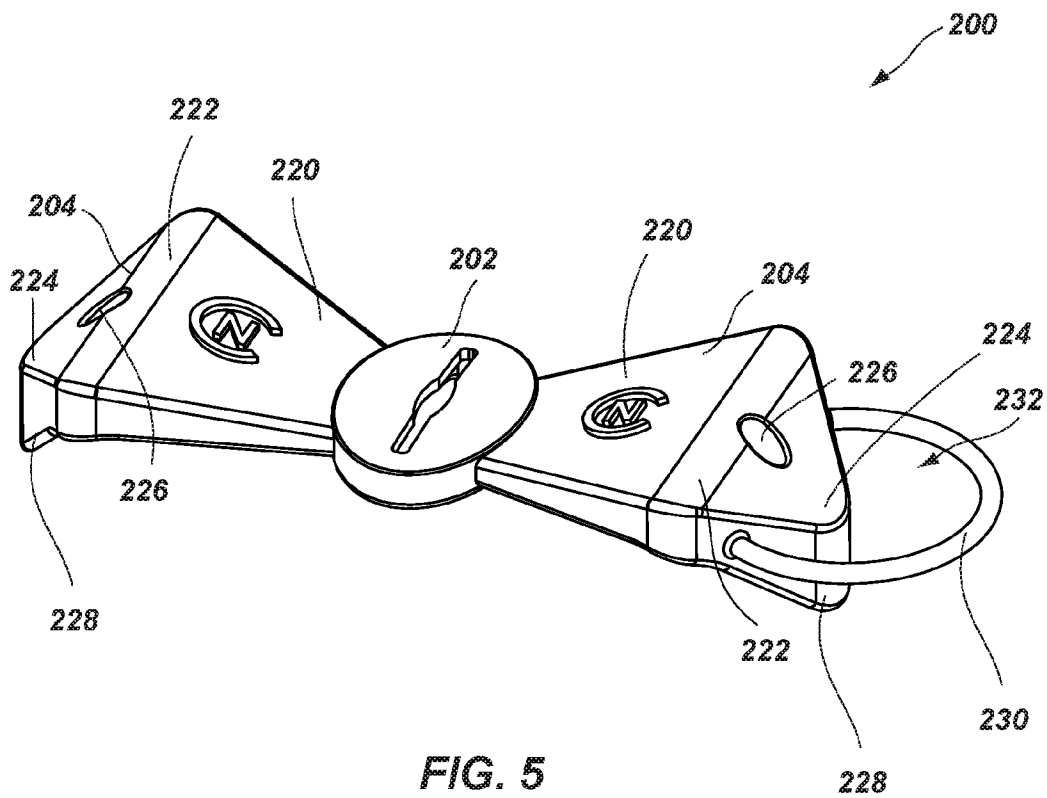
25 18. A dental dam assembly, comprising:
a dental dam; and
a flexible clamp circumscribing a central aperture and for receiving at least one tooth of a
subject in the central aperture to retain the dental dam relative to the at least one
tooth.

30





3/4



4/4

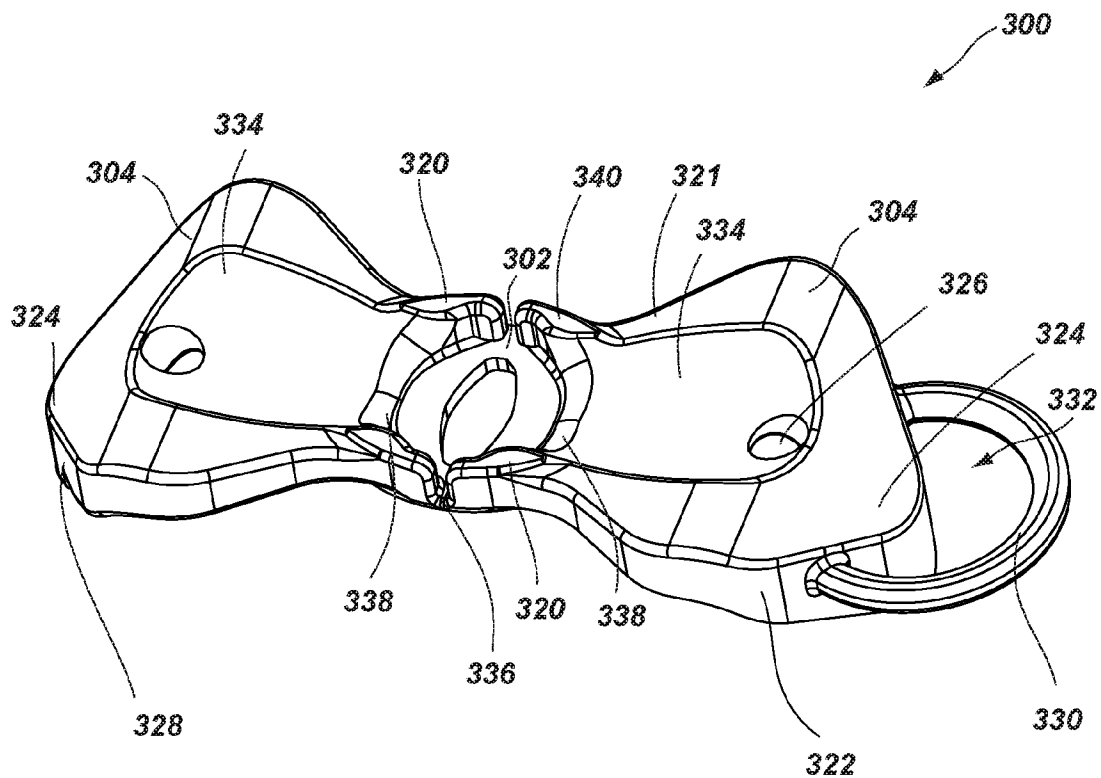


FIG. 7

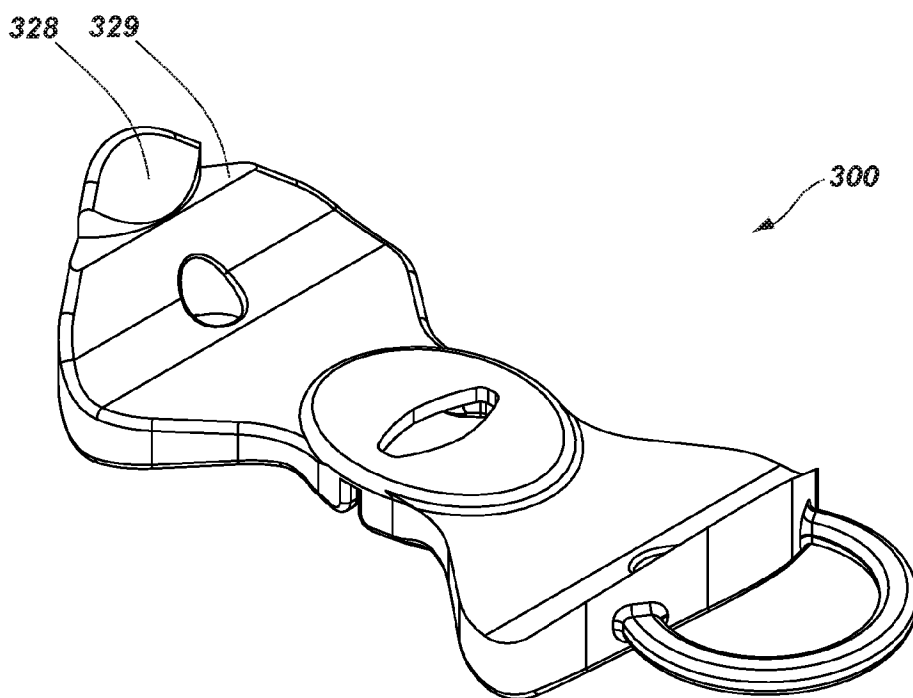


FIG. 8
202 of 281

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US17/68979

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61C 5/82, 5/85, 5/90 (2018.01)

CPC - A61C 5/82, 5/85, 5/90

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	DE 202014010138 U1 (MUHLBAUER TECHNOLOGY GMBH) March 10, 2015; see translation; abstract; paragraphs [0022], [0046], [0054]-[0055]; figures 4-5	1-6 ----- 10/1-6
X -- Y	US 1,336,746 A (IVORY, JW) April. 13, 1920; figures 6-7; pages 1-2	11, 13-14, 17-18 ----- 15
Y	US 2005/0244787 A1 (SUMMER, JD) November 3, 2005; figures 2, 7; paragraph [0035]	10/1-6
Y	US 2013/0252198 A1 (BOOS, J, et al.) September 26, 2013; figure 5; paragraphs [0023], [0027], [0031]	15

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 February 2018 (25.02.2018)

Date of mailing of the international search report

26 MAR 2018

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US17/68979

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 12
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2015)

Substitute for Form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>				Complete if Known	
				Application Number	16/870,745
				Filing Date	May 8, 2020
				First Named Inventor:	Thien Nguyen
				Art Unit	3772
				Examiner Name	Not Yet Assigned
Sheet	1	of	2	Attorney Docket Number	INCEP-005

U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (If known)				
		US-	D666,726	9/4/2012	Davis et al.	
		US-	D735,858	8/4/2015	Hirsch et al.	
		US-	D737,964	9/1/2015	Jessop et al.	
		US-	D782,047	3/21/2017	Ritter	
		US-	D782,048	3/21/2017	Ritter	
		US-	D787,069	5/16/2017	Ritter	
		US-	D787,070	5/16/2017	Ritter	
		US-	1,731,322	10/15/2029	Riddle	
		US-	D868,958	12/3/2019	Reyes	
		US-	3,758,950	9/18/1973	Krouzian	
		US-	5,009,595	4/23/1991	Osborn	
		US-	5,588,836	12/31/1996	Landis et al.	
		US-	6,241,521	6/5/2001	Garrison	
		US-	9,968,341	5/15/2018	Ritter	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No.¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T6
		Country Code³ Number⁴ Kind Codes (if known)				
		WO 2020/231864	11/19/2020	Dryshield, LLC		

Examiner Signature	/HOLLY T. TO/	Date Considered	11/29/2021
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. ¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶Applicant is to place a check mark here if English language translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.**

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Substitute for Form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>		Complete if Known	
		Application Number	16/870,745
		Filing Date	May 8, 2020
		First Named Inventor:	Thien Nguyen
		Art Unit	3772
		Examiner Name	Not Yet Assigned
Sheet	2	of	2
		Attorney Docket Number	INCEP-005
NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No'	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
		Docket No. INCEP-001COA U.S. Patent Application 14/228,046; Final Office Action mailed 11/27/20	
		Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Final Office Action mailed 12/22/20	
		Docket No. INCEP-001COD U.S. Patent Application 14/228,057; Office Action mailed 5/5/21	
		Docket No. INCEP-001COE U.S. Patent Application 14/228,061; Final Office Action mailed 4/29/21	
		Docket No. INCEP-001COE U.S. Patent Application 14/228,061; Office Action mailed 11/27/20	

Examiner Signature	/HOLLY T. TO/	Date Considered	11/29/2021
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*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

'Applicant's unique citation designation number (optional). 'Applicant is to place a check mark here if English Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.**

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

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①⑪ N° de publication :
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2 992 161

②① N° d'enregistrement national : **12 01799**

⑤① Int Cl⁸ : **A 61 C 5/14 (2013.01)**

①②

DEMANDE DE BREVET D'INVENTION

A1

②② Date de dépôt : 26.06.12.

③③ Priorité :

④③ Date de mise à la disposition du public de la
demande : 27.12.13 Bulletin 13/52.

⑤⑥ Liste des documents cités dans le rapport de
recherche préliminaire : *Se reporter à la fin du
présent fascicule*

⑥① Références à d'autres documents nationaux
apparentés :

⑦① Demandeur(s) : **BRAUD VINCENT — FR.**

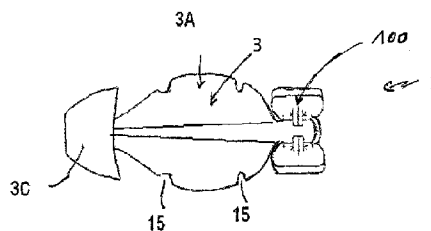
⑦② Inventeur(s) : **BRAUD VINCENT.**

⑦③ Titulaire(s) : **BRAUD VINCENT.**

⑦④ Mandataire(s) : **CABINET DAVID TOURNEL.**

⑤④ **PROTECTION INTRA-BUCCALE.**

⑤⑦ L'invention a pour objet un dispositif de protection buc-
cale comprenant une cale 2 dentaire destinée à se position-
ner entre les arcades dentaires d'un côté de la bouche, une
lame 3 de protection comportant une première partie 3A re-
poussant la langue et une seconde partie 3B venant en ap-
pui sur l'autre côté de la bouche dans le vestibule ce
dispositif étant caractérisé en ce que la seconde partie de la
lame est prolongée par un retour 3C pour former un crochet
se positionnant à la commissure des lèvres.



FR 2 992 161 - A1

PROTECTION INTRA-BUCCALE.

L'invention se rapporte à un dispositif de protection de la cavité buccale lors des interventions sur les dents.

Lors des interventions sur les dents, le patient doit tenir la bouche ouverte. Le chirurgien peut alors accéder aux dents pour intervenir sur celles-ci en prenant
5 soin de ne pas blesser l'intérieur de la joue et/ou la langue.

Donc, pour accéder aux dents, le patient doit maintenir la bouche ouverte ce qu'il fait. Cependant si l'intervention est longue, les mâchoires se rapprochent progressivement car maintenir la bouche ouverte pendant une longue période
10 n'est pas facile.

Le premier problème est donc le maintien de la bouche ouverte.

Le second problème est d'éviter de blesser la langue et/ou l'intérieur de la joue

Une technique ancienne, encore utilisée, consiste à écarter la joue et la langue avec des tampons cylindriques en coton que l'on place de part et d'autre de la
15 zone de travail et/ou entre les arcades dentaires.

Cette technique a été améliorée par des dispositifs qui permettent de repousser la langue vers l'arrière et maintenir la bouche ouverte.

Pour maintenir la bouche ouverte, il existe donc des dispositifs comportant une cale épaisse que l'on positionne entre les arcades inter-dentaires du côté opposé
20 à celui où se localise la dent à traiter.

Pour protéger la cavité buccale, il est connu d'utiliser une lame qui vient s'accrocher sur la cale épaisse précitée et se positionne pour repousser la langue derrière la lame.

Cette lame comporte une partie qui repousse la langue qui se raccorde à un volet latéral qui s'appuie sur l'autre côté de la bouche en se positionnant entre la joue et les dents dans le vestibule. La lame déployée à plat forme en vue de face une sorte de huit couché.

- 5 Pour que cette lame se positionne correctement et reste en place, la liaison entre la cale dentaire et la lame est rigide en sorte que c'est le positionnement de la cale qui oriente la lame. La rigidité de la liaison est contraignante dans la conception du dispositif et dans le positionnement car chaque bouche est particulière alors que le dispositif est du type standard.
- 10 L'invention vise à apporter une solution aux problèmes évoqués plus haut.

- A cet effet, l'invention a pour objet un dispositif de protection buccale comprenant une cale dentaire destinée à se positionner entre les arcades dentaires d'un côté de la bouche, une lame de protection comportant une première partie repoussant la langue et une seconde partie venant en appui sur
- 15 l'autre côté de la bouche ce dispositif étant caractérisé en ce que la seconde partie de la lame est prolongée par un retour pour former un crochet se positionnant à la commissure des lèvres .

L'invention sera bien comprise à l'aide de la description ci après faite à titre d'exemple non limitatif en regard du dessin qui représente :

- 20 FIG 1 : Le dispositif de protection vue en perspective

FIG 2 : le dispositif de la figure 1 vue de face

FIG 3 : le dispositif de la figure 1 vue de dessus

FIG 4 : La lame du dispositif de la figure 1 seule

FIG 5 : la lame de la figure 4 vue de face

FIG 6 : la cale seule en perspective

FIG 7 : la cale de la figure 6 en vue latérale

En se reportant au dessin, on voit un dispositif 1 de protection buccale que l'on utilise pour les interventions dentaires. Ce dispositif est destiné à maintenir la
5 bouche du patient ouverte et pour cela, on utilise une cale 2 dont la hauteur et sa position au niveau des arcades dentaires détermine l'ouverture de la bouche.

A cette cale est associée une lame 3 de protection comportant une première partie 3A et une seconde partie 3B venant en appui sur l'autre côté de la bouche ce dispositif étant caractérisé en ce que la seconde partie 3B de la lame est
10 prolongée par un retour 3C destiné à s'appuyer sur la joue externe pour former un crochet se positionnant à la commissure des lèvres.

Le crochet est tourné vers l'arrière.

Lorsque le dispositif est mis en place, il est tenu aux deux extrémités. Il est donc immobilisé d'un côté par la cale entre les mâchoires et de l'autre côté par le
15 crochet qui, formé par la seconde partie 3B et le retour 3C, est engagé avec la joue.

Il y a donc un positionnement sécurisant.

La première partie 3A repousse la langue et la protège, La seconde partie 3B vient protéger la joue en se glissant entre la joue et les dents, cette zone étant
20 appelée le vestibule.

En outre, la première partie 3A de la lame a une hauteur supérieure à la distance entre le plancher et le palais de la bouche ce qui contraint la lame à se plier lorsqu'elle est mise en place et donc cet « écrasement » augmente le maintien. Entre les différentes parties de la lame, il y a une réduction de matière pour
25 pouvoir orienter les parties les unes par rapport aux autres. On notera que la

réduction 30 entre la première partie 3A de la lame et la seconde partie 3B permet de se positionner derrière les molaires et d'obtenir un calage par pincement.

La mise en place peut commencer par le positionnement du crochet puis par la position de la cale. Une pose en commençant par la cale est possible.

Ce retour ne sert pas à la protection mais permet de remplacer une liaison rigide entre la lame et la cale, par une liaison souple 100 du type à emboîtement rapide avec un jeu facilitant l'orientation de la lame par rapport à la cale. La liaison se fait sur la face avant de la cale, c'est-à-dire la face de la cale opposée au fond de la bouche.

La liaison 100 entre la cale et la lame se présente de la manière suivante :

La lame 3 comporte une pièce mâle 5 en forme de profilé en Cé, la concavité 6 du Cé étant orientée vers la cale , ce profilé venant s'emboîter dans une cavité 7 complémentaire avec une ouverture déformable pour le passage en force du Cé.

La cavité 7 recevant le profilé en Cé est située à l'avant de la cale.

Lorsque la lame est associée à la cale, la concavité 6 du profilé coiffe un bourrelet 8. Ce profilé en Cé peut légèrement se déplacer angulairement par rapport à ce bourrelet et par conséquence permettre l'orientation de la lame 3. La cale présente donc une élasticité permettant le montage du profilé en Cé par déformation élastique de la cale en ouvrant les lèvres 9 qui réduisent l'entrée de la cavité. Le montage de cette lame permet des ajustements en rotation et en translation de la lame par rapport à la cale. Le réglage est facilité car l'autre extrémité de la lame est positionnée à la commissure des lèvres.

L'extrémité libre de cette forme en demi-tube (profile en Cé) présente une butée 5A qui limite le déplacement axial du dit profilé dans la cavité 7 ouverte de la cale. La forme en demi-tube peut coulisser dans la limite de sa longueur

La cale est donc élastiquement déformable en compression et présente deux zones d'appui opposées pour les dents.

Cette élasticité (reste faible) de la cale présente un autre avantage pour le patient qui peut mordre la cale sans percevoir une mauvaise sensation et en mordant cette cale, il vient pincer le profilé en Cé qui se verrouille.

On a donc réalisé une fixation rapide, ajustable et souple.

Cette forme en demi-tube (hemi-cylindre creux) localisée sur le coté de la lame pour constituer une des deux parties complémentaires d'un moyen de liaison avec la cale se prolonge sensiblement jusqu'au bout de la deuxième partie de la lame avant le retour formant ainsi une nervure 10 longitudinale qui donne à la lame une rigidité dans sa forme ondulée longitudinalement.

Si on regarde le dispositif, la première partie 3A a une forme de feuille allongée qui après élargissement se rétrécit en s'éloignant de la cale pour se prolonger par une zone de transition 30 qui est courbe et positionne la deuxième partie 3B dans une direction de l'ordre de 90° par rapport à la première partie et, cette deuxième partie est prolongée par un retour 3C pour former un crochet.

La lame présente une face courbe dont la concavité est orientée vers l'avant donc vers l'entrée de la bouche. Le choix des variations d'épaisseurs de lame et de leurs localisations confère à cette lame plus ou moins de souplesse.

On notera la présence d'encoches 15 sur le bord de la lame pour permettre aux fluides de circuler et qui seront aspirés par un moyen non représenté.

Comme cela a été dit, la cale est compressive donc non strictement rigide. Des nervures 16 au niveau des zones d'appui empêchent le glissement suivant l'axe longitudinal de la cale. Les zones d'appui sont en outre concaves dans l'axe

transverse pour limiter transversalement le déplacement des dents et donc positionner les dites dents.

La liaison démontable entre la cale et la lame permet un démontage rapide et un traitement séparé des éléments constituant le dispositif pour une meilleure
5 stérilisation .

La matière de la cale peut être de nature différente à celle de la lame de sorte que l'on peut mouler chaque pièce individuellement ce qui évite les contraintes de moulage si on fait de la bi-injection.

Elle permet de choisir une cale parmi un jeu de cales et une lame parmi un jeu
10 de lames de tailles différentes.

Chaque pièce est stérilisable.

REVENDICATIONS

1. Dispositif de protection buccale comprenant une cale 2 dentaire destinée à se positionner entre les arcades dentaires d'un coté de la bouche, une lame 3 de protection comportant une première partie 3A repoussant la langue et une seconde partie 3B venant en appui sur l'autre coté de la bouche dans le vestibule ce dispositif étant caractérisé en ce que la seconde partie 3B de la lame 3 est prolongée par un retour 3C pour former un crochet se positionnant à la commissure des lèvres .
2. Dispositif de protection selon la revendication 1 caractérisée en ce que la première partie 3A de la lame à une hauteur supérieure à la distance entre le plancher et le palais de la bouche ce qui contraint la lame à se plier et donc augmente le maintien
3. Dispositif de protection buccale selon la revendication 1 caractérisé en ce que la lame 3 est associée à la cale 2 par une liaison souple 100 du type à emboîtement rapide avec un jeu facilitant l'orientation de la lame par rapport à la cale.
4. Dispositif de protection buccale selon la revendication 3 caractérisé en ce que la liaison souple 100 comprend une pièce mâle 5 en forme de profilé en Cé, la concavité 6 du Cé étant orientée vers la cale, ce profilé venant s'emboîter dans une cavité 7 complémentaire de la cale 2 avec une ouverture déformable pour le passage en force du Cé.
5. Dispositif de protection buccale selon la revendication 4 caractérisé en ce que la longueur du profilé en Cé permet au dit profilé un déplacement en translation dans la cavité qui l'accueille.
6. Dispositif de protection buccale selon la revendication 4 ou 5 caractérisé en ce que la concavité du profilé en Cé coiffe un bourrelet 8 de la cale 2.

7. Dispositif de protection buccale selon l'une quelconque des revendications précédentes caractérisé en ce que la cale est déformable élastiquement par compression et présente des zones d'appui opposées pour les dents.
- 5 8. Dispositif de protection buccale selon la revendication 7 caractérisé en ce que les zones d'appui des dents présentent des nervures 1b qui empêchent le glissement suivant l'axe longitudinal de la cale et ces zones d'appui sont en outre concaves dans l'axe transverse pour positionner transversalement les dents.
- 10 9. Dispositif de protection selon la revendication 1 caractérisé en ce que la première partie 3A de la lame 3 a une forme de feuille allongée qui se rétrécit en s'éloignant de la cale 2 pour se prolonger par une zone de transition 30 qui est courbe et positionne la deuxième partie 3B de la lame 3 dans une direction de l'ordre de 90° par rapport à la première partie 3A
- 15 et, cette deuxième partie 3B est prolongée par un retour pour former un crochet.
10. Dispositif de protection selon la revendication 9 caractérisé en ce qu'une réduction 30 de matière entre la première partie 3A de la lame et la seconde partie 3B permet un positionnement derrière les molaires et
- 20 d'obtenir un calage par pincement.

1 / 3

FIG 1

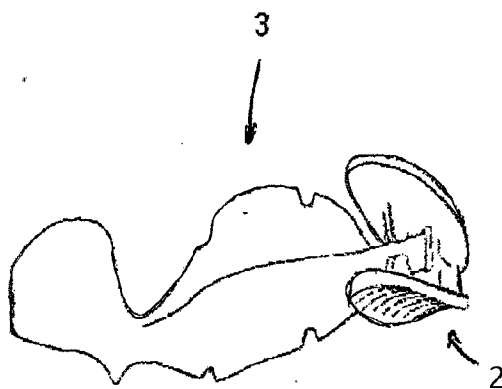


FIG 2

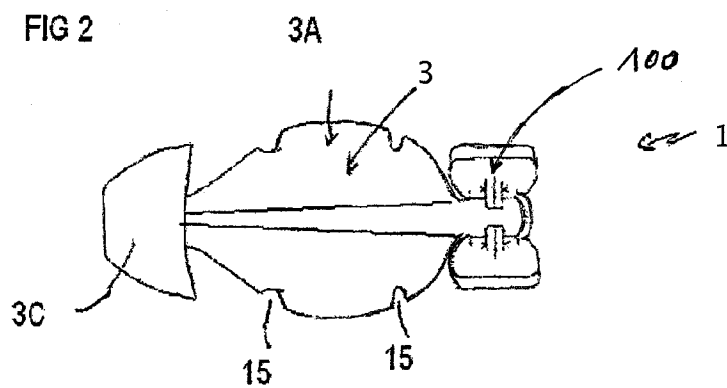
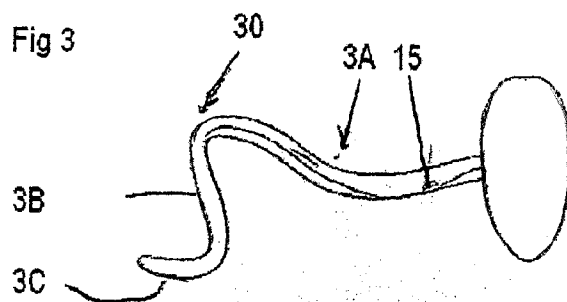
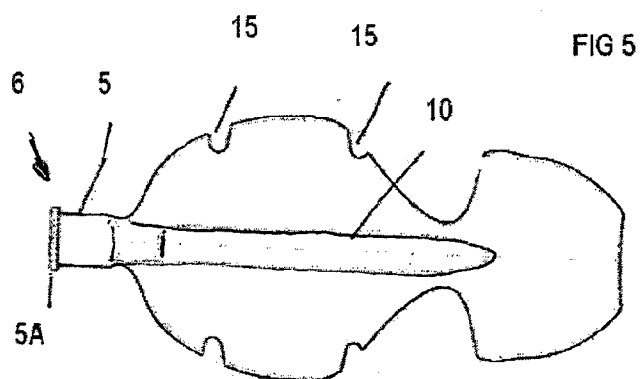
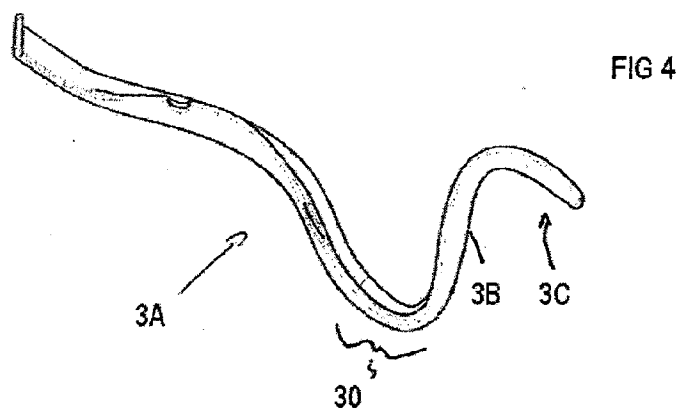


Fig 3



2 / 3



3 / 3

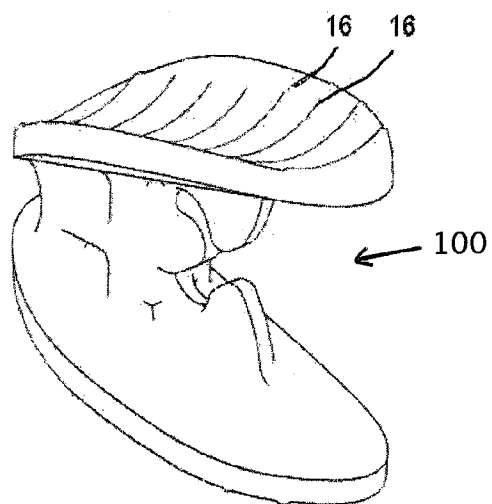
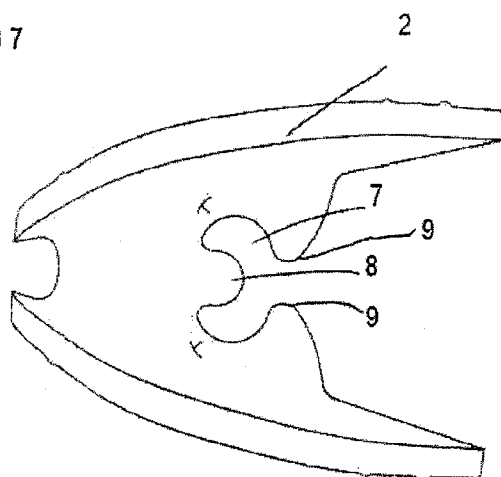


fig 6

FIG 7





RAPPORT DE RECHERCHE PRÉLIMINAIRE

établi sur la base des dernières revendications
déposées avant le commencement de la recherche

N° d'enregistrement
national

FA 767001
FR 1201799

DOCUMENTS CONSIDÉRÉS COMME PERTINENTS		Revendication(s) concernée(s)	Classement attribué à l'invention par l'INPI
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes		
A	US 2003/134253 A1 (HIRSCH JAMES A [US] ET AL) 17 juillet 2003 (2003-07-17) * alinéa [0042] - alinéa [0060]; figures 1-7 *	1-10	A61C5/14
A	US 5 730 599 A (PAK ELIZABETH Y [US]) 24 mars 1998 (1998-03-24) * colonne 4, ligne 57-65; figures 6-9 *	1-10	
			DOMAINES TECHNIQUES RECHERCHÉS (IPC)
			A61C
Date d'achèvement de la recherche		Examineur	
11 mars 2013		Kunz, Lukas	
CATÉGORIE DES DOCUMENTS CITÉS X : particulièrement pertinent à lui seul Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie A : arrière-plan technologique O : divulgation non-écrite P : document intercalaire T : théorie ou principe à la base de l'invention E : document de brevet bénéficiant d'une date antérieure à la date de dépôt et qui n'a été publié qu'à cette date de dépôt ou qu'à une date postérieure. D : cité dans la demande L : cité pour d'autres raisons & : membre de la même famille, document correspondant			

ANNEXE AU RAPPORT DE RECHERCHE PRÉLIMINAIRE
RELATIF A LA DEMANDE DE BREVET FRANÇAIS NO. FR 1201799 FA 767001

La présente annexe indique les membres de la famille de brevets relatifs aux documents brevets cités dans le rapport de recherche préliminaire visé ci-dessus.

Les dits membres sont contenus au fichier informatique de l'Office européen des brevets à la date du **11-03-2013**

Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office européen des brevets, ni de l'Administration française

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
US 2003134253 A1	17-07-2003	US 2003134253 A1	17-07-2003
		US 2006084031 A1	20-04-2006
		US 2008090200 A1	17-04-2008
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		US 2011143306 A1	16-06-2011
		US 2011207076 A1	25-08-2011

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심사관 : 김용열

전체 청구항 수 : 총 7 항

(54) 구강조명기

(57) 요약

본 발명은 구강 내의 적절한 치료 공간을 용이하게 확보하며, 구강 내부 전체를 골고루 밝게 하여, 안정적으로 구강 내 치료를 할 수 있게 하는 구강조명기에 관한 것이다. 상기한 구강 조명기는 구강 내부를 밝게 하는 광섬유가 삽입 결합되고 구강 내에서 고정되어 구강 내의 치료를 위한 구강조명기에 있어서, 광섬유가 결합되고 구강 내 물질을 공기흡입으로 빨아들이는 라이트튜브가 일측으로 결합되는 튜브결합공이 형성되는 튜브결합부와; 상하측의 날개에 의해 혀를 내측으로 밀도록 중앙측에 형성되는 혀보호부와; 상기 혀보호부와 상기 튜브결합부 사이에 사용자의 치아로 물어 구강 내에 고정이 용이하도록 상하측으로 형성되는 마이트블럭으로 구성된다.

대표도

도 1

특허청구의 범위

청구항 1.

구강 내에서 구강 내의 치료를 돕기 위한 장치에 있어서,

광섬유가 결합되고 구강 내 물질을 공기흡입으로 빨아들이는 라이트튜브가 일측으로 결합되는 튜브결합공이 형성되는 튜브결합부와,

상하측의 날개에 의해 혀를 내측으로 밀도록 중앙측에 형성되는 혀보호부와,

상기 혀보호부와 상기 튜브결합부 사이에 사용자의 치아로 물어 구강 내에 고정이 용이하도록 상하측으로 형성되는 바이트블럭을 구비하는 것을 특징으로 하는 구강조명기.

청구항 2.

제 1항에 있어서,

상기 혀보호부는 아치형으로 형성되어 혀를 내측으로 밀도록 하며, 상하측의 각 날개에 구강 내 물질을 흡입하기 위한 흡입세공이 형성되는 것을 특징으로 하는 구강조명기.

청구항 3.

제 2항에 있어서,

상기 혀보호부는 상하측의 각 날개가 한 쌍의 날개인 제1날개 및 제2날개로 구비되며, 상기 제1날개와 제2날개 사이의 일측과 상기 튜브결합부의 내측을 연결하는 제1흡입공 및 제2흡입공이 형성되는 것을 특징으로 하는 구강조명기.

청구항 4.

제 1항에 있어서,

상기 바이트블럭은 사용자의 이가 결합되는 블럭요홈과 상기 블럭요홈의 양측으로 돌출된 돌기인 블럭돌기를 형성하는 것을 특징으로 하는 구강조명기.

청구항 5.

제 1항 내지 제 4항 중 어느 한 항에 있어서,

상기 튜브결합부는 상기 광섬유의 끝단이 삽입 결합되는 광섬유결합공이 상기 튜브결합공 내측에 형성되는 것을 특징으로 하는 구강조명기.

청구항 6.

제 5항에 있어서,

상기 튜브결합부는 상기 바이트블럭 내측에 형성된 통공과 연결되어 구강 내 물질을 흡입하도록 하는 블럭흡입공이 형성된 것을 특징으로 하는 구강조명기.

청구항 7.

제 6항에 있어서,

상기 허보호부를 중심으로 하여 상기 튜브결합부의 타측으로 날개형상의 볼지지부가 더 형성되는 것을 특징으로 하는 구강조명기.

명세서

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 구강조명기에 관한 것으로, 보다 상세하게는 구강 내의 적절한 치료 공간을 용이하게 확보하며, 구강 내부 전체를 골고루 밝게 하여, 안정적으로 구강 내 치료를 할 수 있게 하는 구강조명기에 관한 것이다.

일반적으로 구강 내부의 치료에는 치과치료, 인과선 치료 외에도 구강 내의 많은 부위에 대한 치료가 있다. 이러한 구강 내부를 시술하는 중 석선을 위한 어시스턴트가 필요하며 이부리 경력이 많은 어시스트라고 하여도 완벽히 석선을 할 수 없었다.

이와 같은 종래의 구강 내 치료에 있어서, 보조원들은 구강 내에 조명을 비추며, 구강 내에 발생하는 침 또는 시술에 의해 발생하는 구강 내 물질을 외부로 배출 하는 등의 보조작업을 하게 된다. 그러나 이러한 다수의 인원에 의해 보조를 받으며 시술하게 되더라도 각각 별도로 움직이기 때문에 시술자가 시술 중 정확한 시술이 어려웠다. 또한 시술 중 혀의 움직임 때문에 구강 내에서 이루어지는 작업이 쉽지 않았으며 시술 중 환자의 구강위치에 따라 조명등의 위치 또한 계속적으로 조절해 주어야 하며 석선라인을 계속적으로 움직여 시술자가 시술 중 어려움이 많아, 구강 내부의 시술이 곤란한 문제점이 많았다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기와 같은 문제점을 해소하기 위한 안출된 것으로, 본 발명의 목적은 아치형으로 형성된 허보호부에 의하여 혀를 내측으로 밀어 혀의 움직임을 고정하고, 볼지지부에 의하여 일측 볼을 외부로 밀게 되어, 결국 구강 내의 적절한 치료 공간을 용이하게 확보하며, 사용자의 이가 결합되는 바이트블럭에 의하여 사용자의 치아로 구강조명기를 안정적으로 고정하며, 내부에서 빛을 발산하도록 하여 구강 내부 전체를 골고루 밝게 하기 때문에, 시술자는 안정적으로 구강 내 치료를 할 수 있도록 하는 구강조명기를 제공하는 것이다.

발명의 구성

상기와 같은 목적을 달성하기 위한 본 발명의 구강조명기는 구강 내부를 밝게 하는 광섬유가 삽입 결합되고 구강 내에서 고정되어 구강 내의 치료를 위한 구강조명기에 있어서, 광섬유가 결합되고 구강 내 물질을 공기흡입으로 빨아들이는 라이트튜브가 일측으로 결합되는 튜브결합공이 형성되는 튜브결합부와; 상하측의 날개에 의해 혀를 내측으로 밀도록 중앙측에 형성되는 허보호부와; 상기 허보호부와 상기 튜브결합부 사이에 사용자의 치아로 물어 구강 내에 고정이 용이하도록 상하측으로 형성되는 바이트블럭으로 구성되는 것을 특징으로 한다.

여기서, 상기 허보호부는 아치형으로 형성되어 혀를 내측으로 밀도록 하며, 상하측의 각 날개에 구강 내 물질을 흡입하기 위한 흡입세공이 형성되는 것을 특징으로 한다.

또한, 상기 허보호부는 상하측의 각 날개가 한 쌍의 날개인 제1날개 및 제2날개로 구비되며, 상기 제1날개와 제2날개 사이의 일측과 상기 튜브결합부의 내측을 연결하는 제1흡입공 및 제2흡입공이 형성되는 것을 특징으로 한다.

또한, 상기 바이트블럭은 사용자의 이가 결합되는 블럭요홈과 상기 블럭요홈의 양측으로 돌출된 돌기인 블럭돌기를 형성하는 것을 특징으로 한다.

또한, 상기 튜브결합부는 상기 광섬유(2)의 끝단이 삽입 결합되는 광섬유결합공(11)이 상기 튜브결합부 내측에 형성되는 것을 특징으로 한다.

또한, 상기 튜브결합부는 상기 바이트블럭 내측에 형성된 통공과 연결되어 구강 내 물질을 흡입하도록 하는 블럭흡입공이 형성되는 것을 특징으로 한다.

또한, 상기 허보호부를 중심으로 하여 상기 튜브결합부의 타측으로 날개형상의 불지지부가 더 형성되는 것을 특징으로 한다.

상기한 본 발명 구성을 첨부된 도면에 도시된 일 실시례를 참조하여 상세히 설명하면 다음과 같다.

도 1은 본 발명 구강조명기에 대한 사시도이고, 도 2는 본 발명 구강조명기와 라이트튜브의 분해 예시도이고, 도 3은 본 발명 구강조명기를 입에 착용하는 것에 대한 예시도이고, 도 4는 본 발명 구강조명기를 착용한 상태에 대한 예시도를 나타낸 것으로 설명의 편의상 함께 설명하기로 한다.

도시된 바와 같이, 본 발명에 따른 구강조명기(1)는, 구강 내부를 밝게 하는 광섬유(2)가 삽입 결합되어 구강 내측을 밝게 하여 구강 내에서 고정되어 구강 내의 치료가 원활하도록 구비된 것이다.

또한, 광섬유(2)가 결합되고 구강 내 물질을 공기흡입으로 빨아들이는 작용을 하는 도 2에서와 같은 라이트튜브(3)가 일측으로 결합되는 튜브결합공(11)이 형성되는 튜브결합부(10)를 형성한다.

이때, 라이트튜브(3)는 미도시된 장치인 라이트소스장치 및 공기흡입장치와 연결되어, 구강 내에 조명을 제공하여 구강 내를 밝게 할 뿐만 아니라, 구강 치료 시에 구강 내에 발생하는 침 또는 각종 제거해야 하는 물질을 흡입하도록 하는 구비된 것이다. 이때 구강조명기(1)는 대체로 투명한 재질 또는 불투명하더라도 빛이 적절히 굴절 및 반사되어 빛을 흡수하지 않고 구강 내부를 밝고루 비출 수 있도록 함이 바람직하다. 그 재질은 실리콘 등의 합성수지재(플라스틱재) 또는 그 등가물질일 수 있으며, 그 재질에 제한되는 것은 아니다. 아울러, 전체를 단일체로 형성하여, 구강 내 치료시에도 본 발명 구강조명기(1)가 분리되지 않도록 함이 바람직하다.

이와 같은 구강조명기(1)는 상하측의 날개(21)(22)에 의해 사용자의 혀를 내측으로 밀도록 구강조명기(1)의 중앙부분에 허보호부(20)를 구비한다. 이러한 상기 허보호부(20)와 상기 튜브결합부(10) 사이에는 사용자의 치아로 물어 구강 내에 고정되어 용이하도록 상하측으로 형성되는 바이트블럭(30)(30a)을 구비한다.

여기서, 상기 허보호부(20)는 아치형으로 형성되어 혀를 내측으로 밀도록 하며, 상하측의 각 날개(21)(22)에 구강 내 물질을 흡입하기 위한 흡입세공(23)(23a)을 형성하였으며, 또한, 각각 한 쌍의 날개인 제1날개(24) 및 제2날개(25)를 구비하며, 상기 제1날개(24)와 제2날개(25) 사이의 일측과 상기 튜브결합부(10)의 내측 튜브결합공(11)의 일측을 연결하는 제1흡입공(51) 및 제2흡입공(52)을 형성한다. 이와 같이 구비되는 제1흡입공(51) 및 제2흡입공(52)에 의하여, 상하측의 제1날개(24) 및 제2날개(25) 사이로 흡입되는 침 또는 구강 내 물질을 빨아들여 외부로 배출이 용이하게 된다.

또한, 상기 바이트블럭(30)은 사용자의 이가 결합되는 블럭요홈(31)과 상기 블럭요홈(31)의 양측으로 각각 돌출된 돌기인 블럭돌기(32)를 형성한다. 사용자의 치아는 블럭요홈(31) 부분을 물게 되면서, 블럭돌기(32)에 의해 지지되는 사용자의 치아가 바이트블럭(30)과 견고하게 지지되어, 사용자가 구강 내 치료를 받아도 구강조명기(1)가 요동되지 않게 된다.

아울러, 상기 튜브결합부(10)는 상기 광섬유(2)의 끝단이 삽입 결합되는 광섬유결합공(53)이 상기 튜브결합공(11) 내측에 형성되어, 튜브결합공(11) 내에 라이트튜브(3)를 결합한 상태에서 시술자의 조작에 의하여 광섬유결합공(53)에 광섬유(2)를 적절히 위치시키게 되면, 광섬유(2)로부터 발광되는 빛이 구강 내의 전체를 밝게 비추도록 구비한 것이다.

이에 더하여 상기 바이트블럭(30) 내측에 형성된 통공과 연결되어 구강 내 물질을 흡입하도록 하는 블럭흡입공(54)이 튜브결합부(10)의 튜브결합공(11) 내부 일측에 형성되도록 한다.

상기한 본 발명 구강조명기(1)에는 상기 허보호부(20)를 중심으로 하여 튜브결합부(10)의 타측으로는 날개형상의 불지지부(40)를 더 형성하였다. 그리하여 도 3에서와 같이 시술자의 일측 손으로 불지지부(40)를 잡고 사용자의 입에 착용하도록 하며, 시술 시에는 사용자의 볼 부분의 구강 내측에 불지지부(40)가 지지되어, 결국 볼 부분을 외향으로 밀어 구강 내의 시술 공간을 넓게 확보할 수가 있다.

이와 같이 구성되는 본 발명 구강조명기(1)에 의한 시술 과정을 살펴보면 다음과 같다.

즉, 도 3 및 도 4에서와 같이, 사용자(치료 대상자)의 구강 내에 구강조명기(1)를 착용하기 전에, 도 2에서와 같이, 광섬유(2)가 내측에 구비되는 라이트튜브(3)의 끝단을 구강조명기(1)의 튜브결합부(10)의 튜브결합공(11) 내측으로 삽입 결합하게 된다. 이와 같은 라이트튜브(3)는 상기에서 언급한 바와 같이, 광섬유(2)를 통하여 빛을 발산하도록 하는 라이트소스장치(Compact Fiber Optic Light Source)와, 또한 침 또는 구강 내 물질을 공기의 흡입 압력으로 외부로 배출하기 위한 진공흡입장치와 연결되어 구비되는 것이다.

이와 같이 라이트튜브(3)와 결합된 상태에서 조작에 의하여 광섬유(2)의 끝단이 광섬유결합공(53)에 알맞게 위치하게 되며, 이와 같이 알맞은 위치에 광섬유(2)의 끝단이 위치하게 되면, 구강 내 전체적으로 골고루 밝게 비추지도록 구강조명기(1)의 제1 및 제2 형상을 알맞게 하였다. 즉 다수의 절곡부를 형성하는 등의 방법으로 투명, 불투명 또는 반투명 재질로 구강조명기(1) 전체를 일체로 형성하게 되면, 내측 일측에서 발산된 빛은 구강조명기(1) 물질 내부로 투여된 빛이 외부로 일부가 방출됨과 동시에 일부 빛은 내부와 외부의 경계에 의해 내부 반사되며, 이때 본 발명 구강조명기(1)의 많은 굴곡 형상 때문에 더욱 넓게 빛이 퍼지게 되어, 결국 구강 내부 전체를 골고루 비추게 되는 것이다.

이와 같이 라이트튜브(3) 및 광섬유(2)를 결합한 상태에서, 도 3에서와 같이 시술자의 일측 손은 튜브결합부(10)를 잡고 타측 손은 볼지지부(40)를 잡고 사용자의 구강 내측으로 착용하게 되면, 사용자는 치아로 상하측의 바이트블럭(30)을 물어 구강 내에서 구강조명기(1)가 요동되지 않도록 한다. 그 후, 도 4에서와 같이 볼지지부(40)를 치아 바깥쪽의 구강 내로 넣어 일측 볼이 외향으로 밀려 결국 치료공간이 넓게 형성되는 것이다.

이와 같이 구비되는 구강조명기(1)에 의하면, 아치형으로 형성된 허보호부(20)에 의하여 혀를 내측으로 밀어 혀의 움직임을 고정하고, 볼지지부(40)에 의하여 일측 볼을 외부로 밀게 되어, 결국 구강 내의 치료 공간을 적절히 확보할 수 있게 된다.

또한 사용자의 이가 결합되는 바이트블럭(30)에 의하여 사용자의 치아로 구강조명기(1)를 안정적으로 고정하게 되며, 구강조명기(1)의 내부에서 빛을 발산하도록 하여 구강 내부 전체를 골고루 밝게 하기 때문에, 시술자는 안정적으로 구강 내 치료를 할 수 있게 되는 것이다.

그리고 흡입세공(23)(23a) 및 제1흡입공(51), 제2흡입공(52)과 함께 블럭흡입공(54)을 통하여, 구강 내에 생기는 침 또는 구강 내 물질을 계속하여 외부로 배출하기 때문에, 구강 내에는 항상 시술이 용이한 환경을 유지할 수 있게 된다.

발명의 효과

상기와 같이 구비되는 본 발명의 구강조명기에 의하면, 아치형으로 형성된 허보호부에 의하여 혀를 내측으로 밀어 혀의 움직임을 고정하고, 볼지지부에 의하여 일측 볼을 외부로 밀게 되어, 결국 구강 내의 적절한 치료 공간을 용이하게 확보하며, 사용자의 이가 결합되는 바이트블럭에 의하여 사용자의 치아로 구강조명기를 안정적으로 고정하며, 내부에서 빛을 발산하도록 하여 구강 내부 전체를 골고루 밝게 하며, 다수의 흡입공에 의하여 구강 내 물질을 외부로 배출하기 때문에, 시술자는 안정적으로 구강 내 치료를 할 수 있게 되는 효과가 있다.

도면의 간단한 설명

도 1은 본 발명 구강조명기에 대한 사시도이다.

도 2는 본 발명 구강조명기와 라이트튜브의 분해 예시도이다.

도 3은 본 발명 구강조명기를 입에 착용하는 것에 대한 예시도이다.

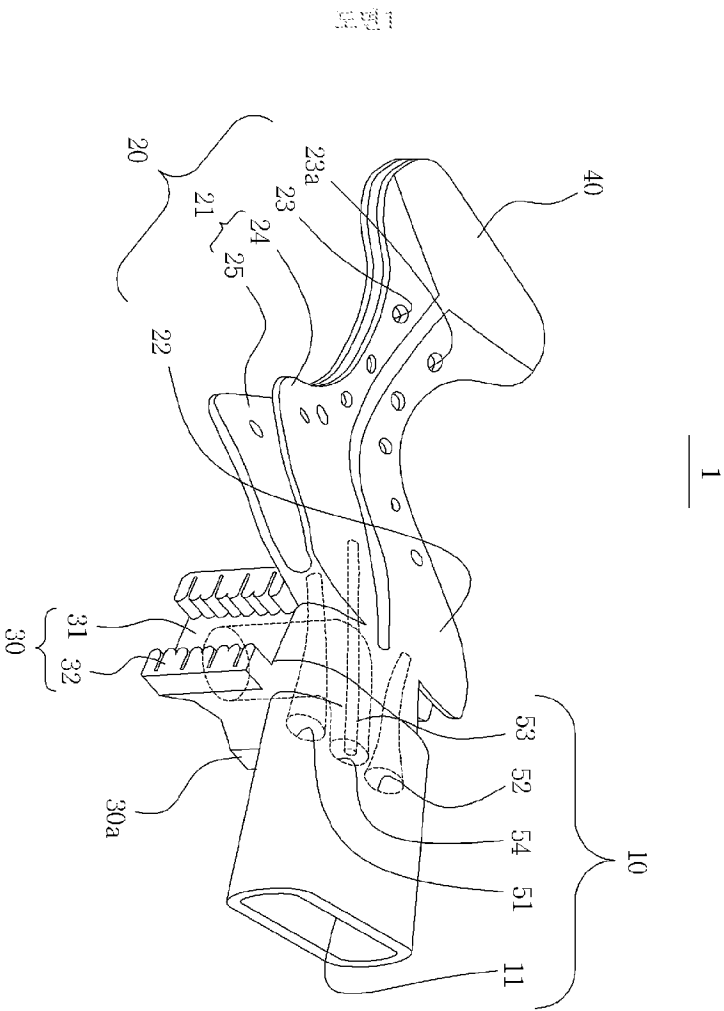
도 4는 본 발명 구강조명기를 착용한 상태에 대한 예시도이다.

<도면의 주요부분에 대한 부호의 설명>

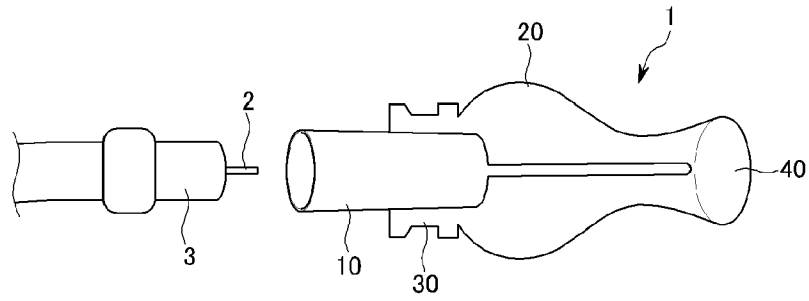
1 : 구강조명기

- 2 : 광섬유 3 : 라이트튜브
- 10 : 튜브결합부 11 : 튜브결합공
- 20 : 허브호부 30 : 바이트블럭
- 31 : 블럭요홈 32 : 블럭돌기
- 40 : 볼지지부 53 : 광섬유결합공

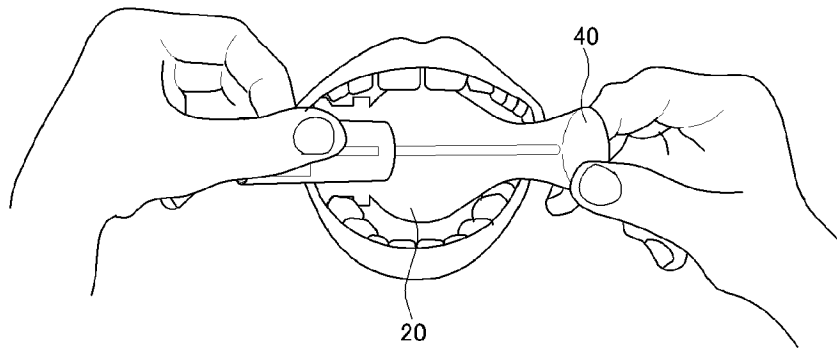
도면



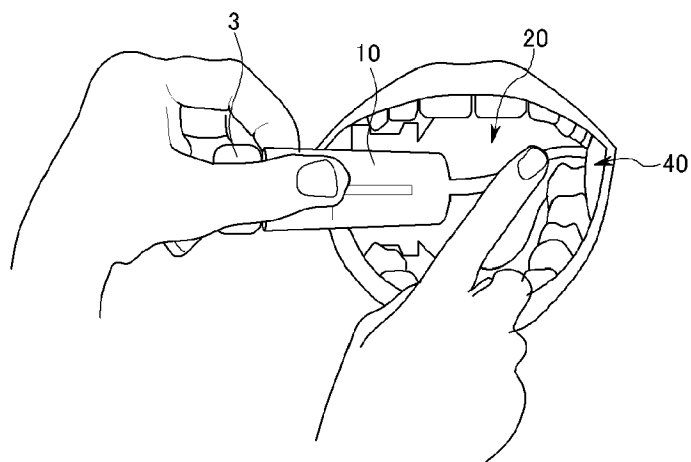
도면2



도면3



도면4



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR(S): Nguyen et al.
APPLICATION NO.: 16/870,745
FILING DATE: May 8, 2020
TITLE: Dental Mouthpiece
EXAMINER: Holly T. To
ART UNIT: 3772
CONFIRM. NO.: 7491
ATTY.DKT.NO.: INCEP-005

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ALEXANDRIA, VA 22313-1450

AMENDMENT A

Examiner To,

In response to the office action dated December 3, 2021 (*Office Action*), please enter the following **amendments** to the **claims**, which commence on **page two**. The **remarks** appear beginning on **page seven**, and the **conclusion** appears on **page ten**.

IN THE CLAIMS

PLEASE AMEND THE CLAIMS AS FOLLOWS:

1. (currently amended) A dental mouthpiece formed in a curve, the dental mouthpiece comprising:

a main body portion at a central part of the curve having a first end and a second end, the main body portion having an anterior wall inside the curve and a posterior wall outside the curve, the anterior wall and the posterior wall defining an interior space corresponding to a distance between the anterior wall and the posterior wall, at least one connector connecting the anterior wall to the posterior wall, at least one anterior intervening wall extending [[from]] along an edge of the anterior wall partially across the distance towards the posterior wall, and at least one posterior intervening wall extending [[from]] along an edge of the posterior wall partially across the distance towards the anterior wall, the at least one anterior intervening wall and the at least one posterior intervening wall each having alternating crests and troughs;

a suction connector portion connected to the first end, the connector portion connecting the interior space to a vacuum suction source; and

a cheek retractor portion connected to the second end.

2. (cancelled)

3. (currently amended) The mouthpiece of claim 1, wherein the at least one connector [[is]] includes at least one of a wall spanning longitudinally in the main body portion in the interior space or a pillar.

4. (currently amended) The mouthpiece of claim 1, further comprising a bridge structure ~~in the interior space~~ that includes one or more protrusions protruding from the posterior wall within the interior space, wherein the protrusions ~~are battlement shaped, with include~~ spaced crests and troughs.

5. (currently amended) The mouthpiece of claim 4, wherein the protrusions ~~near the suction connector is in greater~~ vary in height and length.

6. - 7. (cancelled)

8. (currently amended) The mouthpiece of claim 1, wherein at least one of the anterior intervening wall and the posterior intervening wall ~~[[have]]~~ includes a plurality of portions of varying heights or sizes ~~to maintain integrity of the main body portion~~.

9. (cancelled)

10. (currently amended) The mouthpiece of claim 1, wherein the anterior intervening wall and the posterior intervening wall meet at a point where the suction connector meets the main body portion

11. (currently amended) The mouthpiece of claim 1, wherein the anterior intervening wall and the posterior intervening wall meet at a point where the main body portion meets the cheek retractor portion.

12. (currently amended) The mouthpiece of claim 1, further comprising a bite block integrated to the suction connector portion, wherein the bite block ~~provide additional~~ provides crush-resistance ~~and decreased compressibility~~ during biting by a patient.

13. (original) The mouthpiece of claim 1, wherein the main body portion, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece.
14. (currently amended) The mouthpiece of claim 1, wherein a material that forms the main body, the suction connector portion, and the cheek retractor portion is a flexible, translucent, high heat-resistant, autoclavable ~~silicon-based~~ silicone-based material.
15. (currently amended) The mouthpiece of claim 1, wherein the posterior wall further includes a stability bar protruding from an interior surface of the posterior wall and along a longitudinal axis of the main body portion.
16. (currently amended) The mouthpiece of claim 15, wherein the at least one connector ~~[[lies]]~~ includes a plurality of evenly spaced connectors located along the stability bar.
17. (currently amended) The mouthpiece of claim 1, wherein the suction connector portion comprises a cutout corresponding to a protrusion on a vacuum adapter to provide an interlocking fit.
18. (currently amended) The mouthpiece of claim 1, where in the suction connector portion connects to ~~[[a]]~~ the vacuum suction source, wherein activation of the vacuum suction source provides suction of fluids from the interior space of the main body portion.
19. (currently amended) The mouthpiece of claim 18, wherein the activation of the vacuum suction source draws fluids from an exterior of the main body portion ~~through the crests and troughs of the anterior intervening wall and the posterior intervening wall~~, into the interior space of the main body portion.
20. (cancelled)

21. (new) A dental mouthpiece comprising:

a main body portion having a first end and a second end, the main body portion comprising:

an anterior wall,

a posterior wall spaced at a distance from the anterior wall, wherein an interior space corresponding to the distance between the anterior wall and the posterior wall is defined by the anterior wall and the posterior wall,

at least one connector that connects the anterior wall to the posterior wall within the interior space,

at least one intervening wall extending at least partially across the distance and along an edge of the anterior wall or the posterior wall, wherein the at least one intervening wall has a plurality of alternating crests and troughs, and

a neck extending from the second end of the main body, wherein a width of the neck is less than a width of the main body portion at the first end;

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

a cheek retractor portion connected to the neck at the second end of the main body, wherein the width of the neck is less than a width of the cheek retractor portion.

22. (new) The mouthpiece of claim 21, wherein the intervening wall includes a plurality of spaced portions.

23. (new) The mouthpiece of claim 21, further comprising a bite block integrated to the suction connector portion, wherein the bite block provides crush-resistance during biting by a patient.

24. (new) The mouthpiece of claim 21, wherein the main body portion, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece.

25. (new) The mouthpiece of claim 21, wherein the suction connector portion comprises a cutout corresponding to a protrusion on a vacuum adapter to provide an interlocking fit.

26. (new) The mouthpiece of claim 21, where in the suction connector portion connects to the vacuum suction source, wherein activation of the vacuum suction source provides suction of fluids from the interior space of the main body portion.

27. (new) The mouthpiece of claim 26, wherein the activation of the vacuum suction source further draws fluids from an exterior of the main body portion into the interior space of the main body portion.

REMARKS

Amendments to the Claims

Claims 1, 3-5, 8, 10-19, and 21-27 are presently pending, of which claims 1 and 21 are independent. Claims 2, 6, 7, 9, and 20 are cancelled, and claims 21-27 are newly added. The claims concern subject matter fully supported by the *Specification* and as such, no new matter has been added. Entry and consideration of the same is respectfully requested.

Claim Objections

The *Office Action* objects to claim 19 for informalities relating to inconsistency in antecedent basis. *Office Action*, 2. As amended, claim 19 no longer exhibits the purported informalities, thereby rendering the objection moot. The Applicant therefore respectfully requests withdrawal of the same.

Rejection under 35 U.S.C. § 112(b)

Claims 4 and 8 are rejection for purported indefiniteness related to inconsistency in antecedent basis. *Id.* As amended, claims 4 and 18 no longer exhibits the purported indefiniteness issues, thereby rendering the rejection moot. The Applicant therefore respectfully requests withdrawal of the same.

Rejections under 35 U.S.C. §§ 102-103

Claims 1-3, 8-11, 13, 15, 16, 18, and 19 are rejected as purportedly anticipated by U.S. patent application number 2017/0156832 (hereinafter *Reyes*). *Office Action* at 3. Claims 4-7, 12, 14, 17, and 20 are rejected as purportedly obvious over *Reyes*. *Id.* at 9 (further referring to “Incept” without providing any specific reference number).

Independent claims 1 and 21 presently recite an ‘intervening wall’ that extends ‘partially across the distance’ between the anterior and posterior walls ‘along an edge.’ See e.g., FIGs. 2, 6 (provided below). FIGs. 2 and 6 of the present *Specification* illustrates, for example, “anterior intervening wall 127” and “posterior intervening wall 134,” both of which extend from a respective ‘edge’ at least partially across the interior space between the main anterior and posterior body walls.

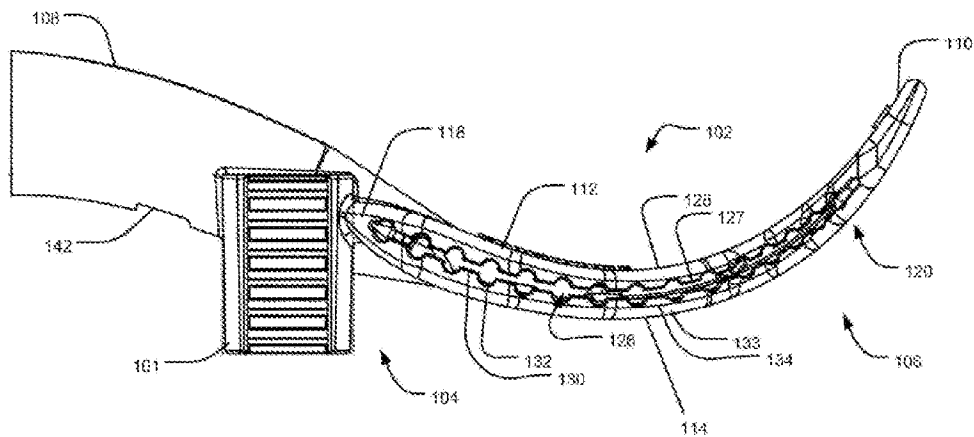
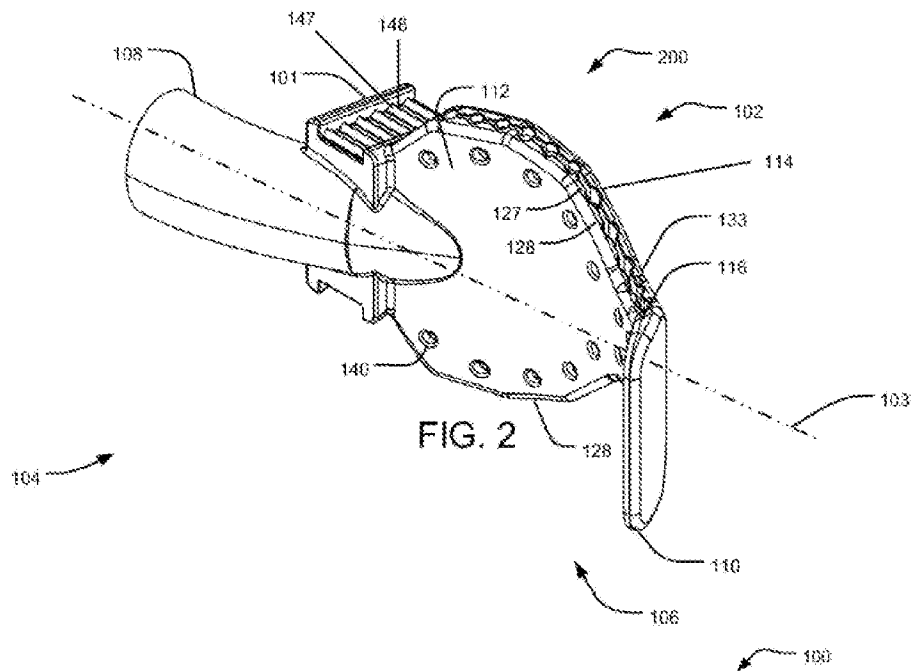


FIG. 6

See also Specification at [0034] (noting that “[a]t least one anterior intervening wall 127 may extend from at least one edge 128 of the anterior wall 112 partially towards the posterior wall 114,” and “[t]he span of such anterior intervening wall 127 therefore may not extend the entire distance between the anterior wall 112 and the posterior wall 114”); [0035] (“The posterior wall 114 may have a corresponding at least one posterior intervening wall 134 that extends from at least one edge 133 of the posterior wall 114 and partially extends towards the anterior wall 112”).

The Applicant submits that such an ‘intervening wall’ that extends ‘partially across the distance’ ‘between the anterior wall and the posterior wall’ ‘along an edge’ is novel and non-obvious over the references of record.

CONCLUSION

Based on the foregoing, it is believed that the present application overcomes the current rejections of record and is now in conditions for allowance. The Examiner is invited to contact Applicant's undersigned representation with any questions regarding the present submission.

Respectfully submitted,

March 2, 2022

By: /Tam Thanh Pham/
Tam Thanh Pham, Reg. No. 50,565
Polsinelli LLP
3 Embarcadero Center, Suite 2400
San Francisco, CA 94111
T: 415.248.2116
F: 415.520.0486
PatentDocketing@Polsinelli.com

Electronic Acknowledgement Receipt

EFS ID:	45123503
Application Number:	16870745
International Application Number:	
Confirmation Number:	7491
Title of Invention:	DENTAL MOUTHPIECE
First Named Inventor/Applicant Name:	Thien Nguyen
Customer Number:	138718
Filer:	TamThanh Thi Pham/Cheri Houle
Filer Authorized By:	TamThanh Thi Pham
Attorney Docket Number:	INCEP-005
Receipt Date:	02-MAR-2022
Filing Date:	08-MAY-2020
Time Stamp:	15:07:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		INCEP-005_AMEND_A_3-2-22.pdf	263665	yes	10
			ea4840a072f9247471ca0f357532888e3a7de3ff		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Request for Reconsideration-After Non-Final Rejection	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	10
Warnings:			
Information:			
Total Files Size (in bytes):		263665	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16870745
	Filing Date	2020-05-08
	First Named Inventor	NGUYEN; Thien
	Art Unit	3772
	Examiner Name	TO, HOLLY T
	Attorney Docket Number	084892-INCEP-005

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	None				

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
Attorney Docket Number	084892-INCEP-005

1	Docket No. INCEP-001COC U.S. Patent Application 14/228,054; Final Office Action mailed 1-3-22.
2	Docket No. INCEP-001COE U.S. Patent Application 14/228,061; Non-Final Office Action mailed 12-8-21.

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16870745
Filing Date	2020-05-08
First Named Inventor	NGUYEN; Thien
Art Unit	3772
Examiner Name	TO, HOLLY T
Attorney Docket Number	084892-INCEP-005

CERTIFICATION STATEMENT

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

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

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Tam Thanh Pham/	Date (YYYY-MM-DD)	2022-03-02
Name/Print	Tam Thanh Pham	Registration Number	50565

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt

EFS ID:	45121634
Application Number:	16870745
International Application Number:	
Confirmation Number:	7491
Title of Invention:	DENTAL MOUTHPIECE
First Named Inventor/Applicant Name:	Thien Nguyen
Customer Number:	138718
Filer:	TamThanh Thi Pham/Lea Fong
Filer Authorized By:	TamThanh Thi Pham
Attorney Docket Number:	INCEP-005
Receipt Date:	02-MAR-2022
Filing Date:	08-MAY-2020
Time Stamp:	20:32:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	INCEP-005_IDS_Statement_3-2-22.pdf	96723 9a130d252fdd6a9da6b60de61de78e3d62a66d64	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	084892- INCEP-005_0_IDS_2022030120 2406.pdf	1064530 87a4bfb46f3a3517cfb35d707a1d05205906f560	no	4
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Information:					
3	Non Patent Literature	INCEP-001COC_Final_OA_1-3-2 2.pdf	471409 882f32eaf5d37d33f6af9b940c0a18eba7ab577c	no	12
Warnings:					
Information:					
4	Non Patent Literature	INCEP-001COE_Non- Final_OA-12-8-21.pdf	509169 653623b02c004f728caae0c11f3cbe3d3a73278a	no	13
Warnings:					
Information:					
Total Files Size (in bytes):			2141831		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 3772

Examiner: Holly T. To

Serial No.: 16/870,745

Filed: May 8, 2020

In re Application of: Thien Nguyen

Confirmation No.: 7491

Customer No.: 138718

Title: DENTAL MOUTHPIECE

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Under 37 C.F.R. § 1.56 and 1.97-1.98

Examiner:

Pursuant to the provisions of 37 C.F.R. §§ 1.56 and 1.97-98 of the Rules of Practice in Patent Cases, enclosed herewith is form PTO-SB-08, listing several references. The Examiner is requested to make these references of official record in the application.

The references cited may be material to examination of the application and are submitted in compliance with the Applicant's duty of disclosure as defined by 37 C.F.R. § 1.56.

Applicants hereby declare, pursuant to 37 C.F.R. §1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after having made a reasonable inquiry, no item of information contained in the information disclosure statement was

known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of the information disclosure statement.

No representation is made or intended as to the completeness of this list, nor is the inclusion of any reference an admission that it is prior art or pertinent to this application.

Respectfully submitted,
POLSINELLI LLP

Dated: March 2, 2022

By: _____/Tam Thanh Pham/_____
Tam Thanh Pham (Reg. No. 50,565)
Polsinelli LLP
Three Embarcadero Center, Suite 2400
San Francisco, CA 94111
415-248-2100 (Main)
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UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/870,745	05/08/2020	Thien Nguyen	INCEP-005	7491
138718	7590	03/09/2022	EXAMINER	
Polsinelli LLP			TO, HOLLY T	
3 Embarcadero Center			ART UNIT	
Suite 2400			PAPER NUMBER	
San Francisco, CA 94111			3772	
			NOTIFICATION DATE	DELIVERY MODE
			03/09/2022	ELECTRONIC

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

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

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

sfpatent@polsinelli.com
uspt@polsinelli.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 16/870,745	Applicant(s) Nguyen et al.		
	Examiner HOLLY T TO	Art Unit 3772	AIA (First Inventor to File) Status Yes	Page 1 of 2

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
HOLLY T TO	Examiner	Telephonic
Tam Thanh Pham	Attorney of Record	
Jacqueline Johanas	SPE	

Date of Interview: 04 March 2022

Issues Discussed:

Other

Attorney started the meeting presenting the argument that the applicant's invention presents a side wall in the main body that extends along the edge of the main body wall and claims the current 102(a)(2) rejection does not provide support of such. It is then further clarified by the attorney that "along the edge" refers to the peripheral edge and not the edge of the inner surface of the main wall. It is explained after review, the current 102(a)(2) rejection appears to be overcome; however, it is informed to the attorney that due to the time constraint of reviewing the amended and new claims, no examiner's amendments or allowance could be considered at the time. It is also clarified that during examination, that a call will be made to the attorney if allowable subject matter arises to address a potential examiner's amendment to expedite prosecution. It is also clarified to the attorney that the 103 rejection made was in view of the "incept" reference which is US 20140162209 A1.

☒ Attachment

/HOLLY T. TO/ Examiner, Art Unit 3772	/JACQUELINE T JOHANAS/ Supervisory Patent Examiner, Art Unit 3772
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete

<i>Applicant-Initiated Interview Summary</i>	Application No. 16/870,745	Applicant(s) Nguyen et al.		
	Examiner HOLLY T TO	Art Unit 3772	AIA (First Inventor to File) Status Yes	Page 2 of 2

and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR(S): Nguyen et al.
APPLICATION NO.: 16/870,745
FILING DATE: May 8, 2020
TITLE: Dental Mouthpiece
EXAMINER: Holly T. To
ART UNIT: 3772
CONFIRM. NO.: 7491
ATTY.DKT.NO.: INCEP-005

ATTN: Examiner To <holly.to@uspto.gov>
Interview: Friday, March 4, 2022, 9AM Pacific/12PM Eastern

AGENDA FOR INTERVIEW

Examiner To:

An agenda is provided herein for telephonic examiner interview scheduled for Friday, March 4, 2022.

I. Exemplary Amendment

1. (currently amended) A dental mouthpiece formed in a curve, the dental mouthpiece comprising:
 a main body portion at a central part of the curve having a first end and a second end, the main body portion having an anterior wall inside the curve and a posterior wall outside the curve, the anterior wall and the posterior wall defining an interior space corresponding to a distance between the anterior wall and the posterior wall, at least one connector connecting the anterior wall to the posterior wall, at least one anterior intervening wall extending along an edge of the anterior wall partially across the distance towards the posterior wall,

and at least one posterior intervening wall extending along an edge of the posterior wall partially across the distance towards the anterior wall, the at least one anterior intervening wall and the at least one posterior intervening wall each having alternating crests and troughs;

a suction connector portion connected to the first end, the connector portion connecting the interior space to a vacuum suction source; and

a cheek retractor portion connected to the second end.

See e.g., Specification, FIG. 6 (illustrating “anterior intervening wall 127” and “posterior intervening wall 134” extending along the respective edge of the anterior and posterior walls).

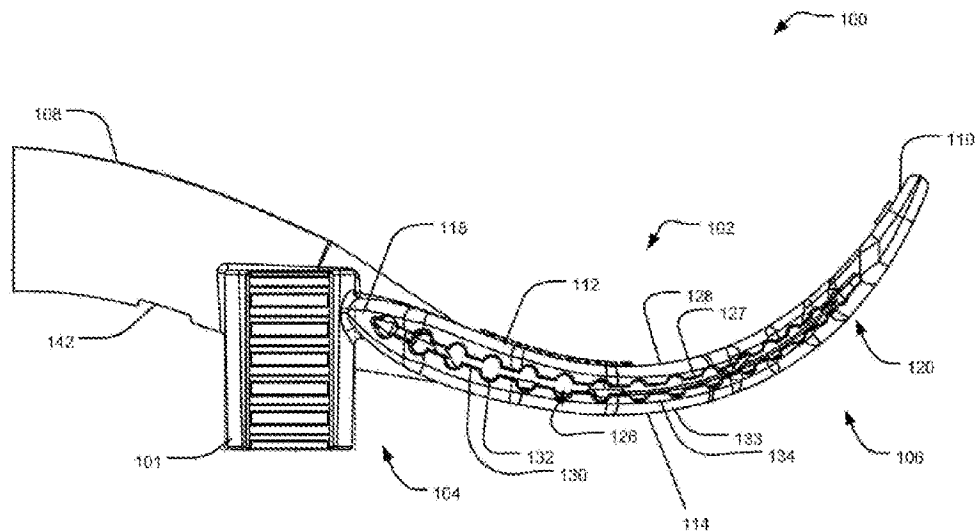


FIG. 6

II. Claim Rejections under 35 U.S.C. §§ 102 - 103

Distinctions between the claimed ‘intervening wall extending along an edge of the ...wall partially across the distance’ (‘between the anterior wall and the posterior wall’) and the cited art of record. *Reyes*, for example, does not include an ‘intervening wall’ that extends ‘along an edge’ as claimed.

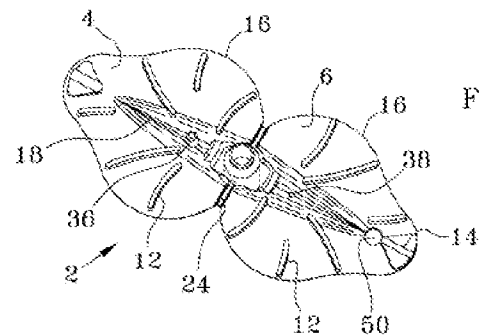


FIG. 1

The Applicant thanks the Examiner for granting the Interview. The Examiner is invited to contact the Applicant's undersigned representative with any questions.

Respectfully submitted,

March 1, 2022

By: /Tam Thanh Pham/
Tam Thanh Pham, Reg. No. 50,565
POLSINELLI LLP
3 Embarcadero Center, Suite 2400
San Francisco, CA 94111
Phone: (415) 248-2116
patentdocketing@polsinelli.com



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/870,745	05/08/2020	Thien Nguyen	INCEP-005	7491
138718	7590	03/14/2022	EXAMINER	
Polsinelli LLP			TO, HOLLY T	
3 Embarcadero Center			ART UNIT	
Suite 2400			PAPER NUMBER	
San Francisco, CA 94111			3772	
			NOTIFICATION DATE	DELIVERY MODE
			03/14/2022	ELECTRONIC

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

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

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

sfpatent@polsinelli.com
uspt@polsinelli.com

NOTICE REQUIRING EXCESS CLAIMS FEES	Application No.	Applicant(s)
	16/870,745	Nguyen et al.
	Art Unit	AIA (FITF) Status
	OED1	Yes

The excess claim(s) filed on 02 March 2022 is/are not accompanied by the appropriate payment of excess claims fees set forth in 37 CFR 1.16(h)-(j) or 1.492(d)-(f). Excess claims fees are required for each claim in independent form in excess of three (§ 1.16(h)), each claim (whether dependent or independent) in excess of twenty (note that § 1.75(c) indicates how multiple dependent claims are considered for fee calculation purposes) (§ 1.16(i)), and each application that contains a multiple dependent claim (§ 1.16(j)).

Since the application is not under a final rejection, applicant is given a time period of **TWO (2) MONTHS** from the mailing date of this notice to submit either: (1) the fee payment of \$ 100 , or (2) an amendment in compliance with 37 CFR 1.121 that cancels the excess claim(s), in order to avoid ABANDONMENT. Extensions of this time period may be granted under 37 CFR 1.136, unless the excess claim(s) was/were presented in a preliminary amendment.

- ☐ 1. The funds in Deposit Account No. _____ are insufficient to cover the entire fee due. The balance is due within the time period set forth in this notice. See note below regarding the appropriate service charge.
- ☐ 2. The Credit Card payment to cover the entire fee due to Account _____ (**Card type + last 4 digits ONLY**) was refused. The balance is due within the time period set forth in this notice. See note below regarding the appropriate service charge.
- ☒ 3. The amendment that includes the excess claim(s) has not been entered, since applicant has failed to remit (or authorize charge to a Deposit Account or Credit Card) the fee as indicated on the attached Patent Application Fee Determination Record (PTO/SB/06). Remittance or authorization is due within the time period set forth in this notice .
- ☐ 4. The fee submitted in this application is insufficient. A balance of \$ _____ is due for presentation of excess claims (37 CFR 1.16(h)-(j) or 1.492(d)-(f)).
- ☐ 5. Other.

Explanation (*Provide specific details of the required correction in order to assist the applicant. Indicate whether a service charge has been added to the fee due*): _____

THE AMOUNT OF THE FEE(S) DUE IS SUBJECT TO CHANGE, GENERALLY ON OCTOBER 1 OF EACH YEAR (37 CFR 1.16, 1.21 & 1.492). **THE AMOUNT OF THE FEE(S) DUE IS DETERMINED AS OF THE DATE A COMPLETE REPLY WITH THE APPROPRIATE FEE(S) IS RECEIVED BY THE OFFICE** (37 CFR 1.8 & 1.10). BECAUSE THE AMOUNT DUE IS SUBJECT TO CHANGE, IT IS RECOMMENDED THAT APPLICANT CHECK THE CURRENT FEE SCHEDULE WHICH IS AVAILABLE ON THE USPTOS WEBSITE AT: <http://www.uspto.gov/web/offices/ac/qs/ope/fees.htm>

Service Charges: There is a \$50 service charge for processing each payment refused (including a check returned unpaid) or charged back by a financial institution (37 CFR 1.21(m)). There is a \$25.00 service charge for each month when the balance of a deposit account is below \$1000 at the end of the month (37 CFR 1.21(b)(2)).

Technical Support Staff (TSS): /JEFFERY L OLSEN/

Phone Number: (571)272-6393

Note to TSS: Please do NOT use this notice if the application is under a final rejection.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/870,745	Filing Date 05/08/2020	☒ To be Mailed
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ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 = *		x \$50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 = *		x \$230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)	RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	03/02/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	* 22	Minus	** 20	= 2	x \$50 =	100
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	x \$240 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	100
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE	
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/JEFFERY L OLSEN/	
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".							
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.: 16/870,745
INVENTOR: Thien Nguyen
FILED: May 8, 2020
TITLE: DENTAL MOUTHPIECE
GROUP ART UNIT: 3772
EXAMINER: Holly T. To
CONFIRMATION NO.: 7491
ATTY. DKT. NO.: INCEP-005

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

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Examiner:

In response to the Notice Requiring Excess Claims Fees dated March 14, 2022, enclosed please find the following:

- Excess Claims Fees

In the event any additional fees are required, the Commissioner is authorized to charge our deposit account 50-1662.

Respectfully Submitted,
POL SINELLI LLP

March 15, 2022

By: /Tam Thanh Pham/
Tam Thanh Pham (Reg. No. 50565)
POL SINELLI LLP
Three Embarcadero Center, Suite 2400
San Francisco, CA 94111
415.248.2100 Main
patentdocketing@polsinelli.com

Electronic Patent Application Fee Transmittal

Application Number:	16870745			
Filing Date:	08-May-2020			
Title of Invention:	DENTAL MOUTHPIECE			
First Named Inventor/Applicant Name:	Thien Nguyen			
Filer:	TamThanh Thi Pham/Cheri Houle			
Attorney Docket Number:	INCEP-005			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	2	50	100
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				100

Electronic Acknowledgement Receipt

EFS ID:	45234001
Application Number:	16870745
International Application Number:	
Confirmation Number:	7491
Title of Invention:	DENTAL MOUTHPIECE
First Named Inventor/Applicant Name:	Thien Nguyen
Customer Number:	138718
Filer:	TamThanh Thi Pham/Cheri Houle
Filer Authorized By:	TamThanh Thi Pham
Attorney Docket Number:	INCEP-005
Receipt Date:	15-MAR-2022
Filing Date:	08-MAY-2020
Time Stamp:	16:53:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 100
RAM confirmation Number	E20223EG53393917
Deposit Account	501662
Authorized User	Cheri Houle

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	INCEP-005_RESP_NOTICE_3-15-22.pdf	142729	no	1
			78590629a6ddbbaed5d560dd336f5cc0377ffc6bb		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	37311	no	2
			8fdb8c755c6d2f5e67872b4959ea42080aae5e76		

Warnings:

Information:

Total Files Size (in bytes):			180040
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/870,745	05/08/2020	Thien Nguyen	INCEP-005	7491
138718	7590	05/12/2022	EXAMINER	
Polsinelli LLP			TO, HOLLY T	
PO Box 140310			ART UNIT	PAPER NUMBER
Kansas City, MO 64114-0310			3772	
			NOTIFICATION DATE	DELIVERY MODE
			05/12/2022	ELECTRONIC

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

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

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

sfpatent@polsinelli.com
uspt@polsinelli.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Objections

Claim **22** is objected to because of the following informalities:

- Claim **22** recites “wherein the intervening wall” in line 1. For consistency purpose, it should be revised to be “wherein the at least one intervening wall”.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

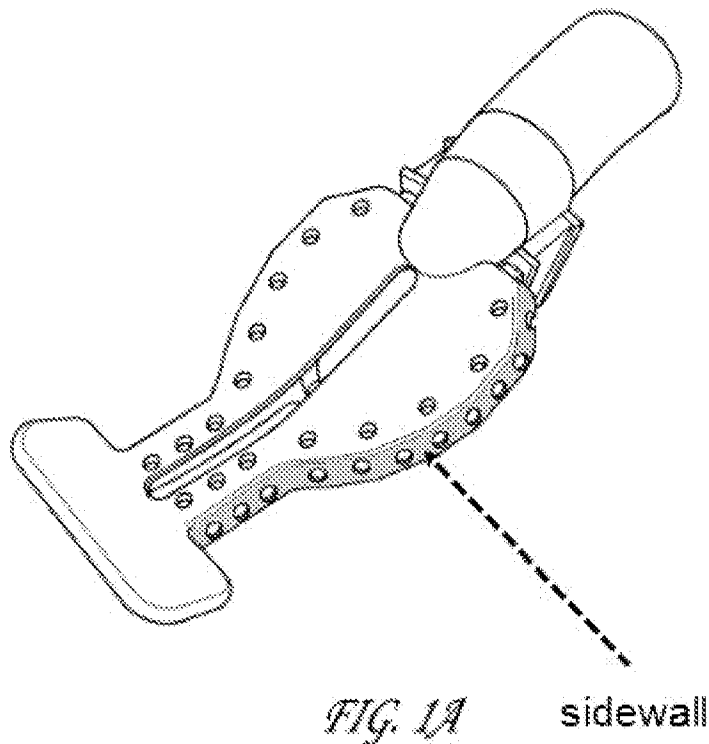
Claims 1, 3-5, 8, 10-14, 17-19 and 21-27 is/are rejected under 35 U.S.C. 103 as being unpatentable over Nguyen (US 20140212841 A1) in view of Al-Shawi (US 20180153637 A1) and He (CN 104490483 A, See Machine Translated Version Labeled as “CN 104490483 A_Translated”).

Regarding Claim **1**, Nguyen discloses a dental mouthpiece formed in a curve (Abstract, Fig. 1A), the dental mouthpiece comprising:

- a main body portion (Fig. 1B, label 110) at a central part of the curve (Fig. 1B) having a first end and a second end (See Annotated Figure A of Fig. 1A), the main body portion having an anterior wall inside the curve and a posterior wall outside the curve (See Annotated Figure B of Fig. 1E), the anterior wall and the posterior wall defining an interior space (Figure 1E wherein the space

pointed by label 180 is the interior space defined by the anterior wall and posterior wall) corresponding to a distance between the anterior wall and the posterior wall (See Annotated Figure A of Fig. 1A and Fig 1A),

- a suction connector portion (120) connected to the first end (See Annotated Figure D of Fig. 1A), the connector portion connecting the interior space to a vacuum suction source (See Annotated Figure D of Fig. 1A; Par. [0042]); and
- a cheek retractor portion (130) connected to the second end (Fig. 7A-7B).



•

Nguyen discloses the presence of a sidewall (see figure above) that extends along the edge of both the anterior wall and posterior wall. This sidewall acts to define the suction conduits (holes shown in the shaded area of the figure above). However, Nguyen is silent to the sidewall being made from an at least one anterior intervening wall extending along an edge of the anterior wall partially across the

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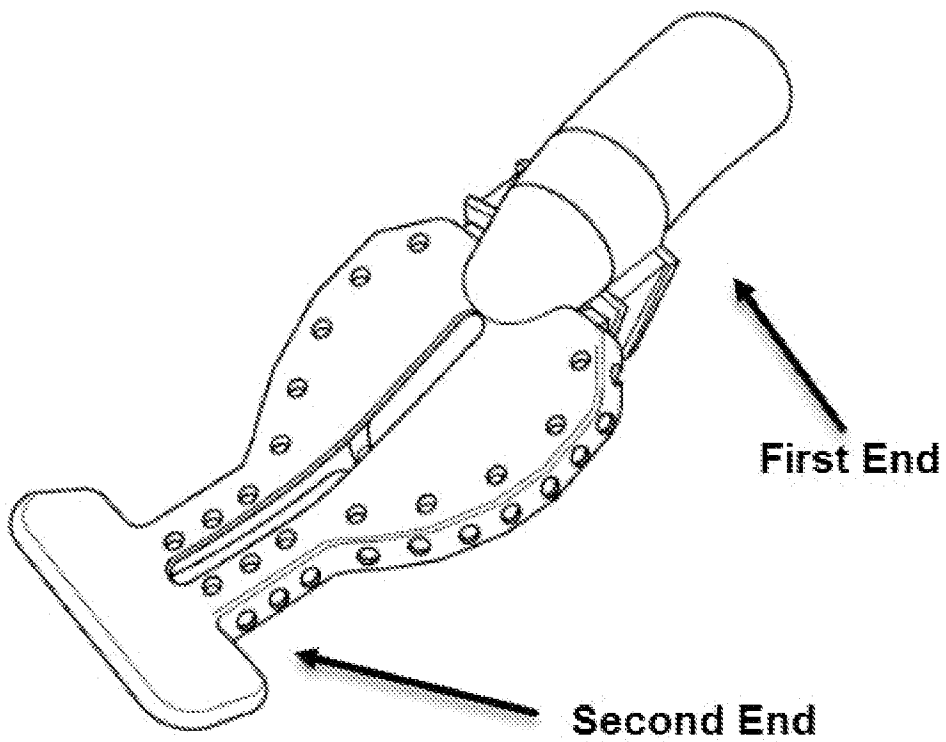
distance towards the posterior wall, and at least one posterior intervening wall extending along an edge of the posterior wall partially across the distance towards the anterior wall, the at least one anterior intervening wall and the at least one posterior intervening wall each having alternating crests and troughs. Further, Nguyen is silent to at least one connector connecting the anterior wall to the posterior wall.

Al-Shawi discloses a medical suction device (400, Fig. 4A) in the analogous art of suction devices and further discloses suction conduits ("flow channels", [0096]) which are formed by two half-walls (401, 402) having mating projections (422). The mating projections (422) with interspaced flow channels form crest and trough shapes on the two mating half-walls (401, 402) that extend toward each other and abut each other to provide the flow channels within the device (Par. [0096] - [0097]; Fig. 4A-4C).

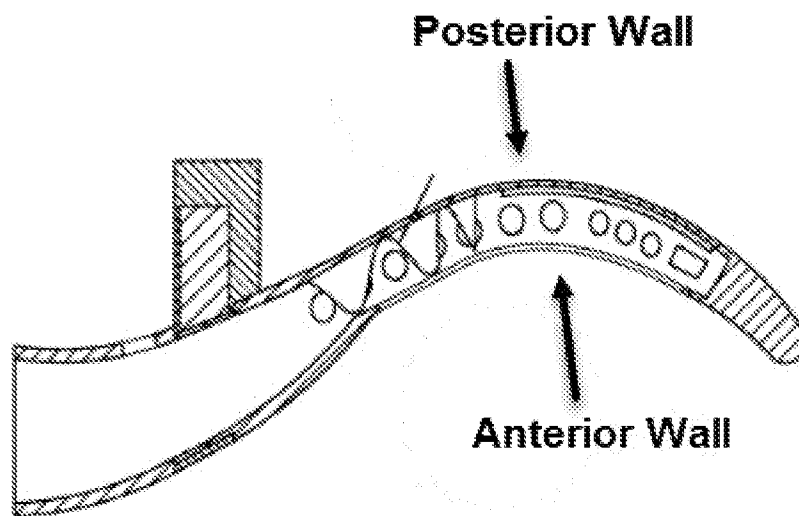
It would have been obvious to someone skilled in the art before the effective filing date to modify the single solid sidewall of Nguyen to be made from two abutting anterior and posterior sidewalls with complementary mating and abutting crests and troughs to form the flow channels as taught by Al-Shawi in order to use an alternative sidewall arrangement shown in the prior art which would yield predictable results of forming flow channels through a double walled suction device.

He discloses a dental suction device in the same field of endeavor and further discloses at least one connector (Fig. 4, label 34) connecting the anterior wall (Fig. 4, label 31) to the posterior wall (Fig. 4, label 32) found in the main body (See Annotated Figure C of Fig. 1 of He) to stabilize the two walls into place.

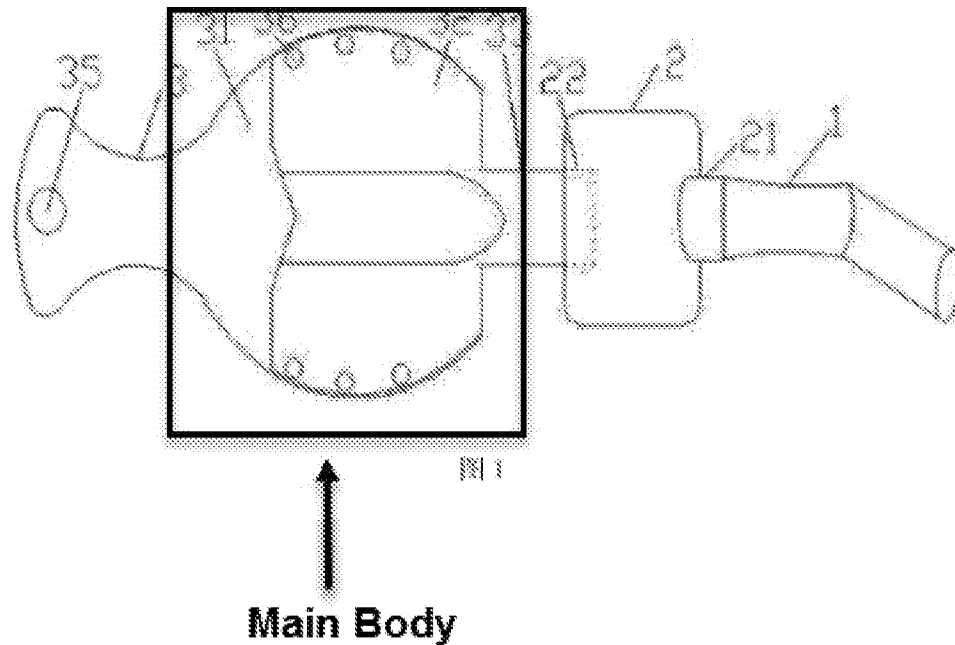
It would have been obvious to someone skilled in the art before the effective filing date to modify the dental mouthpiece of Nguyen and Al-Shawi to have at least one connector extending longitudinally along the main body as taught by He to aid in stabilization of the two walls into place during use.



Annotated Figure A



Annotated Figure B



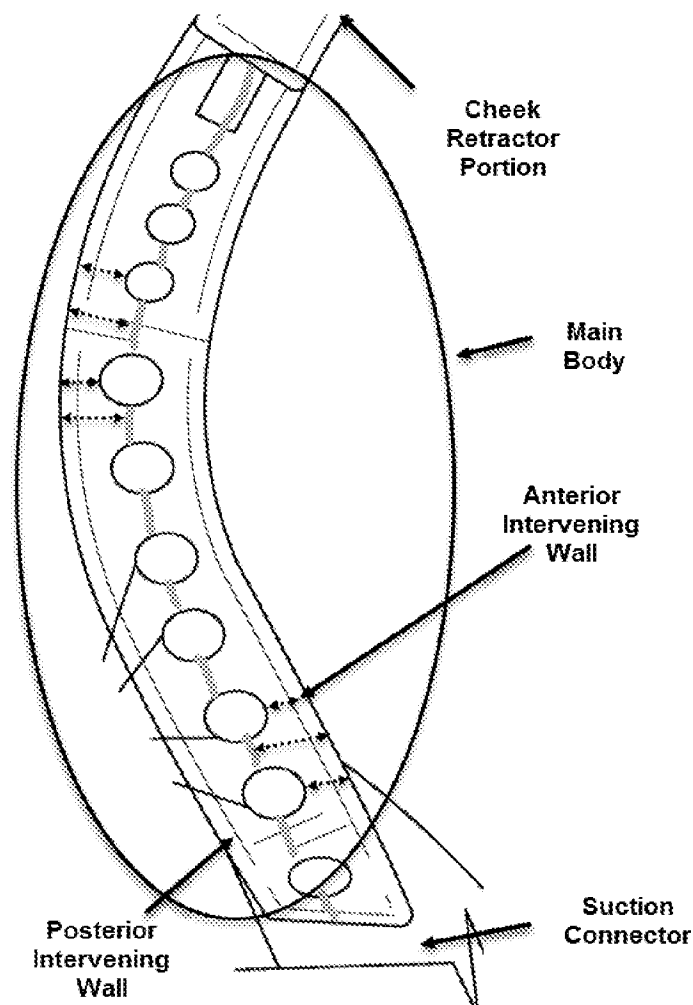
Annotated Figure C

Regarding Claim 3, Nguyen, Al-Shawi, and He teaches the claimed dental mouthpiece of claim 1 and He teaches the at least one connector (Fig. 1 of He, label 34) includes at least one of a wall longitudinally in the main body portion (See Annotated Figure C of Fig. 1 of He) in the interior space or a pillar (See Fig. 4 of He where the interior space is encompassed by the connector).

Regarding Claim 4, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen further discloses a bridge structure (180) that includes or more protrusions (disclosed as “wavelike” in [0040, Nguyen] and shown to have protrusions in Fig. 1E, Nguyen) protruding from the posterior wall within the interior space, wherein the protrusion includes spaced crests and troughs (Par. [0009], Par. [0040] of Nguyen).

Regarding Claim 5, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 4 and Nguyen discloses the protrusions vary in height and length (Fig. 1E, Nguyen shows the bridge structure 180 with protrusion including crest and troughs wherein the crest and troughs are shown to have varying height and length).

Regarding Claim **8**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and based on the modified separate intervening walls as taught by Al-Shawi, Nguyen discloses at least one of the anterior intervening wall and the posterior intervening wall includes a plurality of portions of varying heights or sizes (See Annotated Figure D of Fig. 4 of Nguyen where the grey lines indicate the separation between the two intervening wall and the dotted arrows displays how the intervening wall presents varying heights).



Annotated Figure D

Regarding Claim **10**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses the anterior intervening wall (See Annotated Figure D of Fig. 4 of Nguyen) and the

posterior intervening wall (See Annotated Figure D of Fig. 4 of Nguyen) meet at a point where the suction connector (120) meets the main body portion (110) (Par. [0034]).

Regarding Claim **11**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses the anterior intervening wall (See Annotated Figure D of Fig. 4 of Nguyen) and the posterior intervening wall (See Annotated Figure D of Fig. 4 of Nguyen) meet at a point the main body portion (110) meets the cheek retractor portion (130) (See Annotated Figure D of Fig. 4 of Nguyen; Par. [0034]).

Regarding Claim **12**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses a bite block integrated to the suction connector portion, wherein the bite block provides crush-resistance during biting by a patient (Claim 2 of Nguyen discloses the bite block, bite blocks are fully capable of preventing the crushing of the dental mouthpiece caused by the patient biting down).

Regarding Claim **13**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses the main body, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece (Abstract, Nguyen).

Regarding Claim **14**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses a material that forms the main body, the suction connector portion, and the cheek retractor portion is flexible, translucent, high heat-resistant, autoclavable silicone-based material (Abstract, Nguyen).

Regarding Claim **15**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses a stability bar (Fig. 6B of Nguyen, label 150) included with the posterior wall that protrudes from an interior surface of the posterior wall and along a longitudinal axis of the main body portion (Par. [0039]).

Regarding Claim **17**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses the suction connector portion (120) comprises a cutout (230) corresponding to a protrusion on a vacuum adapter to provide an interlocking fit (Par. [0045], Nguyen).

Regarding Claim **18**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 1 and Nguyen discloses the suction connector portion (120) connects to the vacuum suction source, wherein activation of the vacuum suction source provides suction of fluids from the interior space of the main body portion (Par. [0008]).

Regarding Claim **19**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 18 and Nguyen discloses the activation of the vacuum suction source draws fluids from an exterior of the main body portion into the interior space of the main body portion (Par. [0008]).

Regarding Claim **21**, Nguyen discloses a dental mouthpiece (Abstract, Fig. 1A) comprising:

- a main body portion at a central part of the curve having a first end and a second end (See Annotated Figure A of Fig. 1A), the main body portion having an anterior wall inside the curve and a posterior wall outside the curve (See Annotated Figure A of Fig. 1E), the anterior wall and the posterior wall defining an interior space corresponding to a distance between the anterior wall and the posterior wall (See Annotated Figure A of Fig. 1A and Fig 1A),
- a neck extending from the second end of the main body, wherein a width of the neck is less than a width of the main body portion at the first end (See Annotated Figure E of Fig. 1A)
- a suction connector portion connected to the first end (See Annotated Figure C of Fig. 1A), the connector portion connecting the interior space to a vacuum suction source (See Annotated Figure C of Fig. 1A); and
- a cheek retractor portion connected to the second end (Fig. 7A-7B).

However, Nguyen is silent to at least one intervening wall extending at least partially across the distance and along an edge of the anterior wall or the posterior wall, wherein the at least one

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intervening wall has a plurality of alternating crests and troughs. Further, Nguyen is silent to at least one connector connecting the anterior wall to the posterior wall.

Nguyen discloses the presence of a sidewall (see figure above) that extends along the edge of both the anterior wall and posterior wall. This sidewall acts to define the suction conduits (holes shown in the shaded area of the figure above). However, Nguyen is silent to the sidewall being made from an at least one anterior intervening wall extending along an edge of the anterior wall partially across the distance towards the posterior wall, and at least one posterior intervening wall extending along an edge of the posterior wall partially across the distance towards the anterior wall, the at least one anterior intervening wall and the at least one posterior intervening wall each having alternating crests and troughs. Further, Nguyen is silent to at least one connector connecting the anterior wall to the posterior wall.

Al-Shawi discloses a medical suction device (400, Fig. 4A) in the analogous art of suction devices and further discloses suction conduits ("flow channels", [0096]) which are formed by two half-walls (401, 402) having mating projections (422). The mating projections (422) with interspaced flow channels form crest and trough shapes on the two mating half-walls (401, 402) that extend toward each other and abut each other to provide the flow channels within the device (Par. [0096] - [0097]; Fig. 4A-4C).

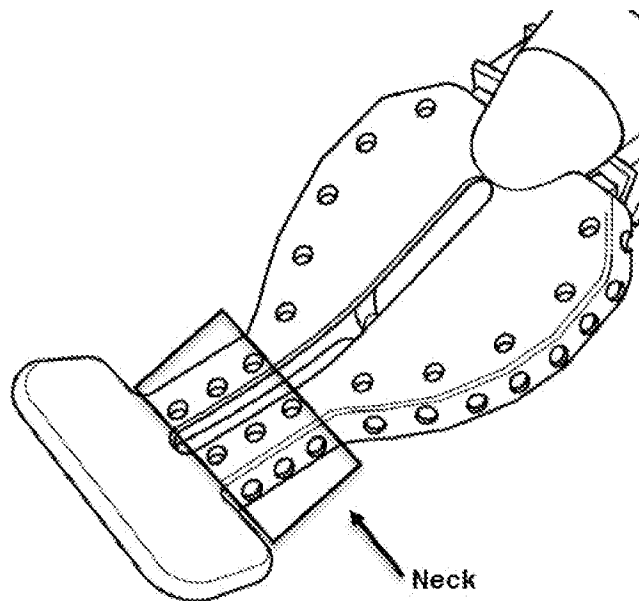
It would have been obvious to someone skilled in the art before the effective filing date to modify the single solid sidewall of Nguyen to be made from two abutting anterior and posterior sidewalls with complementary mating and abutting crests and troughs to form the flow channels as taught by Al-Shawi in order to use an alternative sidewall arrangement shown in the prior art which would yield predictable results of forming flow channels through a double walled suction device.

He discloses a dental suction device in the same field of endeavor and further discloses at least one connector (Fig. 4, label 34) connecting the anterior wall (Fig. 4, label 31) to the posterior wall (Fig. 4,

Art Unit: 3772

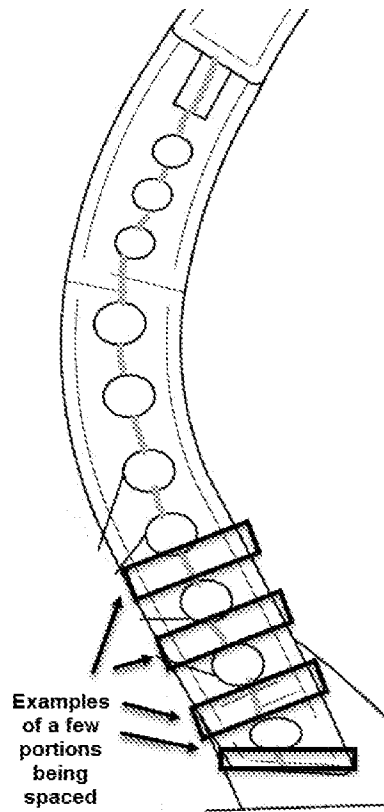
label 32) found in the main body (See Annotated Figure C of Fig. 1 of He) to stabilize the two walls into place.

It would have been obvious to someone skilled in the art before the effective filing date to modify the dental mouthpiece of Nguyen and Al-Shawi to have at least one connector extending longitudinally along the main body as taught by He to aid in stabilization of the two walls into place during use.



Annotated Figure E

Regarding Claim **22**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 21 and Nguyen discloses the at least one intervening wall includes a plurality of spaced portions (See Annotated Figure F of Fig. 4 of Nguyen wherein the holes separates the different portions indicative of the portions being spaced).



Annotated Figure F

Regarding Claim **23**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 21 and Nguyen discloses a bite block integrated to the suction connector portion, wherein the bite block provides crush-resistance during biting by a patient (Claim 2 of Nguyen discloses a bite block, which is fully capable of preventing the crushing of the dental mouthpiece caused by the patient biting down).

Regarding Claim **24**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 21 and Nguyen discloses the main body, the suction connector portion, and the cheek retractor portion are formed by injection-molding as one piece (Abstract, Nguyen).

Regarding Claim **25**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 21 and Nguyen discloses the suction connector portion (120) comprises a cutout (230) corresponding to a protrusion on a vacuum adapter to provide an interlocking fit (Par. [0045]).

Regarding Claim **26**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 21 and Nguyen discloses the suction connector portion (120) connects to the vacuum suction source, wherein activation of the vacuum suction source provides suction of fluids from the interior space of the main body portion (Par. [0008]).

Regarding Claim **27**, Nguyen and Al-Shawi teaches the claimed dental mouthpiece of claim 26 and Nguyen discloses the activation of the vacuum suction source draws fluids from an exterior of the main body portion into the interior space of the main body portion (Par. [0008]).

Response to Arguments

Applicant's arguments, see page 7-9 of remarks, filed on 3/02/2022, with respect to the rejection(s) of claim(s) **1-20** under 102 and 103 are moot in view of new grounds of rejection necessitated by amendment.

Allowable Subject Matter

Claims **16** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The best prior is found to be Nguyen (US 20140212841 A1) which discloses a curved dental mouthpiece with a main body, an anterior wall, a posterior wall, an intervening wall, a neck, a suction connector portion, and a cheek retractor portion. However, Nguyen is silent to the at least one connector includes a plurality of evenly spaced connectors along the stability bar.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOLLY T TO whose telephone number is (571)272-0719. The examiner can normally be reached Monday - Thursday 6:30 - 4:30.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacqueline Johanas can be reached on (571)270-5085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/HOLLY T. TO/
Examiner, Art Unit 3772

/JACQUELINE T JOHANAS/
Supervisory Patent Examiner, Art Unit 3772

Notice of References Cited	Application/Control No. 16/870,745		Applicant(s)/Patent Under Reexamination Nguyen et al.	
	Examiner HOLLY T TO		Art Unit 3772	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180153637-A1	06-2018	Al-Shawi; Modher Ibrahim	A61B90/40	1/1
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	CN-104490483-A	04-2015	CN	HE Q	A61C17/04
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	He, Qing-xuan, "CN 104490483 A_Translated" (Year: 2015)
	V	
	W	
	X	

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

<i>Search Notes</i> 	Application/Control No. 16/870,745	Applicant(s)/Patent Under Reexamination Nguyen et al.
	Examiner HOLLY T TO	Art Unit 3772

CPC - Searched*		
Symbol	Date	Examiner
A61C5/90	11/22/2021	HT
A61C17/08	11/22/2021	HT
A61B1/24	11/22/2021	HT
A61C17/06	04/21/2022	HT
A61C17/04,043,0208	04/21/2022	HT
A61B1/0094	05/02/2022	HT
A61B2017/22079	05/02/2022	HT

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
433	92	11/22/2021	HT
433	91,93,136,138,140 ,20	04/21/2022	HT

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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<i>Search Notes</i> 	Application/Control No. 16/870,745	Applicant(s)/Patent Under Reexamination Nguyen et al.
	Examiner HOLLY T TO	Art Unit 3772

Search Notes		
Search Notes	Date	Examiner
Conducted Inventor, Assignee, USPC and CPC search (with text in PE2E); *denotes cursory review of the search areas listed above	11/22/2021	HT
Consulted With Home SPE Jacqueline Johanas in Dentistry (Class 433)	11/29/2021	HT
Conducted updated Inventor, Assignee, USPC and CPC search (with text in PE2E); *denotes cursory review of the search areas listed above	04/21/2022	HT
Consulted Heidi Eide in Dentistry (Class 433)	04/26/2022	HT

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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<i>Index of Claims</i> 	Application/Control No. 16/870,745	Applicant(s)/Patent Under Reexamination Nguyen et al.
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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	11/29/2021	05/05/2022							
	1	✓	✓							
	2	✓	-							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	-							
	7	✓	-							
	8	✓	✓							
	9	✓	-							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	O							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	-							
	21		✓							
	22		✓							
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	24		✓							
	25		✓							
	26		✓							
	27		✓							