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(54) **ENDODONTICS SURGICAL STENT**

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(52) **U.S. Cl.**

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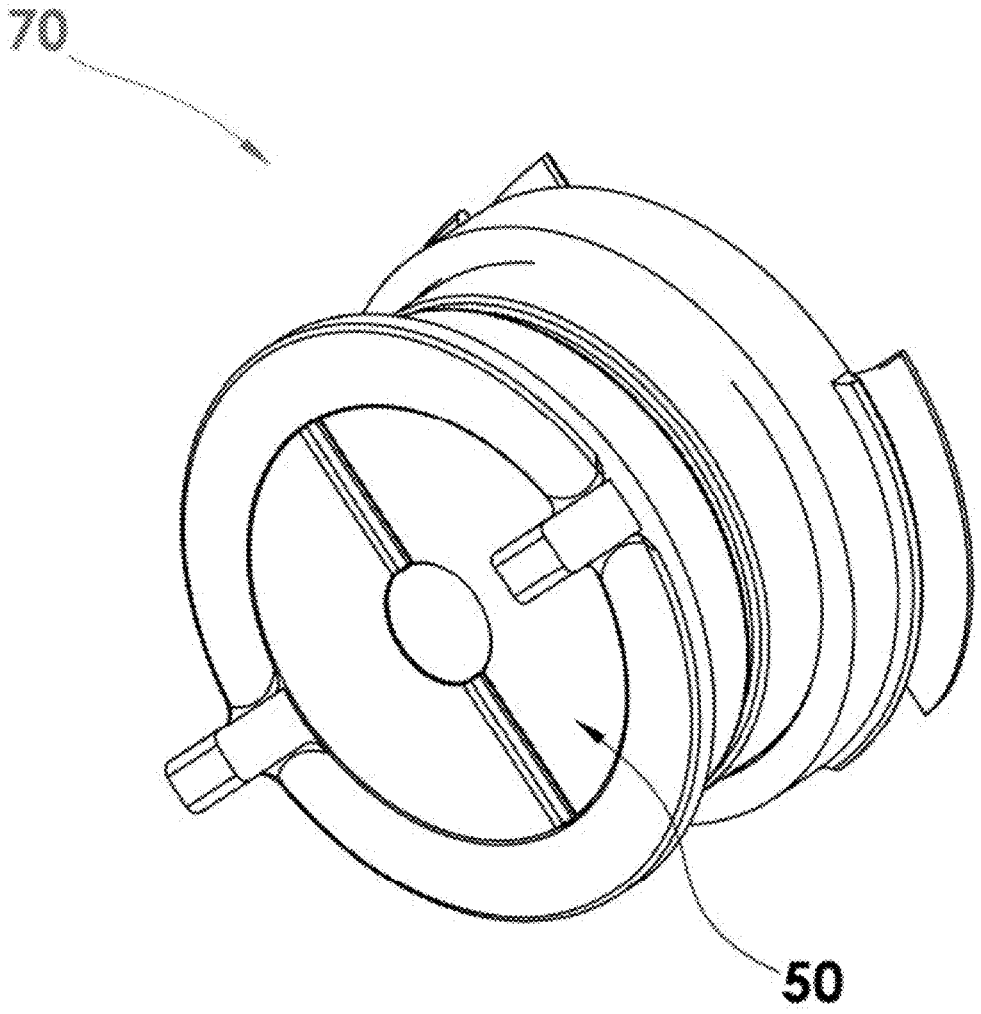
(57) **ABSTRACT**

A hard tissue stent, including an access hole formed in one side, may be placed over one or more of the patient's teeth where the access hole is accurately aligned at a location for drilling to, for example, remove infection. A soft tissue stent may be placed over one or more of the patient's teeth, where the stent can include a mark to cut to create an access flap in the soft tissue. By keeping the flap attached, the surgeon can more easily return the flap to the proper position. The attached surgical guide permits access any area of the jaw and tooth and implanted device. With insertion of a sleeve with custom bores into the guide, the dental surgeon can work in a dry field and accurately manipulate the bony crypt and tooth for many different purposes including root-end preparation, filling and repair of local perforations and cracks.



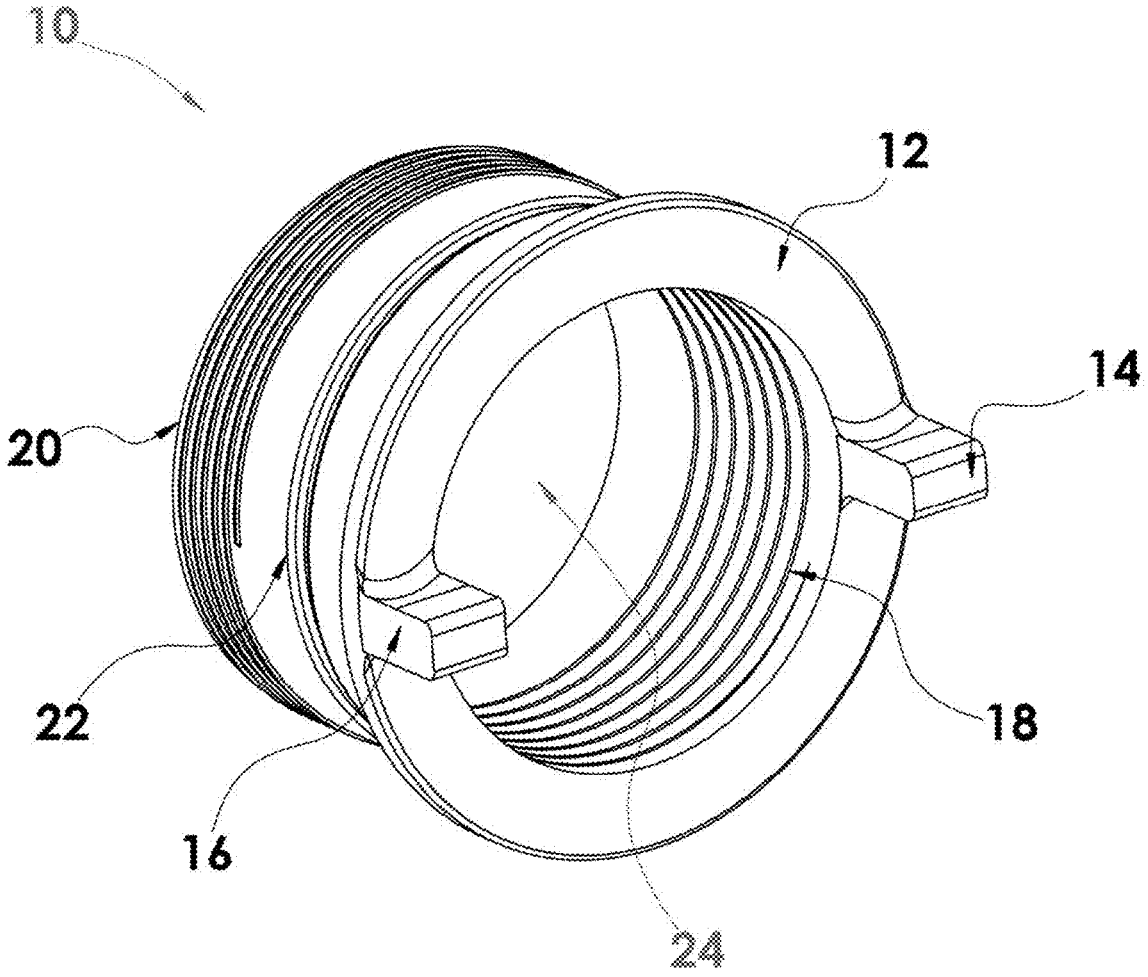


FIG. 1

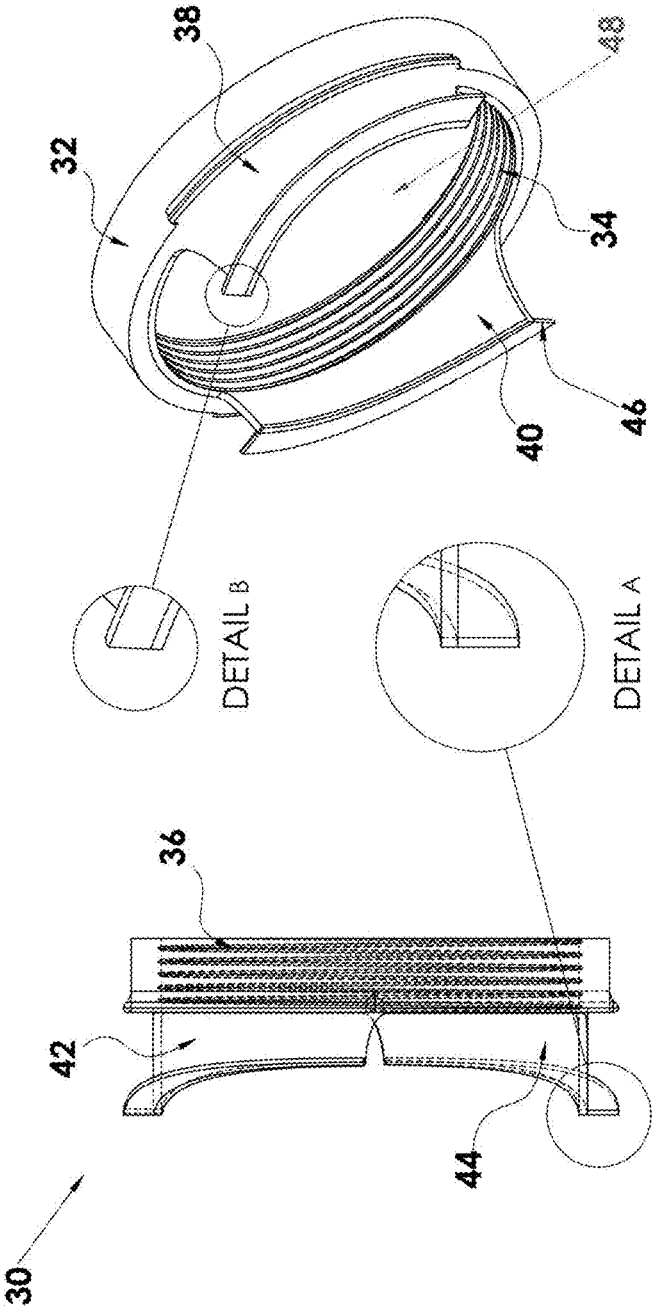


FIG. 2A

FIG. 2B

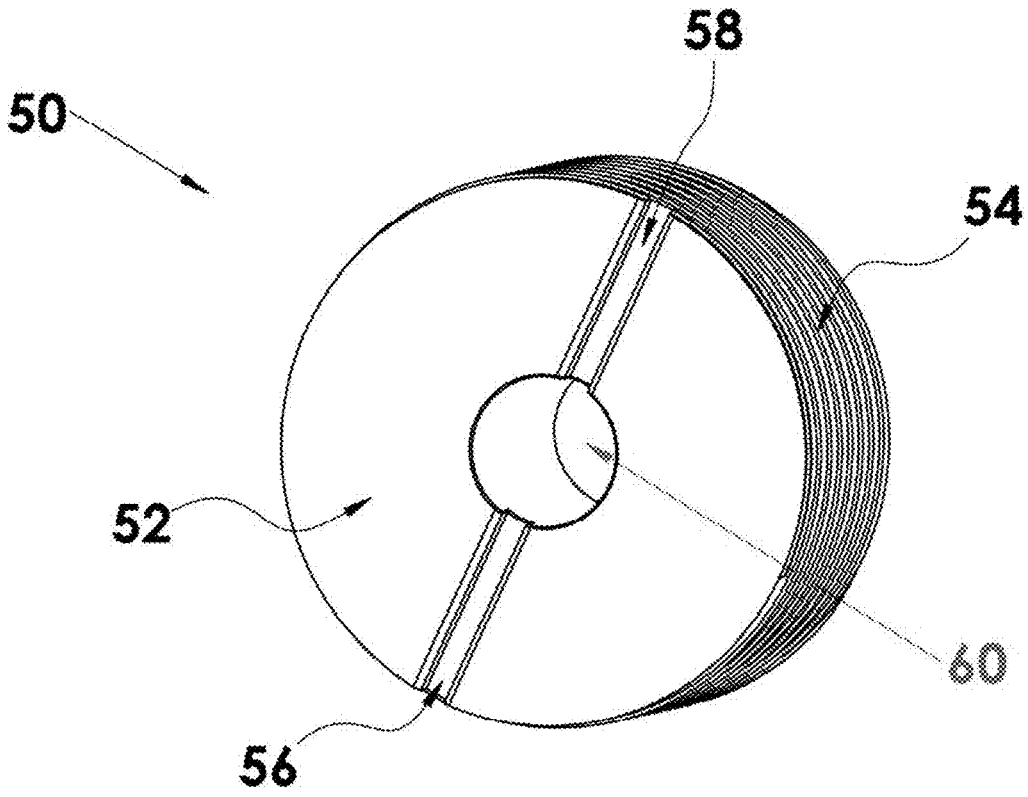


FIG. 3

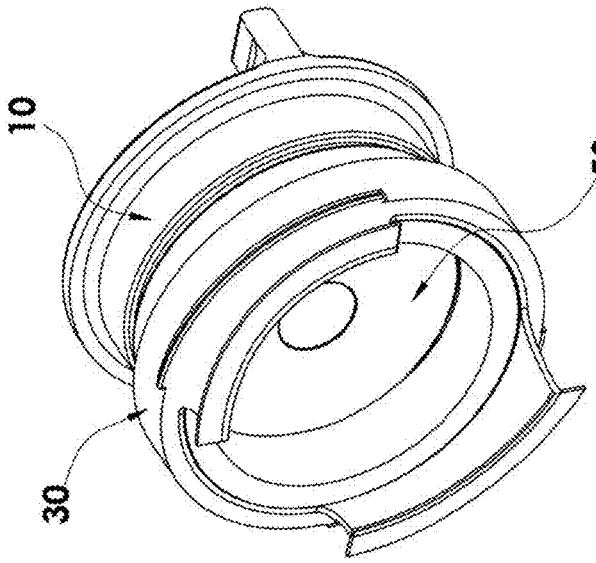


FIG. 4B

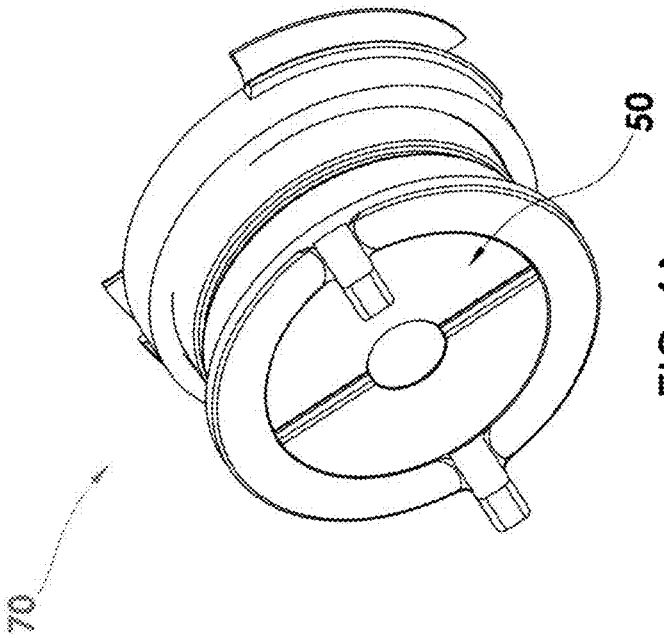


FIG. 4A

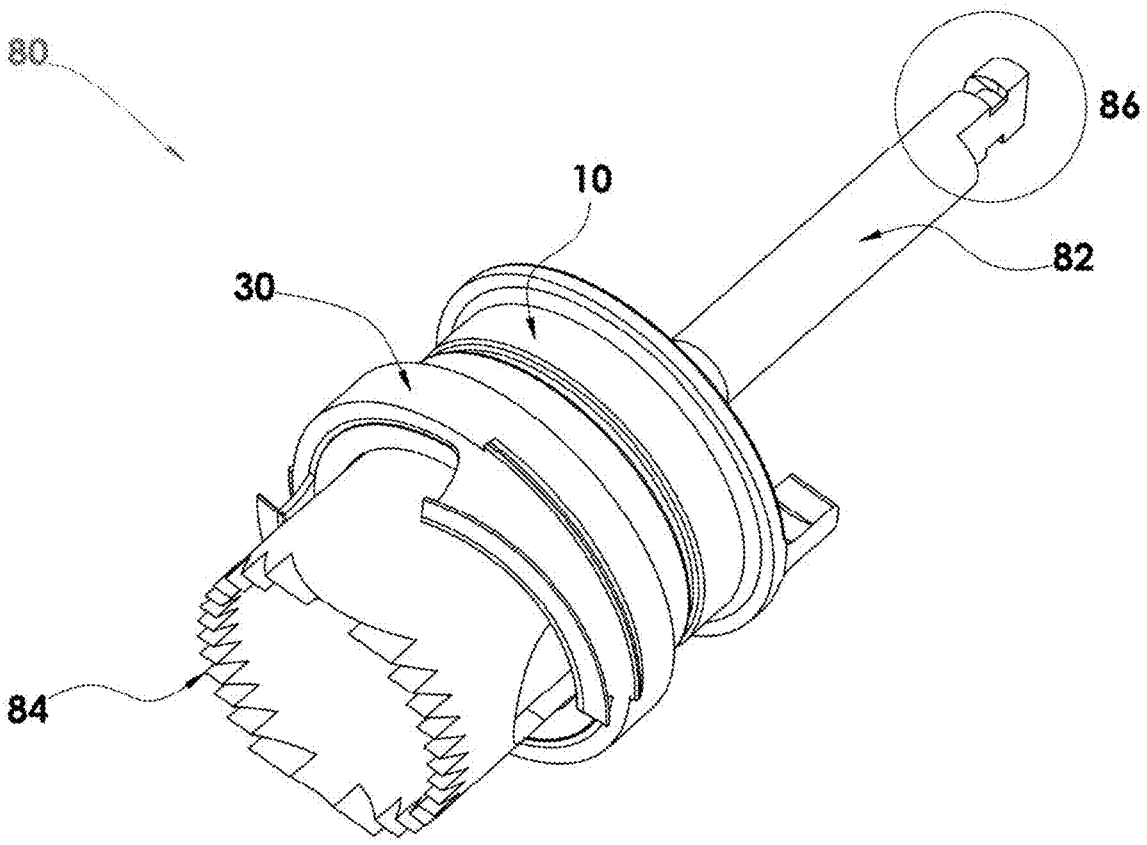


FIG. 5

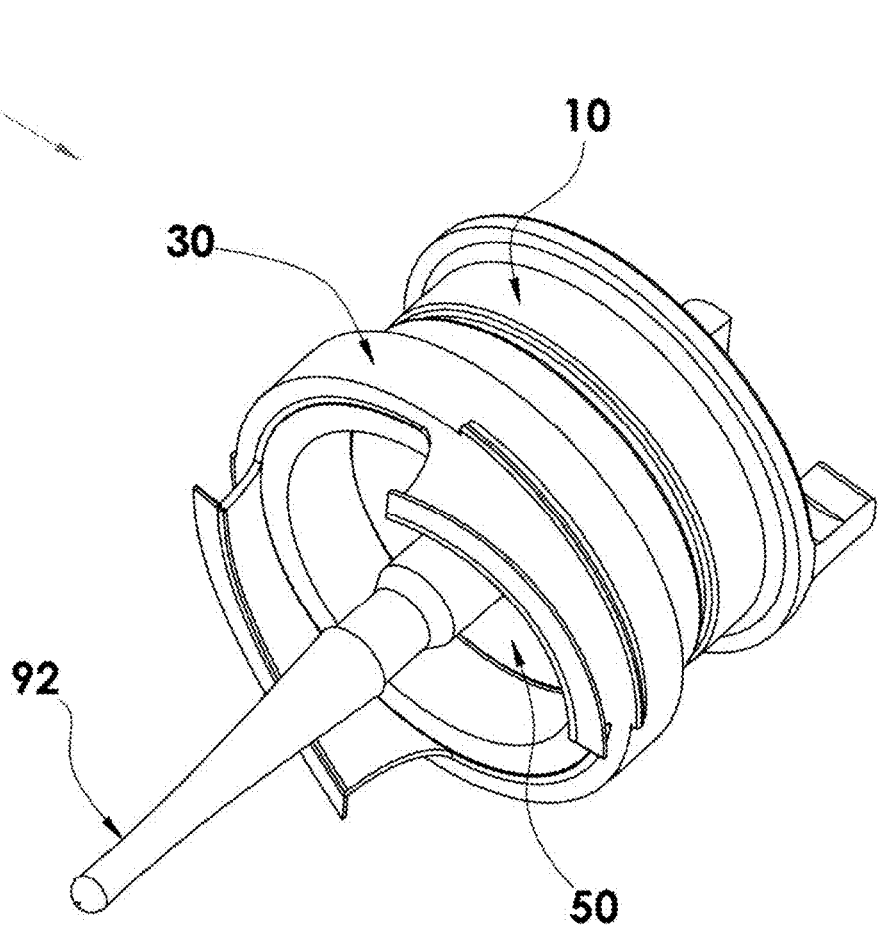


FIG. 6

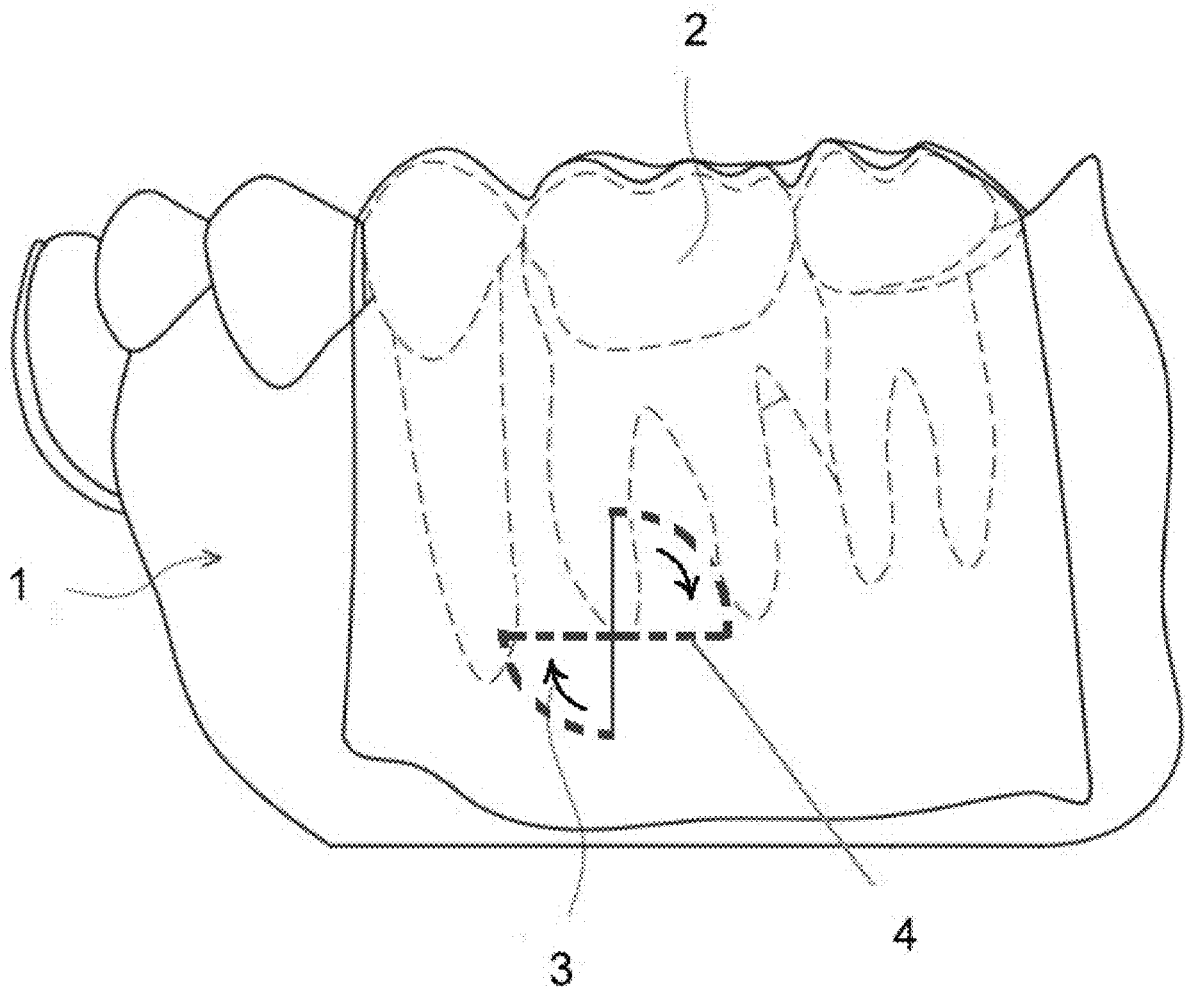


FIG. 7

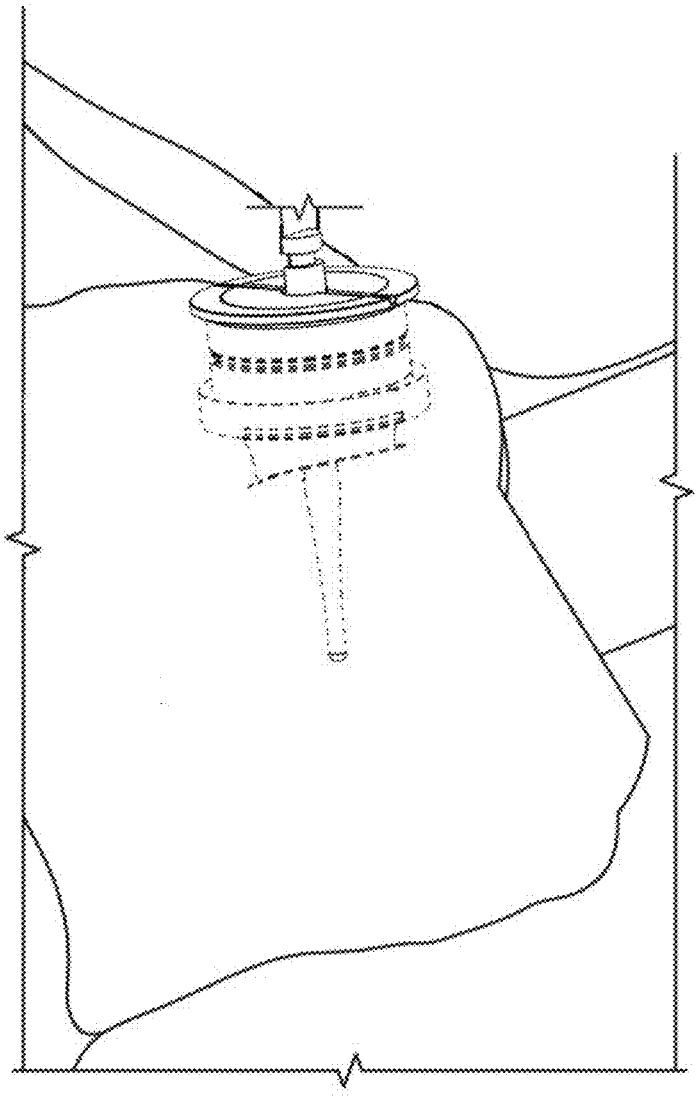


FIG. 8

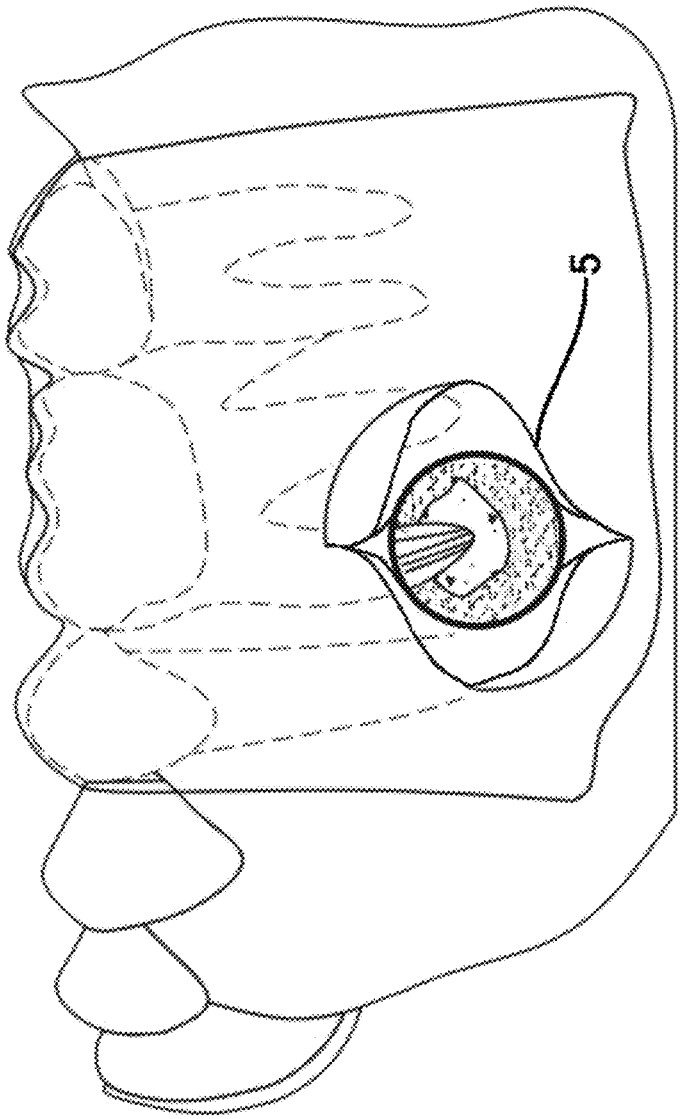


FIG. 9

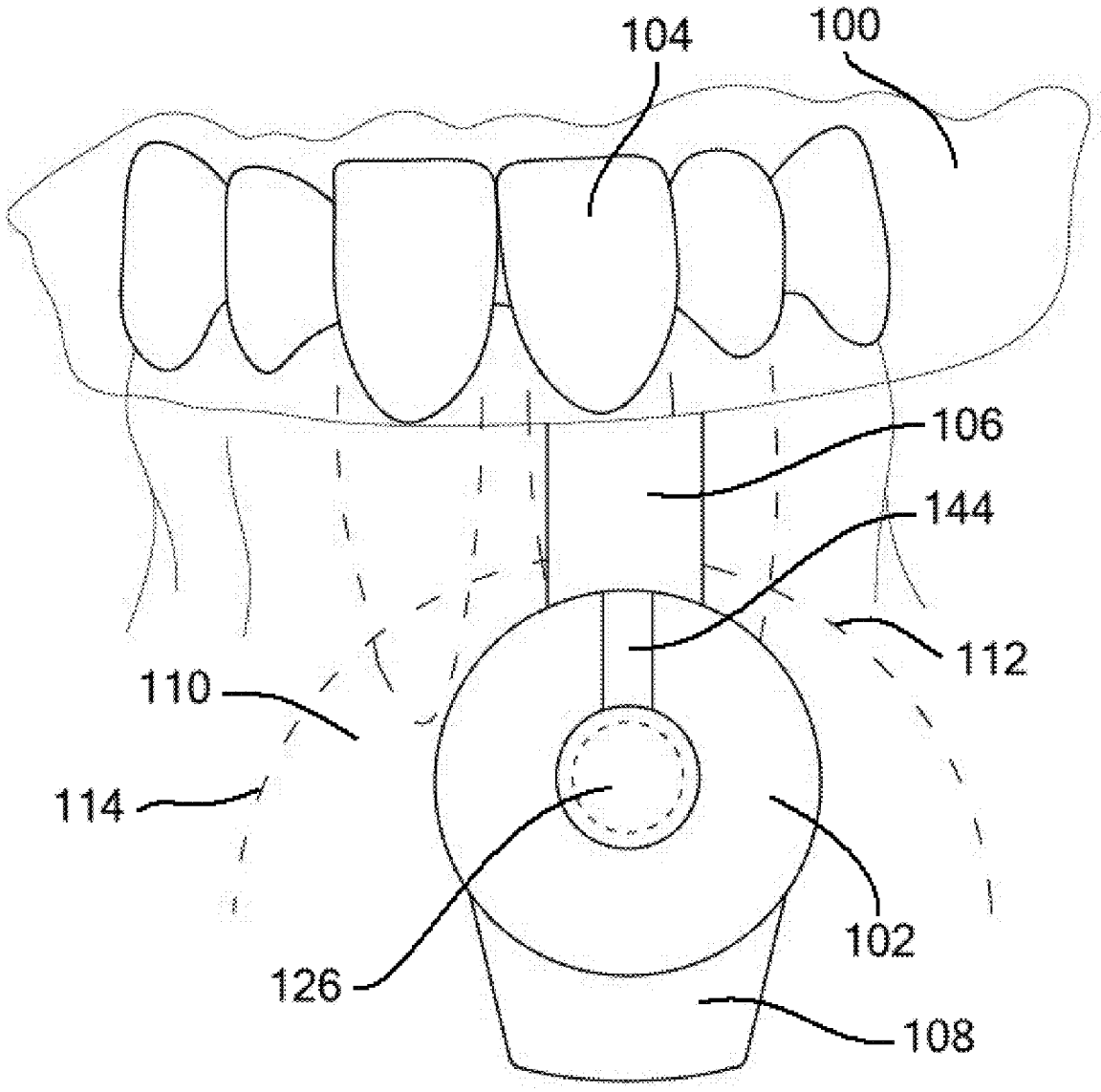


FIG. 10

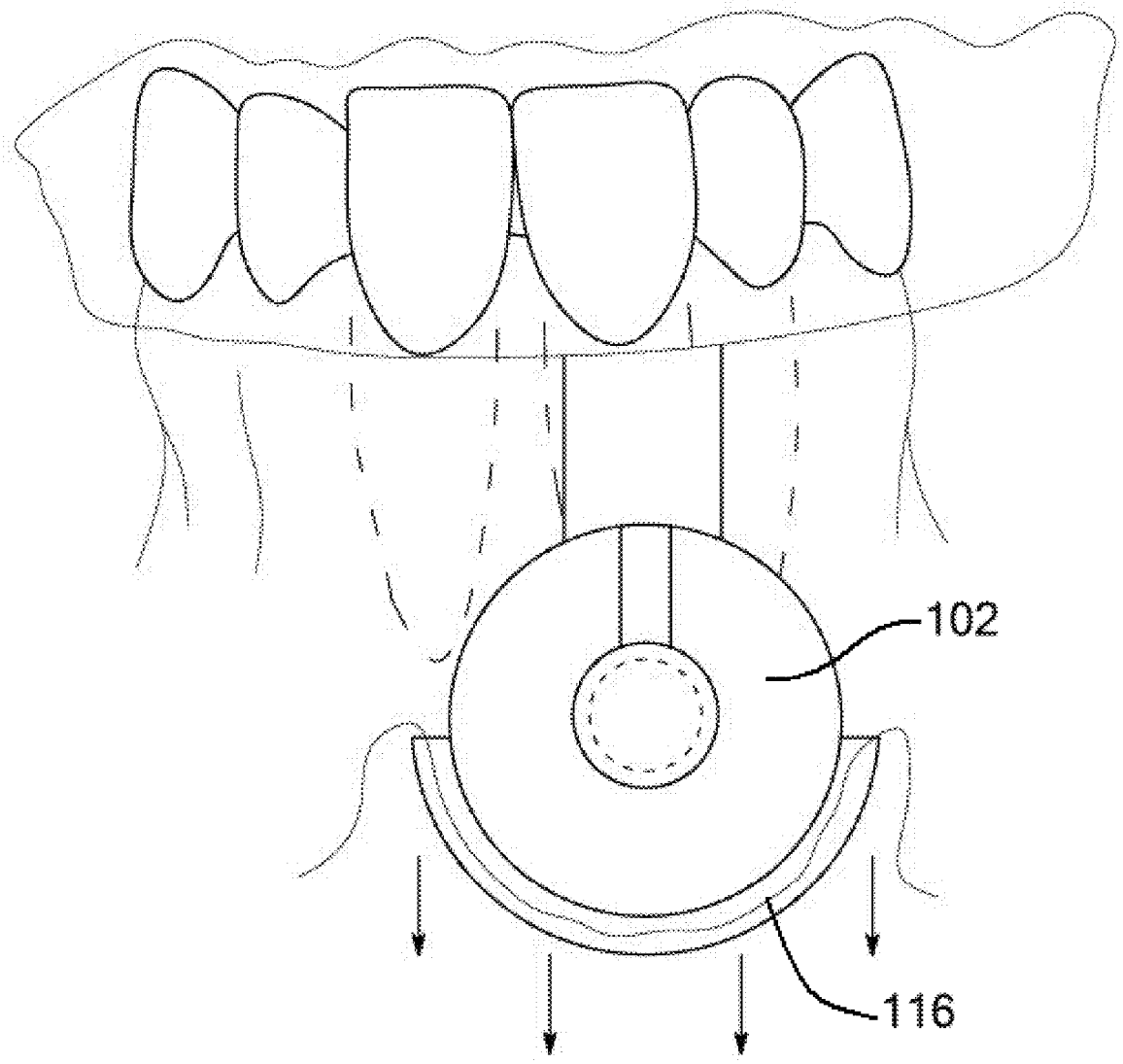


FIG. 11

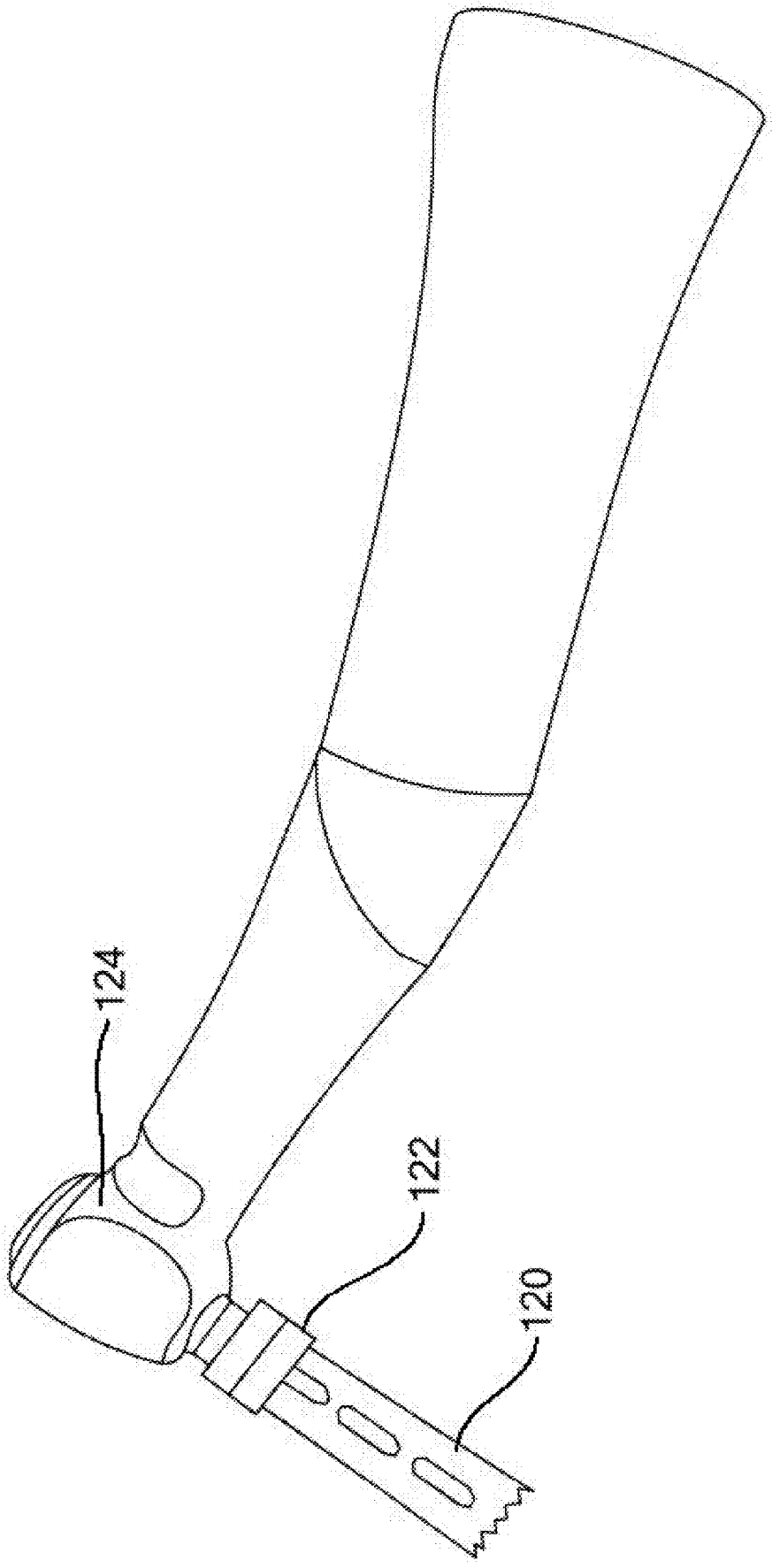


FIG. 12

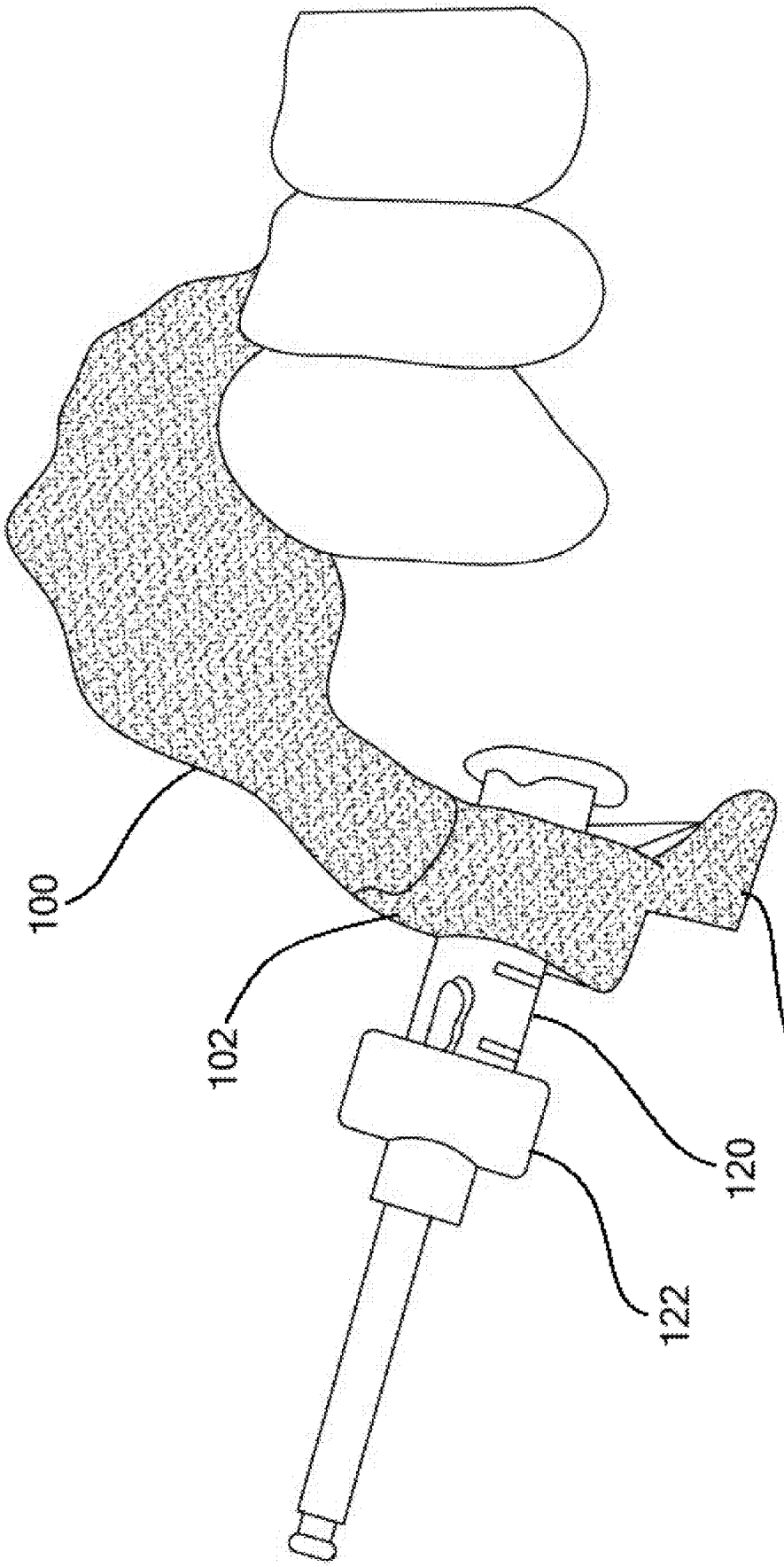


FIG. 13

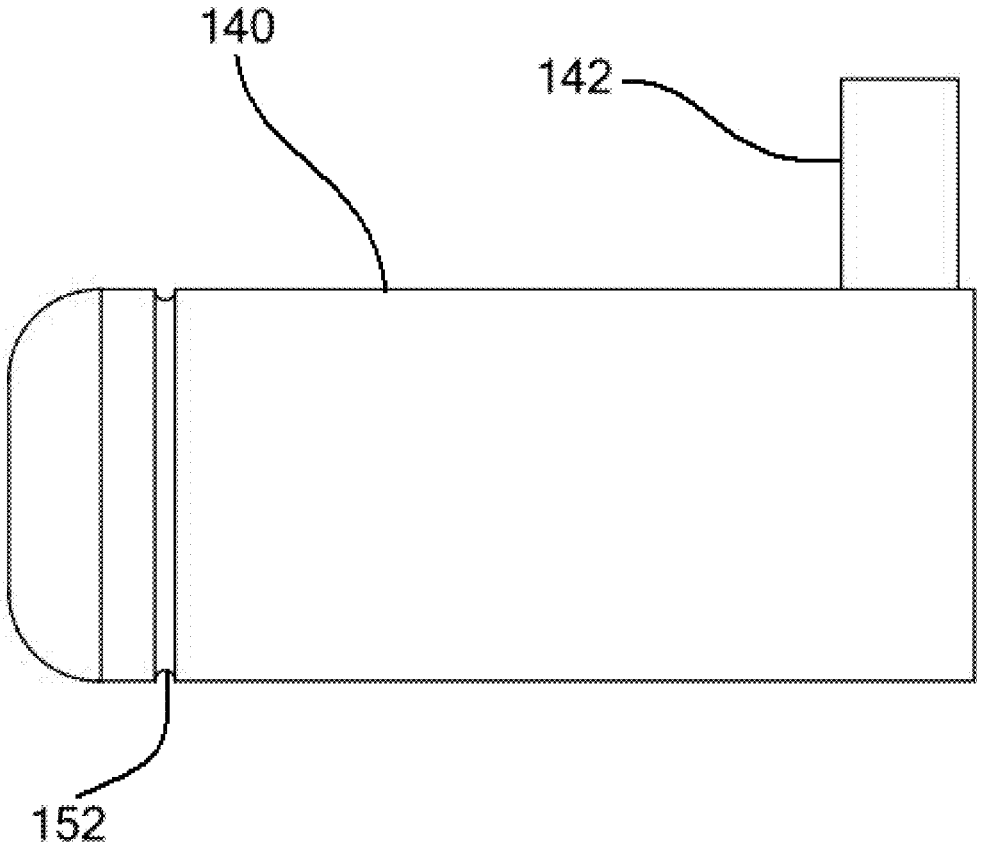


FIG. 14

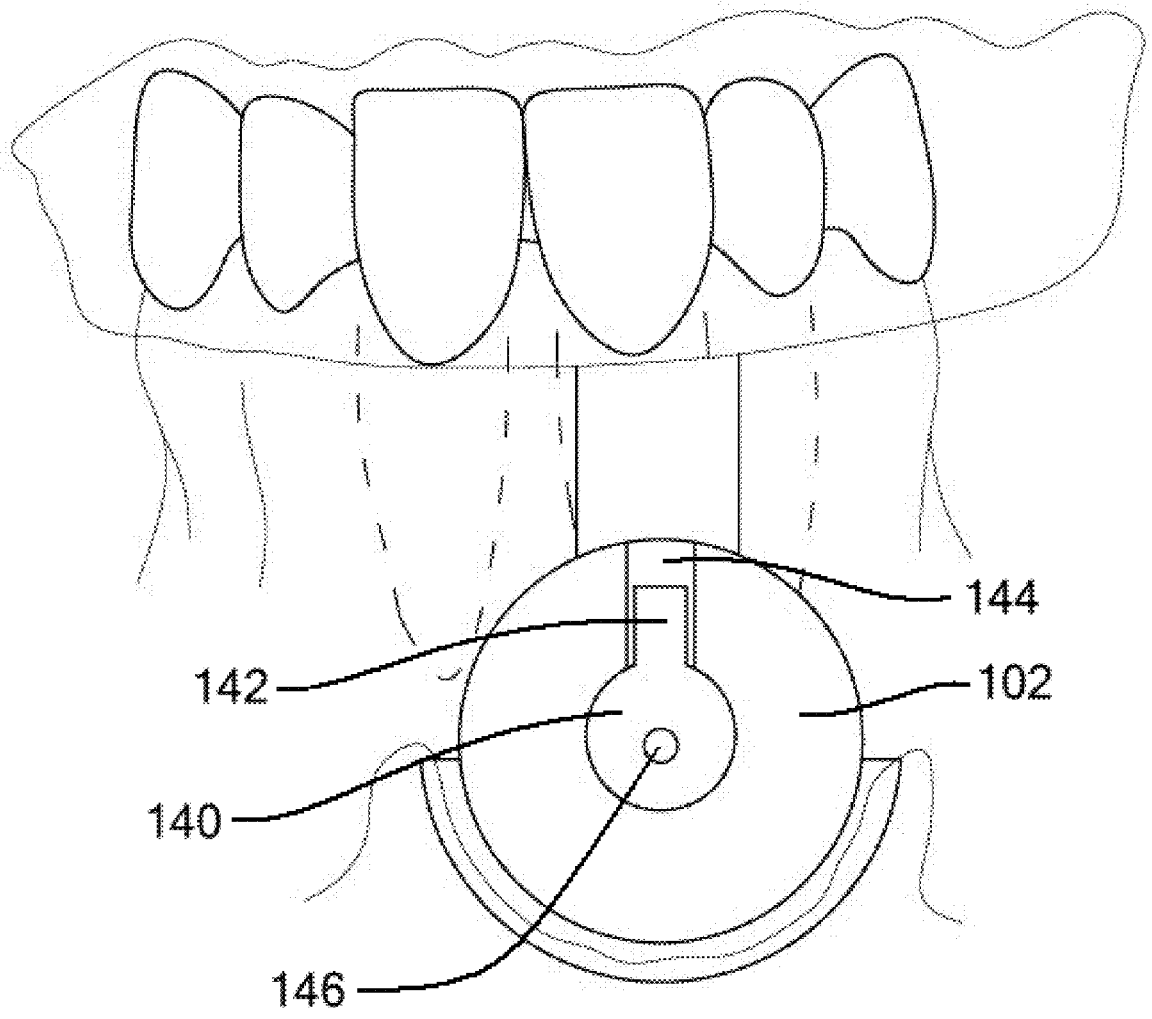


FIG. 15

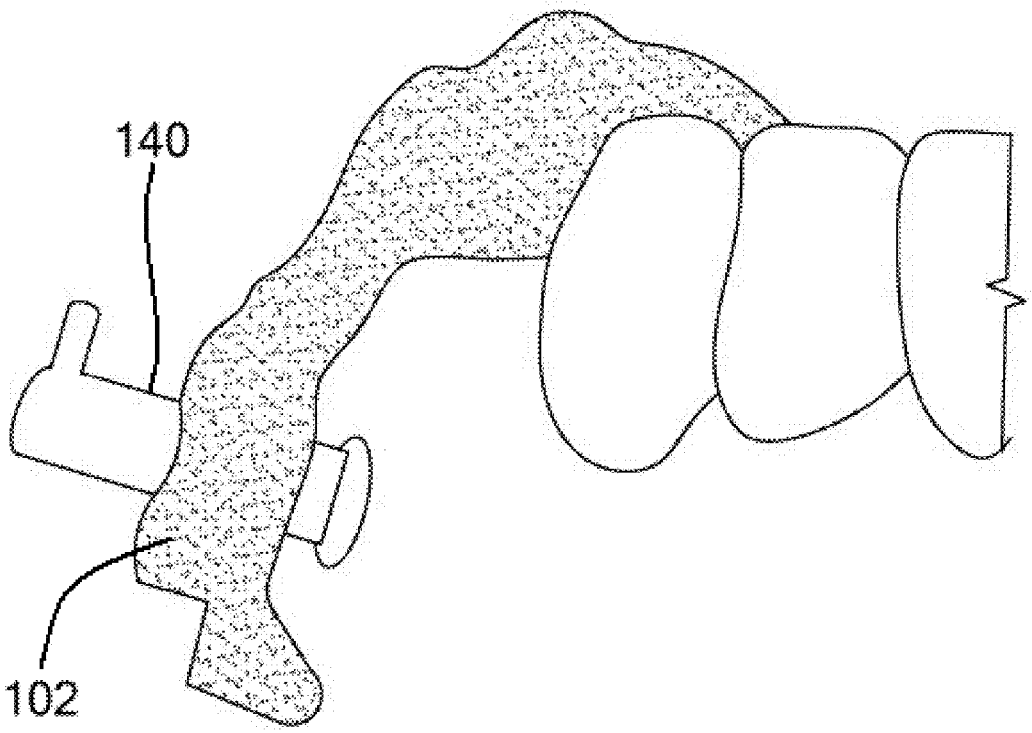


FIG. 16

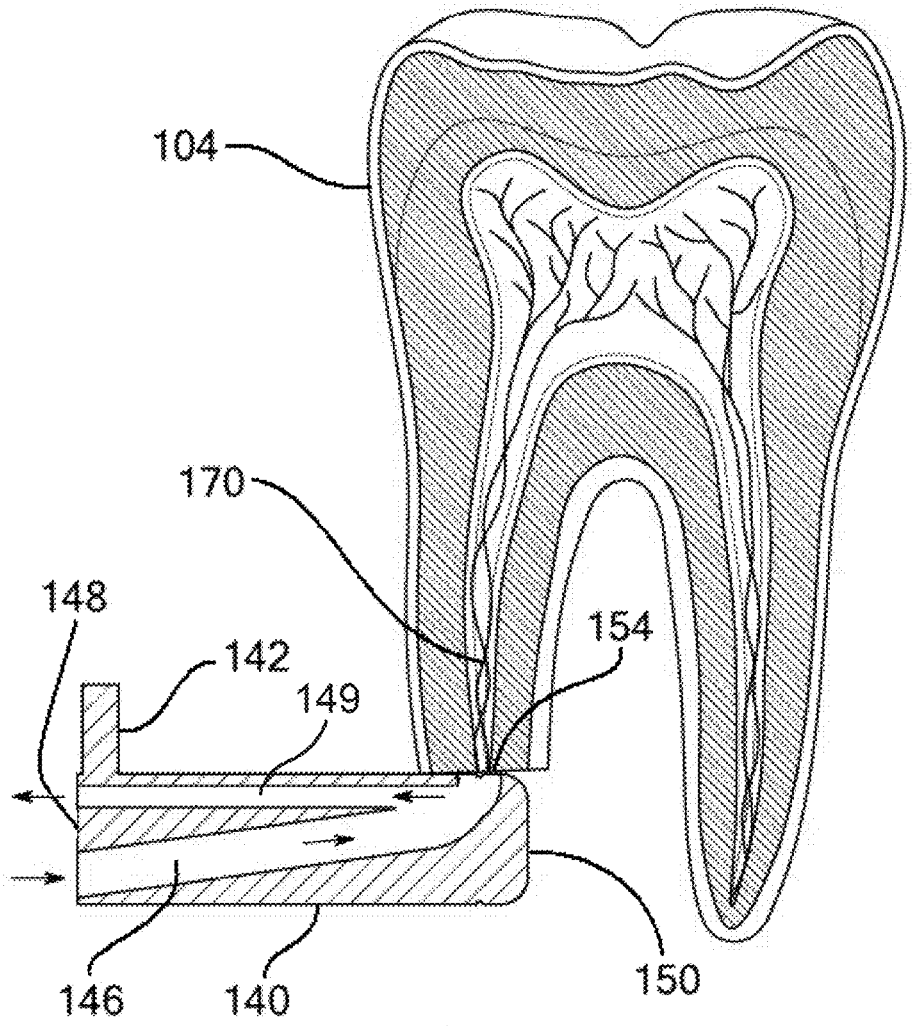


FIG. 17

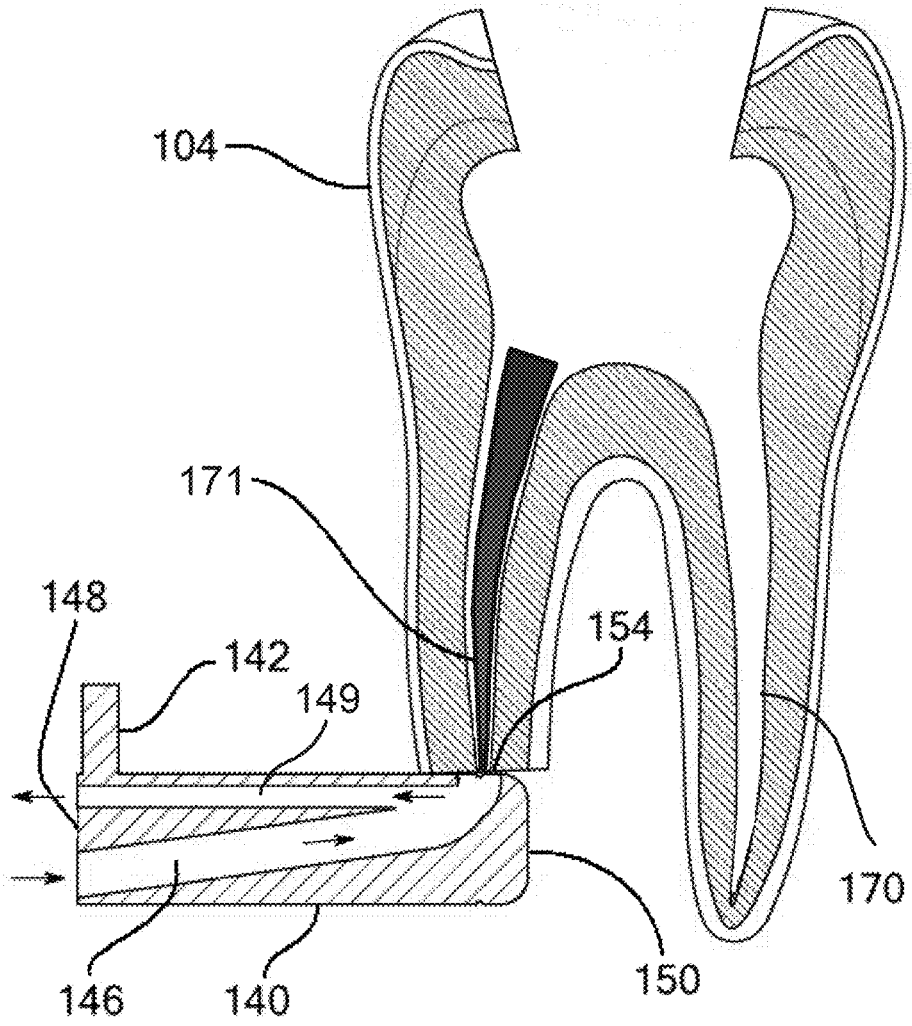


FIG. 18

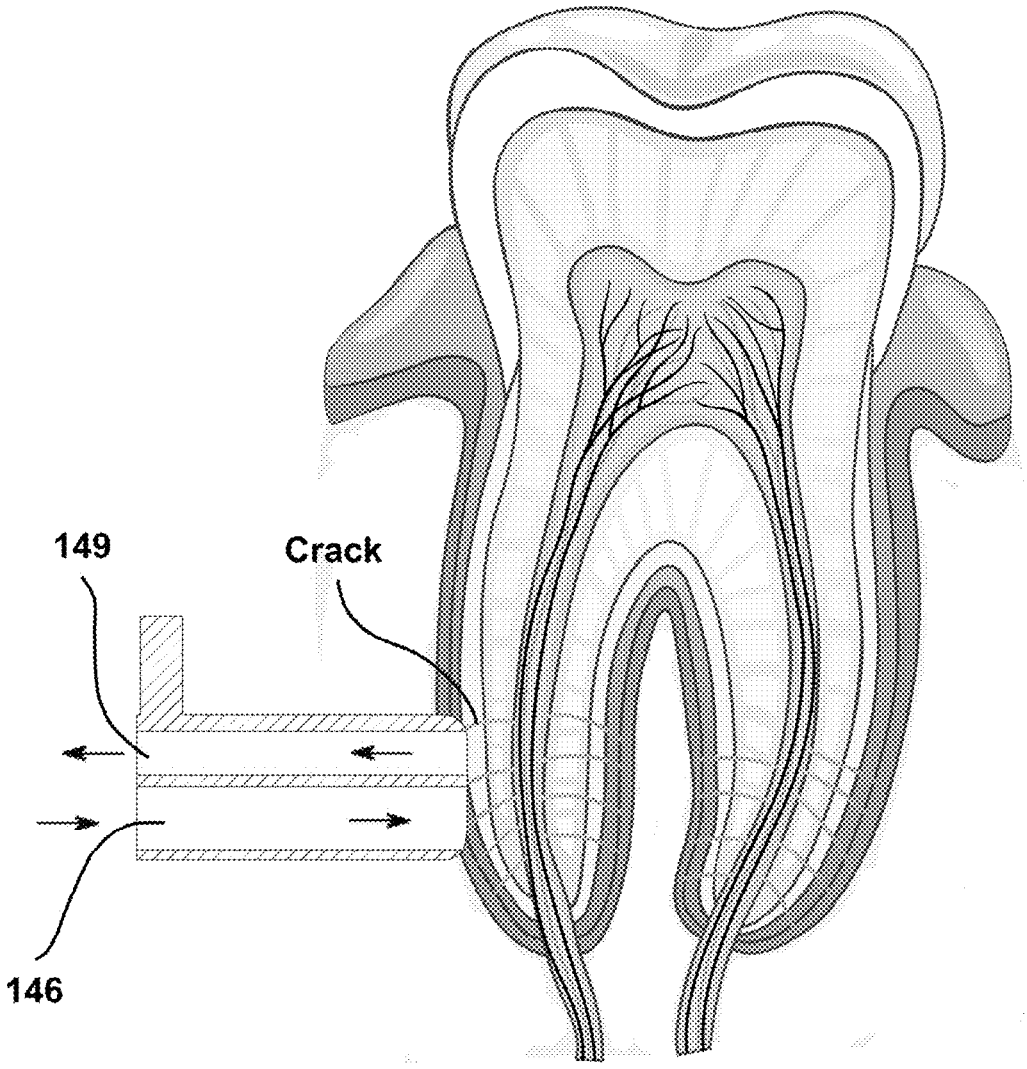


FIG. 19

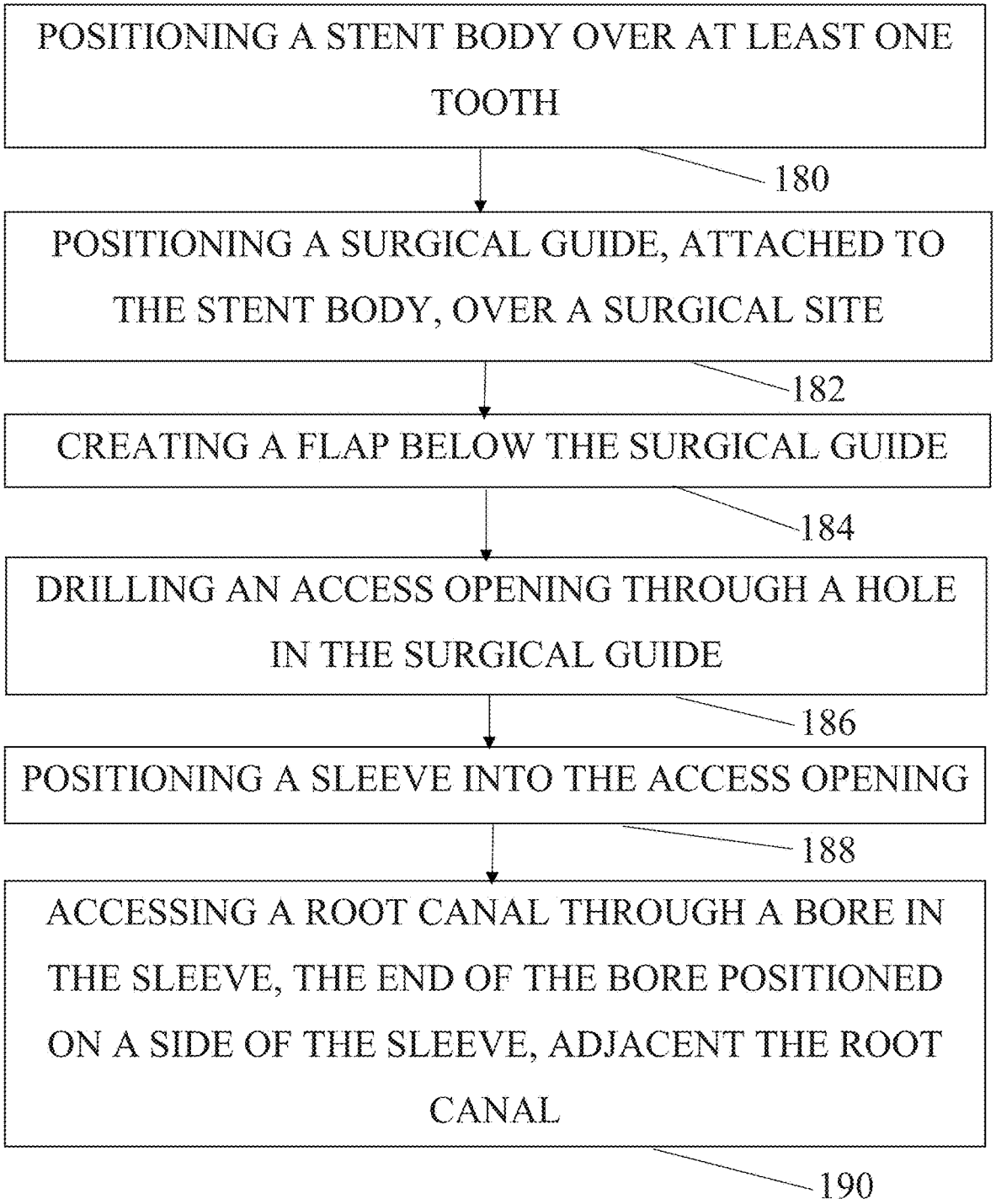

POSITIONING A STENT BODY OVER AT LEAST ONE TOOTH
180
POSITIONING A SURGICAL GUIDE, ATTACHED TO THE STENT BODY, OVER A SURGICAL SITE
182
CREATING A FLAP BELOW THE SURGICAL GUIDE
184
DRILLING AN ACCESS OPENING THROUGH A HOLE IN THE SURGICAL GUIDE
186
POSITIONING A SLEEVE INTO THE ACCESS OPENING
188
ACCESSING A ROOT CANAL THROUGH A BORE IN THE SLEEVE, THE END OF THE BORE POSITIONED ON A SIDE OF THE SLEEVE, ADJACENT THE ROOT CANAL
190

FIG. 20

ENDODONTICS SURGICAL STENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 16/365,468, filed Mar. 26, 2019, the contents of which are herein incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] Embodiments of the invention relates generally to dental instruments. More particularly, the invention relates to dental surgical stents that fit a patient's tooth or teeth to help guide a dentist during a procedure such as a root canal, apicoectomy, or the like.

2. Description of Prior Art and Related Information

[0003] The following background information may present examples of specific aspects of the prior art (e.g., without limitation, approaches, facts, or common wisdom) that, while expected to be helpful to further educate the reader as to additional aspects of the prior art, is not to be construed as limiting the present invention, or any embodiments thereof, to anything stated or implied therein or inferred thereupon.

[0004] The primary aim of any endodontic treatment is to disinfect the root canal system in order to reduce the bacterial load as much as possible and to seal the system to prevent ingress or egress of bacteria or their byproducts. A root canal procedure often accesses the root from the top of the tooth to remove infection therein. In some applications, a dental professional, such as an endodontist, would need to access infection, cracks or other anomalies of the root sub gingivally. A flap may be made of the soft tissue to provide access to the bone and a tool may be used to remove the bone to gain access to the area of interest. The infection may be removed, and the flap replaced to heal. In some circumstances, the root tip may be removed, a root-end cavity prepared and a biocompatible root end filling placed.

[0005] Often, once a flap is cut, it is difficult to handle and maintain it in its proper position during the surgical procedure. The surgeon needs to keep the flap out of the way during the surgery and properly position the flap back in place thereafter. The soft tissue flap may be difficult to handle after it is cut. There is bleeding and fluid also in the surgical crypt making visualization difficult in some cases.

[0006] Moreover, to access the infection, the surgeon may need to remove a substantial amount of bone to not only gain access but also to visually ensure the position and depth of hard tissue is correct.

[0007] In view of the foregoing, there is a need for dental surgical stents, that may secure the flap during surgery as well as provide a hard tissue drilling location during dental surgery, and a surgical sleeve to ensure accurate access to any area of the root and crypt to allow manipulation whilst working in a dry field.

SUMMARY OF THE INVENTION

[0008] In some embodiments, the present invention provides a dental surgical system comprising a stent body configured to drape over at least one tooth; a surgical guide attached to one side of the stent body, the surgical guide positioned over at least a portion of a gum region of a tooth; an opening disposed through the surgical guide; a sleeve configured to fit into the opening of the surgical guide; and a bore through the sleeve, the bore communicating a proximal end of the sleeve with a side of the sleeve adjacent to a distal end thereof.

[0009] Embodiments of the present invention further provide method for accessing a root canal of a tooth comprising draping a stent body at least one tooth, the stent body having a surgical guide attached to one side thereof, the surgical guide positioned over at least a portion of a gum region of the tooth; creating an incision through tissue near a desired access site; flapping the tissue at the incision; positioning the surgical guide under the flap; positioning a trephine bur through an opening in the surgical guide; forming an access opening through tissue and bone with the trephine bur; terminating the access opening at any point in the crypt or root which may be the base of a root of the tooth; and inserting a sleeve into the access opening, the sleeve having a bore through the sleeve, the bore communicating a proximal end of the sleeve with a side of the sleeve adjacent a distal end thereof, the bore positioned adjacent the root canal of the tooth.

[0010] Embodiments of the present invention also provide a method for treating a tooth, comprising draping a stent body at least one tooth, the stent body having a surgical guide attached to one side thereof, the surgical guide positioned over at least a portion of a gum region of the tooth; creating a first incision and a second incision at each side of the surgical guide; removing the surgical guide to provide a further incision connecting the first incision with the second incision; flapping the tissue at the incision with a tissue separator, attached to the surgical guide opposite the stent body, as the surgical guide is positioned under the flap; positioning a trephine bur through an opening in the surgical guide; forming an access opening through tissue and bone with the trephine bur; terminating the access opening at any location on the root; inserting a sleeve into the access opening, the sleeve having a bore through the sleeve, the bore communicating a proximal end of the sleeve with a side of the sleeve adjacent a distal end thereof, the bore positioned adjacent to the root of the tooth; inserting a dental tool, such as a file, bur, sonic, ultrasonic, piezo, laser root preparation tips, or the like, through the bore to manipulate the root/root canal; and inserting a retro filling material through the bore to be applied into the root canal.

[0011] These and other features, aspects and advantages of the present invention will become better understood with reference to the following drawings, description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Some embodiments of the present invention are illustrated as an example and are not limited by the figures of the accompanying drawings, in which like references may indicate similar elements.

[0013] FIG. **1** illustrates a perspective view of a sleeve for placement in a surgical guide;

[0014] FIG. **2**A illustrates a left side view of a stent part similar to a nut, including two sharp parts that, after screwing in the sleeve, lifts and keeps the gingiva;

[0015] FIG. **2**B illustrates a perspective view of a stent part similar to a nut, including two sharp parts that, after screwing in the sleeve, lifts and keeps the gingiva;

[0016] FIG. **3** illustrates a screw that can be attached to the sleeve when using a round bur or probe for dental purposes;
[0017] FIG. **4**A illustrates a top view of the assembled stent for round bur and probe application;
[0018] FIG. **4**B illustrates a bottom view of the assembled stent for round bur and probe application;
[0019] FIG. **5** illustrates the assembled stent for a trephine bur application;
[0020] FIG. **6** illustrates the assembled stent for a round bur application, flap lines and a finishing step;
[0021] FIG. **7** illustrates a schematic view of a stent attached on teeth;
[0022] FIG. **8** illustrates a schematic view of a stent attached on teeth;
[0023] FIG. **9** illustrates a schematic view of a stent attached on teeth having an access opening formed therein;
[0024] FIG. **10** illustrates a front view of a stent attached on teeth having a surgical guide and tissue separator attached thereto;
[0025] FIG. **11** illustrates a front view of the stent of FIG. **10** with the tissue separator moved downward to separate tissue along an incision line;
[0026] FIG. **12** illustrates a dental tool having a stopper integrated therewith for providing root access through the surgical guide of FIG. **10**;
[0027] FIG. **13** illustrates a side view of the stent in position and the dental trephine drill inserted through the surgical guide to providing access to a tooth root, according to an exemplary embodiment of the present invention;
[0028] FIG. **14** illustrates the male alignment member separated from the surgical guide of FIG. **13**;
[0029] FIG. **15** illustrates a male alignment member inserted into the surgical guide of FIG. **10**;
[0030] FIG. **16** illustrates a side view of the male alignment member being inserted into the surgical guide;
[0031] FIG. **17** illustrates proper positioning of the male alignment member at the base of a tooth root;
[0032] FIG. **18** illustrates proper positioning of the male alignment member at the base of a tooth root, with filling material inserted into the tooth's root canal;
[0033] FIG. **19** illustrates proper position of a male alignment member for repair at a side location of a root, such as for repair of a cracked root, for example; and
[0034] FIG. **20** illustrates a flow chart describing a method according to an exemplary embodiment of the present invention.
[0035] Unless otherwise indicated illustrations in the figures are not necessarily drawn to scale.
[0036] The invention and its various embodiments can now be better understood by turning to the following detailed description wherein illustrated embodiments are described. It is to be expressly understood that the illustrated embodiments are set forth as examples and not by way of limitations on the invention as ultimately defined in the claims.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS AND BEST MODE OF INVENTION

[0037] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well as the singular forms, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof.
[0038] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one having ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.
[0039] In describing the invention, it will be understood that a number of techniques and steps are disclosed. Each of these has individual benefit and each can also be used in conjunction with one or more, or in some cases all, of the other disclosed techniques. Accordingly, for the sake of clarity, this description will refrain from repeating every possible combination of the individual steps in an unnecessary fashion. Nevertheless, the specification and claims should be read with the understanding that such combinations are entirely within the scope of the invention and the claims.
[0040] In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details.
[0041] The present disclosure is to be considered as an exemplification of the invention and is not intended to limit the invention to the specific embodiments illustrated by the figures or description below.
[0042] As is well known to those skilled in the art, many careful considerations and compromises typically must be made when designing for the optimal configuration of a commercial implementation of any device, and in particular, the embodiments of the present invention. A commercial implementation in accordance with the spirit and teachings of the present invention may be configured according to the needs of the particular application, whereby any aspect(s), feature(s), function(s), result(s), component(s), approach (es), or step(s) of the teachings related to any described embodiment of the present invention may be suitably omitted, included, adapted, mixed and matched, or improved and/or optimized by those skilled in the art, using their average skills and known techniques, to achieve the desired implementation that addresses the needs of the particular application.
[0043] Broadly, embodiments of the present invention provide a dental surgical stent that can be used to assist a dental surgeon. A hard tissue stent can include an access hole formed in one side and may be placed over one or more of the patient's teeth where the access hole is accurately aligned at a location for drilling to, for example, to repair a crack, perforation, resorptive defect, removing infected root end, foreign material or remove infection. A soft tissue stent

may be placed over one or more of the patient's teeth, where the stent can include a mark positioned where the surgeon is to cut to create an access flap in the soft tissue. By keeping the flap attached to the semi-circular window of the soft tissue stent, the surgeon can more easily return the flap to the proper position and protect it from damage during the dental procedure.

[0044] Referring now to FIGS. **1** through **4**B, a sleeve **10** can include a front face **12** having one or more handles **14**, **16** extending therefrom. The handles **14**, **16** may extend away from the front face **12**, as shown, to aid a user in rotating the sleeve **10** and the nut **30** to cause opening of the flap on the soft tissue of a patient, as discussed below.

[0045] The sleeve **10** can include inside threads **18** (also referred to as female threads **18**) that begin at the front face **12** and extend downward toward a back face thereof. The sleeve **10** can include outside threads **20** (also referred to as male threads **20**) extending from the back face of the sleeve **10** as shown in FIG. **1**.

[0046] A groove **22** may be disposed about an exterior circumference of the sleeve **10** at a longitudinally central portion thereof. The groove **22** may be helpful to minimize the concentration of compressive stress during use of the surgical guide as discussed in greater detail below.

[0047] A nut **30**, as shown in FIGS. **2**A and **2**B, can include a cylindrical exterior **32** having female threads **34** positioned on an interior of the cylindrical exterior **32**. The female threads **34** can mate with the male threads **20** of the sleeve **10** when the front end **36** of the nut **30** is threaded onto the sleeve **10**, thereby attaching the nut **30** to the sleeve **10** as shown in FIGS. **4**A and **4**B. A first side extension, having an inner surface **40** and an outer surface **44** may extend from the cylindrical exterior **32**, typically along from about 35 to 55 degrees of the back end of the cylindrical exterior **32**. A second side extension, having an inner surface **42** and an outer surface **38**, may extend from the cylindrical exterior **32**, typically along from about 35 to 55 degrees of the back end of the cylindrical exterior **32**. The first and second side extensions may be disposed equally spaced apart from each other. Distal ends (distal relative to the cylindrical exterior **32**) may be bent outward (away from a central opening **48** of the nut **30**) at an angle, typically about 90 degrees. Sharp parts **46** may be disposed at distal ends of the first and second side extensions at the bent portions. In some embodiments, the first and second side extensions may be longer (extend farther away from the cylindrical exterior **32**) adjacent the sharp parts **46**, providing an edge to cut through soft tissue when the nut **32** is placed against the soft tissue and rotated.

[0048] A screw **50**, as shown in FIG. **3**, can include an exterior thread **54** (also referred to as mail thread **54** or screw male thread **54**) that extends along an entirety of the external circumference of the screw **50**. The screw **50** can include a central opening **60** for use of the surgical guide, as discussed below. The screw **50** may include a front face **52** having channels **56**, **58** formed therein. The channels **56**, **58** can extend from the central hole **60** to the exterior of the screw **50**. The channels **56**, **58** may be useful for turning the screw **50** for positioning inside the sleeve **10**, as discussed below. As discussed below, the screw **50** may be useful for making the opening **24** of the sleeve **10** smaller, for certain procedures, in essence reducing the opening from the size of the opening **24** to the size of the opening **60**.

[0049] FIGS. **4**A and **4**B illustrate an assembly **70** of the screw **50**, nut **30** and sleeve **10**.

[0050] Referring now to FIG. **5**, a dental assembly **80** can include the sleeve **10** assembled with the nut **30**. The nut **30** may be assembled with the sleeve **10** and the sleeve **10** may be rotated, which, in turn, rotates the nut **30**. The sharp parts **46** may press against soft tissue (such as the gums, or gingiva) and, as rotated, form a flap of tissue that may be lifted and kept. In the embodiment of FIG. **5**, a trephine bur **84** may be attached to a shaft **82** having a dental tool attachment end **86** that provides a motive force to turn the trephine bur **84**. As seen in this example, the sleeve **10** may not include the screw **50** so that the opening **24** of the sleeve **10** can receive the trephine bur **84** therethrough.

[0051] Referring now to FIG. **6**, a dental assembly **80** can include the sleeve **10** assembled with the nut **30**, with the screw **50** inserted in the sleeve **10**. A round bur **92** may be inserted through the opening **60** of the nut **50**, as shown, to provide round bur application and finishing steps.

[0052] Referring to FIG. **7**, a stent can be draped over at least one tooth **2**, where side members of the stent body extends downward to cover at least a portion of the gum region of at least one tooth. The stent body can include an access opening **5**, as shown in FIG. **9**, formed in the side member to provide access positioned in a location for drilling hard tissue there between. In some embodiments, the stent body can include an incision line **4** formed in the side member of the stent body. In some embodiments, the incision line may be opened by the sharp parts **46** of the nut **30**, as described above. In some embodiments, the incision line is formed as two arc spanning about 90 degrees. The incision line is positioned adjacent to the gum region when the stent body is disposed over at least one patient's tooth **2**. Arrows **3** may illustrate rotation of the sharp parts **46** of the nut **30**, as described above, when the assembly **70** is used with the stent of FIG. **7**.

[0053] FIG. **8** illustrates the use of the assembly **70** on a patient's soft tissue, as described above.

[0054] A stent may be applied to a patient's teeth and a surgical guide may be used to provide access to the soft tissue and bone below a tooth of interest. The below describes the use of such a system, including an alignment guide for ensuring consistent and accurate placement of retro filling material.

[0055] Referring now to FIGS. **10** and **11**, a stent **100**, including a surgical guide **102**, can be test fitted on the patient's supporting teeth. A connector **106** can join the stent **100** with the surgical guide **102**. The size of the system can vary, depending on which tooth is being worked on. For example, different sizes may be provided for anterior teeth, pre-molars and molars. Typically, the surgical guide **102** can fit well and is stable enough to resist any rocking motion faciolingually and mesiodistally. While there might be a little rocking faciolingually due to soft tissue, typically this is resolved after reflecting the flap, as discussed below, and adapting the stent to the bone.

[0056] For most surgical procedures, anesthetic approaches are conventional. In most regions, a block is administered. Then local infiltration of an anesthetic with 1:50,000 epinephrine is given to enhance hemostasis. A long-acting anesthetic agent is recommended, such as bupivacaine or etidocaine. Bupivacaine 0.5% with epinephrine 1:200,000 has been shown to give long-lasting anesthesia and later provide lingering analgesia.

[0057] A properly designed and carefully reflected flap **110** can result in proper access and post-op healing. The basic principles of full thickness, semi-lunar flap design should be followed. The surgical guide **102** can be placed on the patient and arced incisions, for example, a 120° clockwise incision **112** and a 120° anti-clockwise incision **114**, can be made with blade #15 to the alveolar mucosa around the surgical guide **102**.

[0058] The surgical guide **102** can be removed and a firm incision should be made through periosteum to alveolar bone connecting the two previous incisions **112**, **114**. Typically, one wants to incise and reflect a full-thickness flap to minimize hemorrhage and to prevent tearing of the tissue.

[0059] The surgical guide **102** can be placed gently on the teeth **104** so that the tissue **116** is directed towards the back of the tissue separator **108**. The tissue separator **108** may be a rigid or semi-rigid member disposed at a side of the surgical guide **102** opposite the stent **100**. The tissue separator **108** may be configured to be inserted into the incision and separate the external tissue so that it may be reattached over a hole drilled thereunder. If hemorrhage from soft or hard tissue is excessive to the extent that visibility is compromised, homeostatic agents or other techniques are useful.

[0060] After putting the surgical guide **102** on the patient's teeth **104**, the patient should bite the surgical guide **102** and keep it for stability. Optionally, the patient can bite on a bite block placed on the teeth **104**.

[0061] At this point, everything is ready for the surgery. Before using the trephine **120** bur, as shown in FIG. **12**, a stopper **122** should be set on the trephine tip and then lock the butt in the handpiece **124**. There are different sizes for the trephine bur **120**. Typically, a recommended size is provided depending on which tooth is being treated.

[0062] The trephine bur **120** with the stopper **122** attached to it, can be inserted into a central hole **126** of the surgical guide **102** (see FIG. **10**). The trephine bur **120** can be used to drill through bone until the stopper **122** touches the stent body (the exterior of the surgical guide **102**, adjacent the hole **126**). The stopper **122** can be designed according to the desired working length.

[0063] Bone and root tip, infected tissue or foreign material can be removed. Usually the hard tissue is stuck inside the trephine bur. If, in some cases, there are debris from root tip or bone left in the surgical site, it can be removed with a bone curette or bur. The surgical site can be flushed with copious amounts of sterile saline to remove soft and hard tissue debris, hemorrhage, blood clots, and excess root end filling material (if present from a prior endodontic procedure). FIG. **15** illustrates the trephine bur **120** used in a drilling operation.

[0064] Before manipulation of the root, such as a perforation repair, crack repair or root end cavity preparation, and insertion of injecting the retro filling material in the canal, a radiograph is taken to verify that the surgical objectives are satisfactory. If corrections are needed, these are made. In cases of endodontic surgery, the cut root end surface may be prepared for a cavity into the root to include the canal or other configurations such as a dome preparation. (see FIG. **17**).

[0065] Referring now to FIGS. **14** through **19**, an alignment suction sleeve **140** (also simply referred to as sleeve **140**, or alignment sleeve **140**) can be inserted in the surgical guide hole **126** (see FIG. **10**), in the way that a male part **142** of sleeve **140** fits in the female part **144** of surgical guide **102**. The sleeve **140** includes at least a first bore **146** extending therethrough from a proximal end **148** to a location at the side of the sleeve **140**, near a distal end **150** of the sleeve **150**. A second bore **149**, typically for suction, can extend from the proximal end **148** to connect with the first bore **146** near its distal end. In some embodiments, as shown in FIG. **19**, the first bore **146** and the second bore **149** may terminate at the distal end **150** of the sleeve **150**, thereby permitting access to a side of a tooth root to repair, for example, a cracked root. In some embodiments, the bore **146** can include a radio-opaque part to assist in following on an x-ray pattern.

[0066] The length of the sleeve **140** may be configured so that the end of the bore **146** is positioned at any site within the trephinated cavity including on the root canal space immediately below the root of the tooth of interest, as shown in FIG. **17**. The bore size can also be of different sizes to be adjacent to any part of the trephinated cavity/root surface including adjacent to a part/all or a larger area of the root end. In certain cases the root surface may be manipulated by mechanical, thermal or laser devices to change its characteristics. In certain cases, a rotary file/bur, sonic, piezo, laser or ultrasonic tip (not shown) can be inserted through the bore **146** and into the canal **170** for preparing the root surface or canal space from the arrow section of FIG. **17**. In certain cases, dental materials can be placed in the canal **170**, as discussed below. The sleeve **140** may include a groove **152** or radiographic marker about its circumference where the bore **146** exits at the side of the sleeve **140**. This groove or radiographic marker **152** may be useful as a guide for X-Ray pattern where doctors can see the bore hole of the sleeve and help with its alignment and position within the trephined cavity. as shown in FIG. **17**.

[0067] In cases where a root end filling **171** may need to be placed, according to the CBCT image, the end **154** of the bore **140** of the sleeve **140** is designed to be exactly next to the canal location. Root end preparation can be done by rotary files/bur, sonic, piezo, laser or ultrasonic tip.

[0068] Once the canal **170** is prepared, the retro-filling materials (not shown) may be placed in the canal. Before inserting the filling materials in the canal, a radiograph can be made to verify that the canal is properly prepared. If corrections are needed, these are made before inserting root end filling material. A tip set to the measured length can be used to place the root end filling materials.

[0069] The sleeve **140** and the surgical guide **102** can be removed and the surgical site can be flushed with copious amounts of sterile saline to remove soft and hard tissue debris, hemorrhage, blood clots and excess root end filling material. Bone graft material can be mixed with sterile saline and applied to the surgical site until the hole is filled.

[0070] To conclude the procedure, the flap can be returned to its original position and held with moderate digital pressure and moistened gauze. This expresses hemorrhage from under the flap and initial adaptation and more accurate suturing. Sutures are generally used, such as absorbable 4-0 suture. After suturing, the flap should again be compressed digitally with moisten gauze for several minutes to express more hemorrhage. The suture knots should note be too tight or it may strangle the tissue and decrease blood supply and cause hypertrophic scars. This encourages less postoperative swelling and more rapid healing.

[0071] Referring to FIG. **20**, the above method is summarized in a flow chart. At step **180**, a stent body is positioned over at least one tooth. At step **182**, the surgical guide, attached to the stent body, is positioned. At step **184**, a flap is created below the surgical guide. The flap may be formed as discussed in detail above. At step **186**, an access opening is formed, typically with a trephine bur, through a hole/opening in the surgical guide. At step **188**, a sleeve is positioned into the access opening. At step **190**, a root canal of the tooth is accessed through a bore in the sleeve. This access can be for cleaning and filling the root canal.

[0072] All the features disclosed in this specification, including any accompanying abstract and drawings, may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0073] Claim elements and steps herein may have been numbered and/or lettered solely as an aid in readability and understanding. Any such numbering and lettering in itself is not intended to and should not be taken to indicate the ordering of elements and/or steps in the claims.

[0074] Many alterations and modifications may be made by those having ordinary skill in the art without departing from the spirit and scope of the invention. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of examples and that they should not be taken as limiting the invention as defined by the following claims. For example, notwithstanding the fact that the elements of a claim are set forth below in a certain combination, it must be expressly understood that the invention includes other combinations of fewer, more or different ones of the disclosed elements.

[0075] The words used in this specification to describe the invention and its various embodiments are to be understood not only in the sense of their commonly defined meanings, but to include by special definition in this specification the generic structure, material or acts of which they represent a single species.

[0076] The definitions of the words or elements of the following claims are, therefore, defined in this specification to not only include the combination of elements which are literally set forth. In this sense it is therefore contemplated that an equivalent substitution of two or more elements may be made for any one of the elements in the claims below or that a single element may be substituted for two or more elements in a claim. Although elements may be described above as acting in certain combinations and even initially claimed as such, it is to be expressly understood that one or more elements from a claimed combination can in some cases be excised from the combination and that the claimed combination may be directed to a subcombination or variation of a subcombination.

[0077] Insubstantial changes from the claimed subject matter as viewed by a person with ordinary skill in the art, now known or later devised, are expressly contemplated as being equivalently within the scope of the claims. Therefore, obvious substitutions now or later known to one with ordinary skill in the art are defined to be within the scope of the defined elements.

[0078] The claims are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, what can be obviously substituted and also what incorporates the essential idea of the invention.

What is claimed is:

1. A dental surgical system comprising:

a stent body configured to drape over at least one tooth;

a surgical guide attached to one side of the stent body, the surgical guide positioned over at least a portion of a gum region of a tooth;

an opening disposed through the surgical guide;

a sleeve configured to fit into the opening of the surgical guide; and

one or more bores through the sleeve, the one or more bores communicating a proximal end of the sleeve with a one of a side of the sleeve, adjacent a distal end thereof, or the distal end of the sleeve.

2. The dental surgical system of claim **1**, further comprising:

a channel formed on an exterior surface of the surgical guide, the channel extending from the opening toward an external periphery thereof; and

a male part extending from the proximal end of the sleeve, the male part aligning with the channel when the sleeve is inserted into the surgical guide.

3. The dental surgical system of claim **1**, further comprising a groove formed about a circumference of the sleeve, the groove intersecting a position where the bore exits the sleeve at the side of the sleeve.

4. The dental surgical system of claim **1**, further comprising a tissue separator positioned at side of the surgical guide opposite the stent body.

5. The dental surgical system of claim **1**, further comprising a trephine bur operable to fit into the opening in the surgical guide to drill an access opening to a base of a tooth, the access opening providing access into a canal of the tooth.

6. The dental surgical system of claim **5**, wherein the sleeve is configured to fit into the opening such that an end of the bore through the sleeve aligns with any part of the root.

7. The dental surgical system of claim **5**, further comprising a stopper one the trephine bur, the stopper limiting a depth of the access opening, the stopper contacting the surgical guide to prevent the trephine bur from extending the depth beyond a required depth.

8. A method for accessing a root canal of a tooth comprising:

draping a stent body at least one tooth, the stent body having a surgical guide attached to one side thereof, the surgical guide positioned over at least a portion of a gum region of the tooth;

creating an incision through tissue near a desired access site;

flapping the tissue at the incision;

positioning the surgical guide under the flap;

positioning a trephine bur through an opening in the surgical guide;

forming an access opening through tissue and bone with the trephine bur;

terminating the access opening at a root of the tooth; and

inserting a sleeve into the access opening, the sleeve having a plurality of bores through the sleeve, the bores communicating a proximal end of the sleeve with either

a side of the sleeve adjacent a distal end thereof or the distal end of the sleeve, the bores positioned adjacent the root of the tooth.

9. The method of claim **8**, wherein the step of creating the incision includes:

creating first and second incisions on each side of the surgical guide; and

removing the surgical guide to form an incision joining the first and second incisions.

10. The method of claim **8**, wherein the step of flapping the tissue includes inserting a tissue separator into the incision and moving the tissue separator away from the tooth to create the flap.

11. The method of claim **10**, wherein the tissue separator is attached to the surgical guide opposite the stent body.

12. The method of claim **8**, wherein the step of inserting the sleeve into the access opening includes aligning a male part, extending from the proximal end of the sleeve, with a channel formed on an exterior surface of the surgical guide, the channel extending from the opening toward an external periphery thereof.

13. The method of claim **8**, further comprising inserting dental tool through the bore to prepare the root surface or the root canal.

14. The method of claim **8**, further comprising inserting a filling material through the bore to be applied into the root canal or manipulating a root mechanical, thermal or laser device.

15. The method of claim **8**, further comprising visualizing a proper depth of the sleeve in the access opening with an x-ray view showing a groove, formed about a circumference of the sleeve and intersecting a position where the bore exits the sleeve at the side of the sleeve, aligning with the root canal when the proper depth is realized.

16. The method of claim **15**, wherein the sleeve includes a radiographic mark as a cutout in an outer periphery of the sleeve at the position where the bore exits the sleeve.

17. A method for treating a tooth, comprising:

draping a stent body at least one tooth, the stent body having a surgical guide attached to one side thereof, the surgical guide positioned over at least a portion of a gum region of the tooth;

creating a first incision and a second incision at each side of the surgical guide; removing the surgical guide to provide a further incision connecting the first incision with the second incision;

flapping the tissue at the incision with a tissue separator, attached to the surgical guide opposite the stent body, as the surgical guide is positioned under the flap;

positioning a trephine bur through an opening in the surgical guide;

forming an access opening through tissue and bone with the trephine bur;

terminating the access opening at a root of the tooth;

inserting a sleeve into the access opening, the sleeve having a plurality of bores through the sleeve, the bores communicating a proximal end of the sleeve with a side of the sleeve adjacent a distal end thereof, the bore positioned adjacent the root of the tooth;

inserting a dental tool through the bore to clean the root canal; and

inserting a retro filling material through the bore to be applied into the root canal.

18. The method of claim **17**, wherein the step of inserting the sleeve into the access opening includes aligning a male part, extending from the proximal end of the sleeve, with a channel formed on an exterior surface of the surgical guide, the channel extending from the opening toward an external periphery thereof.

19. The method of claim **17**, further comprising visualizing a proper depth of the sleeve in the access opening with an x-ray view showing a groove, formed about a circumference of the sleeve and intersecting a position where the bore exits the sleeve at the side of the sleeve, aligning with the root canal when the proper depth is realized.

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