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(71) Applicant(s)
Young Wan Song

(72) Inventor(s)
Song, Young Wan

(74) Agent / Attorney
Janet Stead & Associates Patent & Trade Marks Attorneys, 716 Murray Street, West Perth, WA, 6005

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(71) Applicant and
(72) Inventor: **SONG, Young Wan** [KR/KR]; DONGJU DENTAL CLINIC, 199-5 Seongnae2-dong, Gang-dong-gu, Seoul 134-841 (KR).

(74) Agent: **LEE, Seoung Gill**; 601 Daegun Bldg., 822-5 Yeoksam-dong, Gangnam-gu, Seoul 135-080 (KR).

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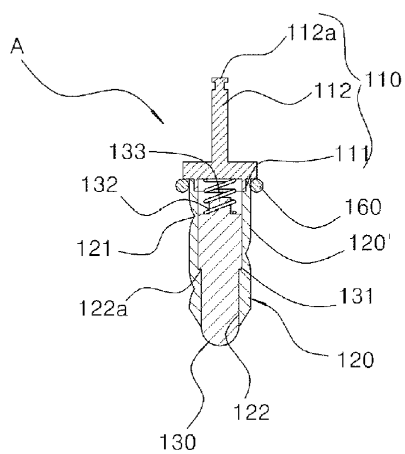

(57) Abstract: There is provided an implant drill for maxillary sinus lifting, which is capable of easily and simply boring the maxillary bone, without damaging the lining membrane of the maxillary sinus, to easily operate the maxillary sinus lifting and to expand a boring part of the maxillary bone for implant placement. The implant drill for maxillary sinus lifting, which includes a central shaft with a shank in a body to be mounted onto a general dental hand piece, comprises a protrusion member elastically positioned in the body so as to move forward and backward or a lifting member being free from the rotation of the body.

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Description

AN IMPLANT DRILL

Technical Field

[1] The present invention relates to a dental implant drill, and more particularly, to an implant drill for maxillary sinus lifting, which is capable of easily and simply boring the maxillary bone, without damaging the lining membrane of the maxillary sinus, to easily operate the maxillary sinus lifting and to expand a boring part of the maxillary bone for implant placement.

Background Art

[2] Today, the implant operation for placing an artificial tooth has been rapidly spread.

[3] However, quite a number of patients have the mouth structures with difficult in performing the implant operation. Some dentists are reluctant to perform the implant operation in these patients.

[4] Specifically, when a remaining bone in a posterior region where the maxillary sinus is positioned is insufficient, it is very hard to place an implant. In this case, after a space is secured by lifting the lining membrane of the maxillary sinus, a bone is transplanted in the secured space and then an implant is placed to be embedded therein. This method of placing an implant is divided into two manners, such as a vertical approach manner and a side approach manner.

[5] The vertical approach manner is used when the remaining bone is certainly secured in a part for the implant operation (that is, when the thickness of the remaining bone is 4mm or above). In this case, a device, such as an osteotome (a chisel and a mallet), is used to tap the maxillary bone several times, and bore an aperture being 2 to 3 mm in diameter into the maxillary bone, without damaging the lining membrane of the maxillary sinus, and a transplant bone is little by little inserted into the aperture.

[6] In this vertical approach manner, since the surgical operation part is narrow, the part less swells after the operation. However, since it is impossible to directly see the lining membrane of the maxillary sinus during the surgical operation, a dentist needs to very carefully perform the operation while checking an operation process by X-rays. Therefore, a long time is required for the surgical operation. Moreover, a shock during the operation process may cause a very unpleasant feeling to a patient.

[7] The side approach manner is used when the remaining bone is very insufficient in the part for the implant operation (that is, when the thickness of the remaining bone is 4mm or below). In this case, an aperture (window) is formed on the side of the maxillary sinus and the lining membrane of the maxillary sinus is lifted to transplant a bone.

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In the side approach manner, since a dentist lifts the lining membrane of the maxillary sinus while directly seeing it during the surgical operation, the lining membrane of the maxillary sinus is less damaged. Even if the lining membrane of the maxillary sinus is damaged, a post-treatment is possible. Further, since a bone transplant material in a desired amount can be promptly inserted at once, the progress thereof is fast.

However, the surgical operation is difficult and a valve needs to be formed. Therefore, after the surgical operation, a patient has a severe edema. Due to these reasons, the side approach manner is in fact avoided.

Meantime, research has been conducted for a maxillary sinus lifting technique using a general implant drill and a trephine drill shown in FIGS. 1 and 2, together with the above-mentioned methods.

A patient has less aversion to the surgical operation using the implant drill. Further, the maxillary bone can be easily and fast bored. However, when the boring of the maxillary bone is completed by the rotation of a drill bit, since no means is prepared to prevent a tip of the drill bit from contacting with the lining membrane of the maxillary sinus, the lining membrane of maxillary sinus may be damaged by being torn or rolled by the tip of the drill bit. Therefore, it can be said that the maxillary sinus lifting technique using a drill is almost impossible at present.

Disclosure of Invention

Technical Problem

Therefore, the present invention is directed to provide an implant drill for maxillary sinus lifting, which is capable of easily and simply boring the maxillary bone, without damaging the lining membrane of the maxillary sinus, to easily operate the maxillary sinus lifting.

Another object of the present invention is to provide an implant drill for maxillary sinus lifting, which is capable of easily and simply expanding a boring part of the maxillary bone for implant placement, without damaging the lining membrane of the maxillary sinus.

Another object of the present invention is to provide an implant drill which is capable of previously and easily checking a position for boring the maxillary bone and visually marking a size of an artificial tooth and a position for placing an artificial tooth root, both being checked, at a part for implant operation.

Technical Solution

In accordance with an exemplary embodiment, the present invention provides an implant drill for maxillary sinus lifting, which includes a cylindrical body, and a central shaft having a shank and being mounted onto a general dental hand piece, comprising: a protrusion

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member inserted into a through-aperture formed in the cylindrical body in the length direction, a front end of the protrusion member being formed to be round; a connector installed at one end of the cylindrical body; and a spring installed between a rear end of the protrusion member and an inner surface of the connector, to elastically support the protrusion member such that the protrusion member is moveable forward and backward in the cylindrical body in a length direction.

Further, the protrusion member may include a stop rod so that the protrusion member is controllably inserted into the drill at a predetermined depth.

Further, the protrusion member may include an end protrusion and the through-aperture may include an inner protrusion so that the end protrusion engages with the inner protrusion, to prevent the protrusion member from separating from the through-aperture.

Further, the outer circumference surface of the body may include a flange so that the drill is controllably inserted at a predetermined length. Further, the outer circumference surface of the body may further include an impact absorber controlling the length of the drill to be inserted to be shorter and absorbing impact when the drill is inserted at the controlled length.

In accordance with another exemplary embodiment, the present invention provides an implant drill for maxillary sinus lifting, which is an implant trephine drill including a cutting groove formed on an end of a cylindrical body, and a central shaft with a shank and mounted onto a general dental hand piece, comprising: a protrusion member elastically positioned in the cylindrical body and moving forward and backward at a center of the cutting groove formed on the end of the cylindrical body in a length direction.

Then, the protrusion member may be inserted into the cylindrical body so as to be supported by a spring; and the protrusion member may include an end protrusion and the cylindrical body may include an inner protrusion so that the end protrusion engages with the inner protrusion, to prevent the protrusion member from separating from the inside of the cylindrical body.

Further, the outer circumference surface of the body may include a flange so that the drill is controllably inserted at a predetermined length. Further, the outer circumference surface of the body may further include an impact absorber controlling the length of the drill to be shorter and absorbing impact when the drill is inserted at the controlled length.

In accordance with another exemplary embodiment, the present invention provides an implant drill for maxillary sinus lifting, which includes a cutting groove formed on an outer circumference surface of a tapered cylindrical body, and a central shaft with a shank and which is mounted onto a general dental hand piece, comprising: a lifting member positioned at an drill end of the body, so as to be free from rotation of the drill.

[26] Then, the front end of the lifting member may be processed to be round, and the lifting member may have a shape being wide at both end parts and narrow in a middle part so that the middle part is hinge-coupled at an end of the drill, and the lifting member with a first end positioned outside the drill and a second end positioned inside the drill may be free from the rotation of the drill.

[27] Further, the second end of the lifting member, positioned inside the drill, may have a conical shape, and the apex part of the second end may be supported inside the drill.

[28] Further, the outer circumference surface of the tapered cylindrical body may include a flange so that the drill is controllably inserted at a predetermined length.

[29] In accordance with another exemplary embodiment, the present invention provides an implant drill for maxillary sinus lifting, comprising: a connection shaft with a shank to be mounted onto a dental hand piece, and a cylindrical body to which the connection shaft is fixedly positioned, and the connection shaft is vertically positioned at the center on the body, and the body includes a recessed opening formed at a predetermined depth from the lower end of the body, a round blade in a saw-toothed shape continuously formed along the edge of the recessed opening, and a drill bit positioned at the center of the recessed opening in a vertical direction.

[30] Then, in the body, the depth of the recessed opening may be same as or greater than the height of the round blade, and the lower end of drill bit may protrude further than the lower end of the round blade.

[31] Further, the body may be any one selected from a mini type, a regular type and a wide type which are different from one another in the width of the body.

Brief Description of the Drawings

[32] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail preferred exemplary embodiments thereof with reference to the attached drawings in which:

[33] FIG. 1 is a front view of a conventional dental drill;

[34] FIG. 2 is a perspective view of a conventional trephine drill;

[35] FIG. 3 is a perspective view of an implant drill for maxillary sinus lifting according to an exemplary embodiment of the present invention;

[36] FIG. 4 is a sectional view illustrating a connection state of the implant drill for maxillary sinus lifting according to an exemplary embodiment of the present invention;

[37] FIGS. 5 through 8 are views illustrating an operation state of the implant drill for maxillary sinus lifting according to an exemplary embodiment of the present invention;

[38] FIG. 9 is a perspective view of a modification of the implant drill for maxillary

sinus lifting according to the present invention;

[39] FIG. 10 is a perspective view of an implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[40] FIG. 11 is a sectional view illustrating a connection state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[41] FIGS. 12 through 15 are views illustrating an operation state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[42] FIGS. 16 and 17 are sectional views illustrating examples of an impact absorber further included in the implant drill of FIG. 10;

[43] FIG. 18 is a perspective view of an implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[44] FIG. 19 is a sectional view illustrating a connection state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[45] FIGS. 20 through 23 are views illustrating an operation state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[46] FIG. 24 is a perspective view of an implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[47] FIG. 25 is a sectional view of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[48] FIG. 26 is a view illustrating a use state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention;

[49] FIG. 27 is a view illustrating an operation state of the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention; and

[50] FIG. 28 is a plan view illustrating a marking state by the implant drill for maxillary sinus lifting according to another exemplary embodiment of the present invention.

Mode for the Invention

[51] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred exemplary embodiments of the invention are shown.

[52] FIGS. 3 through 8 are views for explaining an implant drill A for maxillary sinus lifting according to an exemplary embodiment of the present invention.

[53] As illustrated in FIG. 3, the implant drill A comprises a connector 110, a drill bit 120 and a protrusion member 130.

[54] The connector 110 has a disc shape with the diameter within the range of 4 to 5mm and includes a securing rim 111, a shank 112a and a central shaft 112. The securing rim 111 in a round shape with the outer diameter smaller than the outer diameter of the connector 110 is formed under the bottom surface of the connector 110. The central shaft 112 with the shank 112a is positioned at the center on the top surface of the connector 110.

[55] The drill bit 120 has a cylindrical shape with the diameter of about 3mm, which is little smaller than the diameter of the connector 110. The drill bit 120 includes a spiral cutting groove 121 and a through-aperture 122. The spiral cutting groove 121 is formed on the outer circumference surface of a body 120'. The through-aperture 122 with the diameter of about 2mm is formed at the center part in a vertical direction and is extended vertically.

[56] The protrusion member 130 has a round rod shape with the diameter being same as or smaller than the diameter of the through-aperture 122 of the drill bit 120. A front end of the protrusion member 130 is processed to be round. A stop rod 133 protrudes at a predetermined length at the other end of the protrusion member 130 and the protrusion member 130 contacts with a spring 132 surrounding the outside of the stop rod 133. Therefore, the protrusion member 130 is forward or backward movable by the elasticity of the spring 132 within a predetermined range.

[57] The protrusion member 130 is positioned in the through-aperture 122 of the drill bit 120.

[58] As illustrated in FIG. 4, the round front end of the protrusion member 130 is positioned to be exposed out of the drill bit 120, and the spring 132 is positioned in the other end of the protrusion member 130 and is supported by the connector 110.

[59] The upper end of the drill bit 120 in which the protrusion member 130 is positioned is combined with the securing rim 111 of the connector 110, so that the drill bit 120 is integral with the connector 110. The securing rim 111 of the connector 110 may be combined with the upper end of the drill bit 120 by using a screw or by welding if a connecting force is secured at a predetermined level.

[60] A process of boring the maxillary bone, using the implant drill A according to the exemplary embodiment of the present invention is performed in the order of FIGS. 5 through 8 and will be described in detail.

[61] The shank 112a of the connector 110 is mounted onto a dental hand piece driving part, so that the entire implant drill A is rotated when power is applied. As illustrated in FIG. 5, the tip of the drill bit 120 is allowed to approach to a part for surgical operation.

[62] After a dentist applies a force so that the tip of the drill bit 120 is secured against to the part for the surgical operation, the power is applied to the hand piece to rotate the

implant drill A.

[63] Then, as illustrated in FIG. 6, since the spring 132 positioned at the back of the drill bit 120 is pressed by contact with the maxillary bone 140 and the protrusion member 130 partially exposed in the front of the drill bit 120 is pushed backward, the tip of the drill bit 120 surrounding the protrusion member 130 drills the maxillary bone 140 to perform the boring.

[64] Then, as the protrusion member 130 is pushed backward at a predetermined length, the stop rod 133 contacts with the connector 110 so that the protrusion member 130 is controllably inserted at a constant length. This prevents powered bones from being inserted in the front end of the protrusion member 130.

[65] When the boring of the maxillary bone 140 is completed and the tip of the drill bit 120 reaches the lining membrane 150 of the maxillary sinus in a state surrounding an empty space, the pressure to the protrusion member 130 by the maxillary bone 140 is momentarily released. Therefore, as illustrated in FIG. 7, the protrusion member 130 protrudes forwardly by the elasticity of the spring 132 and lifts the lining membrane 150 of the maxillary sinus 150 towards the empty space. This easily secures a space for inserting a bone transplant material.

[66] While the protrusion member 130 protrudes from the inside of the through-aperture 122 of the drill bit 120 and contacts with the lining membrane 150 of the maxillary sinus, the front end of the protrusion member 130 may damage the lining membrane 150 of the maxillary sinus. However, in accordance with the embodiment of the present invention, since the front end of the protrusion member 130 is processed to be round, the lining membrane 150 of the maxillary sinus is prevented from being damaged by the front end of the protrusion member 130.

[67] An end protrusion 131 is formed in the middle of the protrusion member 130 in a direction of the length of the protrusion member 130. An inner protrusion 122a is formed in the middle of the through-aperture 122 of the drill bit 120 in a direction of the length of the drill bit 120. Therefore, since the end protrusion 131 engages with the inner protrusion 122a, the protrusion member 130 does not separate from the inside of the through-aperture 122 and the protrusion member 130 protrudes within a constant range of protrusion.

[68] After the drill bit 120 bores the maxillary bone 140 and the protrusion member 130 lifts the lining membrane 150 of the maxillary sinus, since the dentist still pushes the implant drill A, the drill bit 120 may further progress towards the direction in which the dentist applies the force, i.e., the maxillary sinus. However, in accordance with the embodiment of the present invention, as illustrated in FIG. 8, even though the drill bit 120 further progress, the connector 110 with the greater diameter than the diameter of the drill bit 120 is limited by the maxillary bone 140 around the point at which the

boring is started. Therefore, the drill bit 120 cannot be further progressed, and the extent that the drill bit 120 is inserted into the maxillary bone 140 can be limited.

[69] If necessary, an impact absorber in a donut shape may be mounted onto the outer diameter of the drill bit 120, so that the length of the drill bit 120 being inserted into the maxillary bone 140 can be controlled to be shorter and, when the drill bit 120 is inserted at a desired length, the impact by the maxillary bone 140 can be absorbed. An example of the impact absorber may be a rubber ring 160 illustrated in FIG. 4, and this rubber ring 160 is sufficiently used for that purpose.

[70] The drill bit 120 according to the exemplary embodiment of the present invention may not have the spiral shape and therefore it may have a parallel shape as illustrated in FIG. 9.

[71] FIGS. 10 through 16 are views for explaining an implant trephine drill B for maxillary sinus lifting according to another exemplary embodiment of the present invention.

[72] As illustrated in FIG. 10, the implant trephine drill B comprises a connector 210, a drill bit 220 and a protrusion member 230.

[73] Unlike a general drill for boring in a round shape, since the trephine drill includes a cutting groove in a round shape on a cylindrical shape end only and performs boring, the trephine drill extracts a round shape self-bone corresponding to the middle part of the cutting groove.

[74] The connector 210 has a disc shape with the diameter within the range of 4 to 5mm and includes a securing rim 211, a shank 212a and a central shaft 212. The securing rim 211 in a round shape with the outer diameter smaller than the outer diameter of the connector 210 is formed under the bottom surface of the connector 210. The central shaft 212 with the shank 212a is positioned at the center on the top surface of the connector 210.

[75] The drill bit 220 has a cylindrical shape with the diameter of about 3mm, which is little smaller than the diameter of the connector 210. The drill bit 220 includes a saw-toothed cutting groove 221 and a through-aperture 222. The saw-toothed groove 221 is formed in a round shape at an end of a cylindrical shaped body 220'. The through-aperture 222 with the diameter of about 2mm is formed at the center part in a vertical direction and is extended vertically.

[76] The protrusion member 230 has a round rod shape with the diameter being same as or smaller than the diameter of the through-aperture 222 of the drill bit 220. A front end of the protrusion member 230 is processed to be round. The other end of the protrusion member 230 is in contact with a spring 232. The protrusion member 230 is forward or backward movable by the elasticity of the spring 232 within a pre-determined range.

[77] The protrusion member 230 is positioned in the through-aperture 222 of the drill bit 220.

[78] As illustrated in FIG. 11, the round front end of the protrusion member 230 is positioned to be exposed out of the lower part of the drill bit 220, and the spring 232 is positioned in the other end of the protrusion member 230 and is supported by the connector 210.

[79] The upper end of the drill bit 220 in which the protrusion member 230 is positioned is combined with the securing rim 211 of the connector 210, so that the drill bit 220 is integral with the connector 210. The securing rim 211 of the connector 210 may be combined with the upper end of the drill bit 220 by using a screw or by welding if a connecting force is secured at a predetermined level.

[80] A process of boring the maxillary bone and extracting the self-bone, using the implant trephine drill B according to the exemplary embodiment of the present invention is performed in the order of FIGS. 12 through 15 and will be described in detail.

[81] The shank 212a of the connector 210 is mounted onto a dental hand piece driving part, so that the entire implant trephine drill B is rotated when power is applied. As illustrated in FIG. 12, the tip of the drill bit 220 is allowed to approach a part for surgical operation.

[82] After a dentist applies a force so that the tip of the drill bit 220 is secured against to the part for the surgical operation, the power is applied to the hand piece to rotate the drill B.

[83] Then, as illustrated in FIG. 13, since the spring 232 positioned at the back of the drill bit 220 is pressed by contact with the maxillary bone 240 and the protrusion member 230 partially exposed in the front of the drill bit 220 is pushed backward, the tip of the drill bit 220 surrounding the protrusion member 230 drills the maxillary bone 240 to perform the boring.

[84] When the boring of the maxillary bone 240 is completed and the tip of the drill bit 220 reaches the lining membrane 250 of the maxillary sinus in a state surrounding an empty space, the pressure to the protrusion member 230 by the maxillary bone 240 is momentarily released. Therefore, as illustrated in FIG. 14, the protrusion member 230 protrudes forwardly by the elasticity of the spring 232, pushes the extracted self-bone and lifts the lining membrane 250 of the maxillary sinus towards the empty space. This easily secures a space for inserting a bone transplant material.

[85] While the protrusion member 230 protrudes from the inside of the through-aperture 222 of the drill bit 220 and contacts with the lining membrane 250 of the maxillary sinus, the front end of the protrusion member 230 may damage the lining membrane 250 of the maxillary sinus. However, in accordance with the embodiment of the

present invention, since the front end of the protrusion member 230 is processed to be round, the lining membrane 250 of the maxillary sinus is prevented from being damaged by the front end of the protrusion member 230.

[86] An end protrusion 231 is formed in the middle of the protrusion member 230 in a direction of the length of the protrusion member 230. An inner protrusion 222a is formed in the middle of the through-aperture 222 of the drill bit 220 in a direction of the length of the drill bit 220. Therefore, since the end protrusion 231 engages with the inner protrusion 222a, the protrusion member 230 does not separate from the inside of the through-aperture 222 and the protrusion member 230 protrudes within a constant range of protrusion.

[87] After the drill bit 220 bores the maxillary bone 240 and the protrusion member 230 lifts the lining membrane 250 of the maxillary sinus, since the dentist still pushes the implant trephine drill B, the drill bit 220 may further progress towards the direction in which the dentist applies the force, i.e., the maxillary sinus. However, in accordance with the embodiment of the present invention, as illustrated in FIG. 15, even though the drill bit 220 further progress, the connector 210 with the greater diameter than the diameter of the drill bit 220 is limited by the maxillary bone 240 around the point at which the boring is started. Therefore, the drill bit 220 cannot be further progressed, and the extent that the drill bit 220 is inserted into the maxillary bone 240 can be limited.

[88] If necessary, an impact absorber in a donut shape may be mounted onto the outer diameter of the drill bit 220, so that the length of the drill bit 220 being inserted into the maxillary bone 240 can be controlled to be shorter and, when the drill bit 220 is inserted at a desired length, the impact by the maxillary bone 240 can be absorbed.

[89] Examples of the impact absorber may be a rubber ring 260 illustrated in FIG. 16 and a spring device 270 with a more complicate structure illustrated in FIG. 17. The rubber ring 260 is sufficiently used for that purpose. The spring device 270 is formed by a coil spring 272 interposed in a donut-shaped housing 271.

[90] FIGS. 18 through 23 are views for explaining an implant drill C for the maxillary sinus lifting according to another exemplary embodiment of the present invention.

[91] FIG. 18 is a perspective view of the implant drill C according to another exemplary embodiment of the present invention. As illustrated in FIG. 18, the implant drill C comprises a connector 310, a drill bit 320 and a lifting member 330.

[92]

[93] *The connector 310 has a disc shape with the diameter within the range of 4 to 5mm and includes a securing rim 311, a shank 312a and a central shaft 312. The securing rim 311 in a round shape with the outer diameter smaller than the outer diameter of the connector 310 is formed under the bottom surface of the connector

310. The central shaft 312 with the shank 312a is positioned at the center on the top surface of the connector 310.

[94] The drill bit 320 has a cylindrical shape with the diameter of about 3.8mm, which is little smaller than the diameter of the connector 310. In the drill bit 320, the diameter of its lower end is formed to be small and tapered. The drill bit 320 includes a spiral cutting groove 321 and a bi-level through-aperture 322. The spiral cutting groove 321 is formed on the outer circumference surface of a body 320'. The through-aperture 322 is formed at the center part in a vertical direction and is extended vertically.

[95] The lifting member 330 has a dumbbell shape with a upper supporter 331 in a conical shape, formed at the upper end, and a lower supporter 332 being processed to be round, formed at the lower end.

[96] The lifting member 330 is positioned in the through-aperture 322 of the drill bit 320. As illustrated in FIG. 19, the round-processed lower supporter 332 is positioned to be exposed outward out of the lower end of the drill bit 320, and the upper supporter 331 is positioned above the bi-level through-aperture 322. Since the lower end of the upper supporter 331 is limited by an inner protrusion 322a of the through-aperture 322, the lifting member 330 is combined not to be separated from the inside of the through-aperture 322.

[97] The upper end of the drill bit 320 in which the lifting member 330 is positioned is combined with the securing rim 311 of the connector 310, so that the drill bit 320 is integral with the connector 310. The securing rim 311 of the connector 310 may be combined with the upper end of the drill bit 320 by using a screw or by welding if a connecting force is secured at a predetermined level.

[98] A process of expanding an existing boring part of the maxillary bone 340, using the implant drill C according to another exemplary embodiment of the present invention is performed in the order of FIGS. 20 through 23 and will be described in detail.

[99] The shank 312a of the connector 310 is mounted onto a dental hand piece driving part, so that the entire implant drill C is rotated when power is applied. As illustrated in FIG. 20, the lower supporter 332 of the lifting member 330 is allowed to approach a part for surgical operation.

[100] After a dentist applies a force so that the tip of the drill bit 320 is secured against the part for the surgical operation, the power is applied to the hand piece to rotate the implant drill C.

[101] Then, as illustrated in FIG. 21, the lower supporter 332 in the front of the drill bit 320 and the tapered tip of the drill bit 320 are inserted into the boring part so that the body 320' of the drill bit 320 cuts the circumference of the boring part to be expanded.

[102] Generally, since the diameter of the boring into the maxillary bone is about 3mm, the tip of the drill bit 320 in the present invention is 3mm to be same as the diameter of

the boring into the maxillary bone. Since the body 320 of the drill bit 320 needs to be capable of expanding the boring part, the diameter thereof is 3.8mm to be greater than the diameter of the boring into the maxillary bone.

[103] To expand the entire boring part in the maxillary bone 340, the body 320 of the drill bit 320 is to completely perforate into the existing boring part. In accordance with the embodiment of the present invention, as illustrated in FIG. 22, since the lower supporter 332 of the lifting member 330 is positioned at the tip of the drill bit 320, the lower supporter 332 precedes the drill bit 320 and lifts the lining membrane 350 of the maxillary sinus towards an empty space when contacting with the lining membrane 350 of the maxillary sinus. Therefore, even though the drill bit 320 completely perforates into the boring part, the lining membrane 350 of the maxillary sinus is prevented from being damaged.

[104] While a front end of the lifting member 330, that is, the lower supporter 332, is in contact with the lining membrane 350 of the maxillary sinus, the front end of the lifting member 330 may damage the lining membrane 350 of the maxillary sinus. However, in accordance with the embodiment of the present invention, since the lower supporter 332 is processed to be round, the lining membrane 350 of the maxillary sinus is prevented from being damaged by the lower supporter 332.

[105] When the lower supporter 332 contacts with the lining membrane 350 of the maxillary sinus, the lifting member 330 is slightly pushed backward by the resistance of the lining membrane 350 of the maxillary sinus so that the apex part of the upper supporter 331 in the conical shape comes into contact with the bottom surface of the connector 332. However, since the contact area between the apex part of the upper supporter 331 and the bottom surface of the connector 332 is very small, the lifting member 330 is supported irrespective of the rotation of the drill bit 332. Since the lifting member 330 dose not rotate by itself, the lining membrane 350 of the maxillary sinus is prevented from being damaged by the lifting member 330 in contact with the lining membrane 350 of the maxillary sinus.

[106] After the boring part is expanded as the drill bit 320 completely perforates into the boring part of the maxillary bone 340, since the dentist still pushes the implant drill C, the drill bit 320 may further progress towards the direction in which the dentist applies the force, i.e., the maxillary sinus. However, in accordance with the embodiment of the present invention, as illustrated in FIG. 23, even though the drill bit 320 further progresses, the connector 310 with the greater diameter than the diameter of the body 320 of the drill bit 320 is limited by an entrance of the boring being expanded. Therefore, the drill bit 320 cannot be further progressed, and the extent that the drill bit 320 is inserted into the maxillary bone 340 can be limited.

[107] FIGS. 24 through 28 are views for explaining an implant drill D for maxillary sinus

lifting according to another embodiment of the present invention, for visually marking a size of an artificial tooth and a position for placing an artificial tooth root on a part for implant operation before boring the maxillary bone.

[108] As illustrated in FIGS. 24 and 25, the implant drill D comprises a connection shaft 410 and a body 420.

[109] The connection shaft 410 has a bar shape with a predetermined length. The upper end of the connection shaft 410 includes a shank 411 to be mounted onto a dental hand piece 430, and the lower end thereof is fixed to the center on the body 420.

[110] The body 420 has a cylindrical shape with a predetermined height. A recessed opening 421 is formed from the lower end of the body 420. A round blade 422 in a saw-toothed shape is formed, along the edge of the recessed opening 421. A drill bit 423 is positioned at the middle of the recessed opening 421 in a vertical direction. A number of apertures 424 are formed on the outer circumference surface of the body 420.

[111] The depth of the recessed opening 421 may be formed to be same as or greater than the height of the round blade 422. The lower end of the drill bit 423 may have a height to partially protrude from the lower end of the round blade 422.

[112] In the embodiment of the present invention, the width of the body 420 is approximately the width of a tooth of an adult (about 10mm). The body 420 may be slightly different in width, such as a mini type, a regular type or a wide type, so that it may be selectively used. The thickness of the drill bit 423 is about 2mm, irrespective of the size of the body 420.

[113] As illustrated in FIG. 26, the implant drill D according to the embodiment of the present invention is used by mounting the shank 411 positioned on the upper end of the connection shaft 410 onto a head 431 of the dental hand piece 430. As the hand piece 430 is driven, the body 420 including the connection shaft 410 is rotated.

[114] When the drill D is mounted onto the hand piece 430 so as to be secured against the part for the implant surgical operation, that is, the maxillary bone, and it is rotated, as illustrated in FIG. 27, the tip of the drill bit 423 and the tip of the round blade 422 drill the maxillary bone 440 so that a marking "a" in a specific shape is indicated on the maxillary bone 440.

[115] FIG. 28 is a plan view of the marking state by the implant drill D according to the embodiment of the present invention. As illustrated in FIG. 28, the mark "a" indicated on an alveolar bone distinctly indicates a round blade insertion opening 422a and a drill bit insertion opening 423a.

[116] The round blade insertion opening 422a is the means for checking the size of an artificial tooth. The drill bit insertion opening 423a is the means for checking the position for placing an artificial tooth root. A dentist is able to know the size of the

artificial tooth and the position of placing the artificial tooth root which are suitable for the mouth condition of a patient. Furthermore, based on the marking, the powered bones remaining in the body 420 are easily extracted through the apertures 424 and re-used for the surgical operation.

[117] This process will be described in detail.

[118] The marking "a" is indicated on the maxillary bone 440 between the other surviving teeth 450 by using the implant drill D. One side of a first marking "a" needs to be performed adjacent to the existing tooth 450 at the side of the first marking "a", and a second (last) marking "a" needs to be performed not to overlap or be spaced from the first marking "a".

[119] In the above-described process, the body 420 used for the first marking "a" is selected from the mini type, the regular type or the wide type, considering the size of the adjacent existing tooth 450. For the second (last) marking "a", the body 420 with the width to be secured and received in the space between the first marking "a" and another existing tooth 450 at the opposite side needs to be used.

[120] For example, when the markings "a" indicated between the existing teeth 450 are the regular type and the regular type, the artificial teeth respectively corresponding to the width of the regular type body 420 are continuously transplanted. However, when the markings "a" indicated between the existing teeth 450 are the regular type and the wide type, the artificial tooth corresponding to the width of the regular type body 420 and the artificial tooth corresponding to the width of the wide type body 420 are transplanted. Then, the drill bit insertion opening 423a marked in the middle of each marking "a" becomes the position for placing the artificial tooth root for the artificial tooth transplantation.

[121] In accordance with the embodiment of the present invention, a dentist performs the implant surgical operation after visually checking the size of the artificial tooth and the position for placing the artificial tooth root, thereby performing the more suitable implant operation for the mouth condition of a patient.

[122] FIG. 28 shows, for example, two artificial teeth to be transplanted. However, the present invention is applicable when transplanting one or more artificial teeth. But, when a number of artificial teeth are to be transplanted, the marking "a" by the body 420 with the same width may be continued for the cosmetic purpose after the surgical operation.

[123] The invention has been described using preferred exemplary embodiments. However, it is to be understood that the scope of the invention is not limited to the disclosed embodiments. On the contrary, the scope of the invention is intended to include various modifications and alternative arrangements within the capabilities of persons skilled in the art using presently known or future technologies and equivalents.

The scope of the claims, therefore, should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

Industrial Applicability

[124] In the implant drill for the maxillary sinus lifting according to the embodiment of the present invention, when the drill bit completely perforates into the maxillary bone, the front end of the protrusion member moves forward to lift the lining membrane of the maxillary sinus. Accordingly, since the tip of the drill bit is basically prevented from approaching the lining membrane of the maxillary sinus. The maxillary sinus lifting is easily and simply performed without damaging the lining membrane of the maxillary sinus by the drill bit.

[125] In the implant drill for the maxillary sinus lifting according to the embodiment of the present invention, when the tapered tip of the drill bit is inserted into the existing boring part of the maxillary bone, the body of the drill bit with the greater diameter than the diameter of the front end of the drill bit expands the boring part. Further, the lower supporter of the lifting member which protrudes than the tip of the drill bit lifts the lining membrane of the maxillary sinus before the drill bit reaches the lining membrane of the maxillary sinus. Therefore, the tip of the drill bit is basically prevented from approaching the lining membrane of the maxillary sinus. Accordingly, even a non-specialist one can easily and simply expand the boring part of the maxillary bone, without damaging the lining membrane of the maxillary sinus by the drill bit.

[126] In the implant drill for the maxillary sinus lifting according to the embodiment of the present invention, when the implant drill is rotatably mounted onto the hand piece, the markings by the insertion of the round blade and the drill bit are indicated on the part for the implant surgical operation. Through the markings, the size of the artificial tooth and the position for placing the artificial tooth root are easily checked. Accordingly, since a dentist performs the implant surgical operation after visually checking the size of the artificial tooth and the position for placing the artificial tooth root, the implant surgical operation is performed to be more suitable for the mouth structure of a patient.

[127]

2007215700 09 Feb 2011

Claims

[1] An implant drill for maxillary sinus lifting, which includes a cylindrical body, and a central shaft having a shank and being mounted onto a general dental hand piece, comprising: a protrusion member inserted into a through-aperture formed in the cylindrical body in the length direction, a front end of the protrusion member being formed to be round;
a connector installed at one end of the cylindrical body; and
a spring installed between a rear end of the protrusion member and an inner surface of the connector, to elastically support the protrusion member such that the protrusion member is moveable forward and backward in the cylindrical body in a length direction.

[2] The implant drill according to claim 1, wherein the protrusion member comprises a stop rod so that the protrusion member is controllably inserted into the drill at a predetermined depth.

[3] The implant drill according to claim 2, wherein the protrusion member comprises an end protrusion, and the through- aperture comprises an inner protrusion so that the end protrusion engages with the inner protrusion, to prevent the protrusion member from separating from the through-aperture.

[4] The implant drill according to any one of claims 1 to 3, wherein the outer circumference surface of the cylindrical body comprises a flange so that the drill is controllably inserted at a predetermined length.

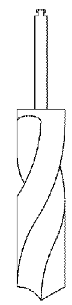
[5] The implant drill according to claim 4, wherein the outer circumference surface of the cylindrical body further comprises an impact absorber controlling the length of the drill to be inserted to be shorter and absorbing impact when the drill is inserted at the controlled length.

[6] The implant drill according to any one of claims 1 to 5, wherein a cutting groove of the drill is formed on an outer circumference surface of the cylindrical body.

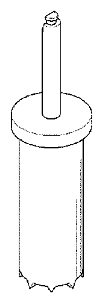
[7] The implant drill according to any one of claims 1 to 5, wherein a cutting groove of the drill is formed on an end of the cylindrical body.

[8] The implant drill substantially as hereinbefore described with reference to and as illustrated in the accompanying Figures 3 to 28.

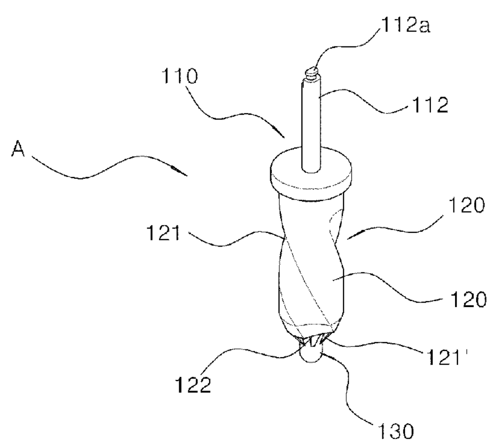
[Fig. 1]



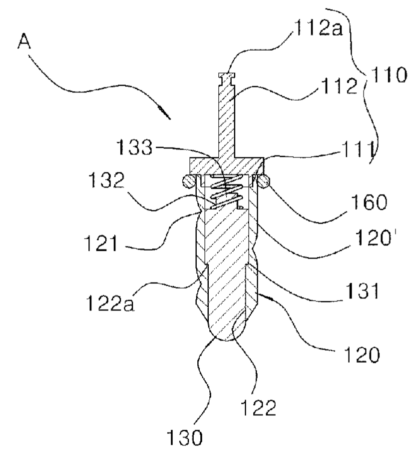
[Fig. 2]



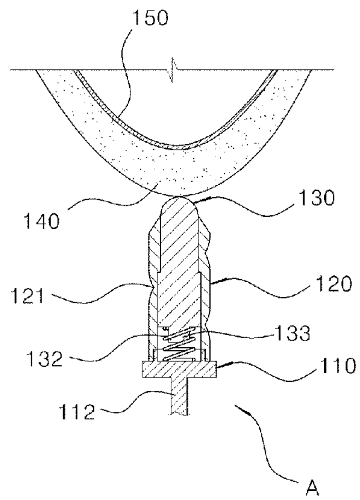
[Fig. 3]



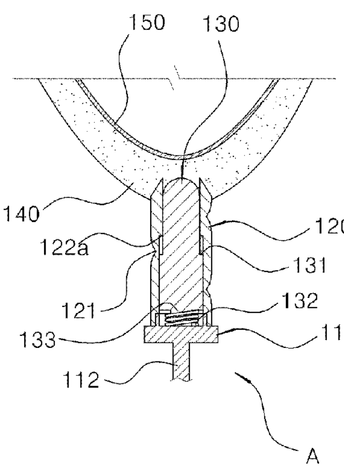
[Fig. 4]



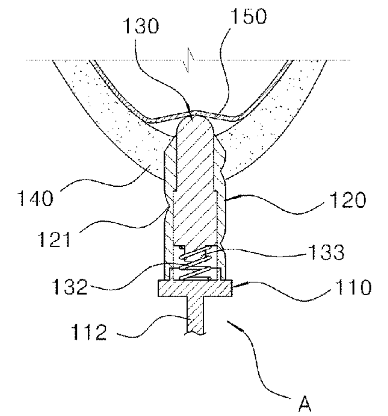
[Fig. 5]



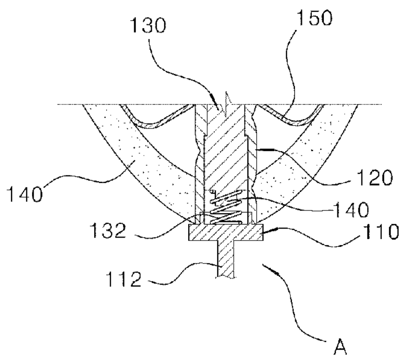
[Fig. 6]



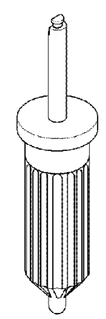
[Fig. 7]



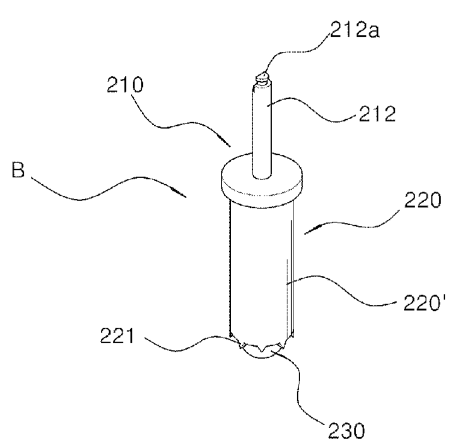
[Fig. 8]



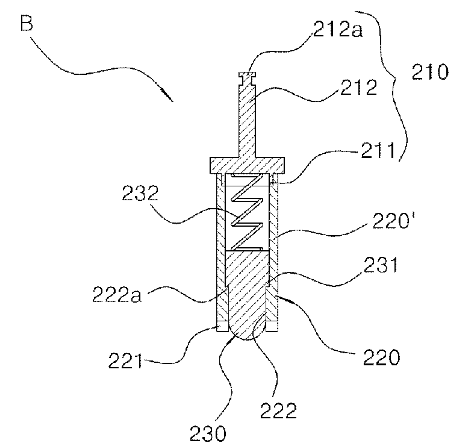
[Fig. 9]



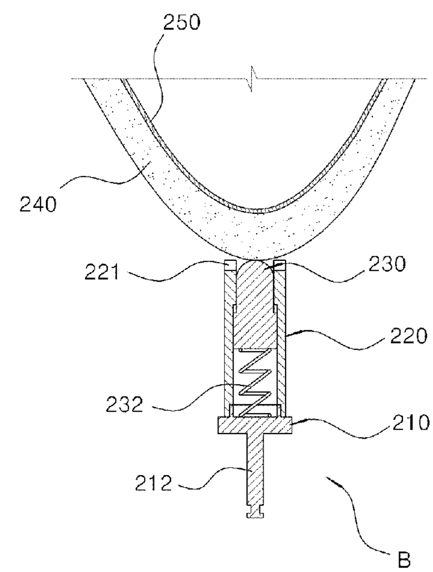
[Fig. 10]



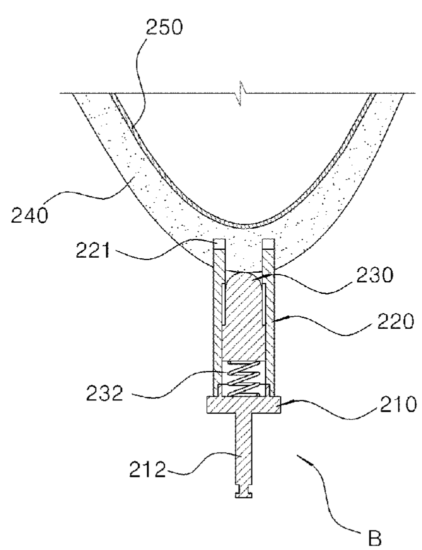
[Fig. 11]



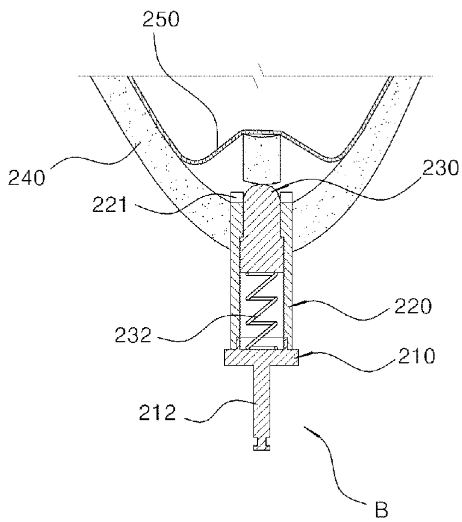
[Fig. 12]



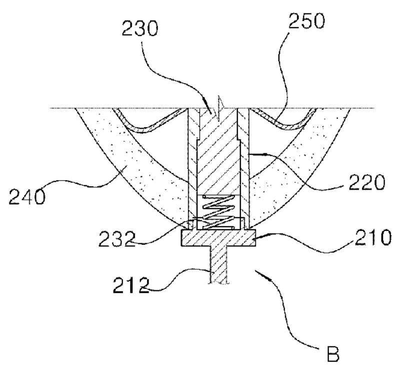
[Fig. 13]



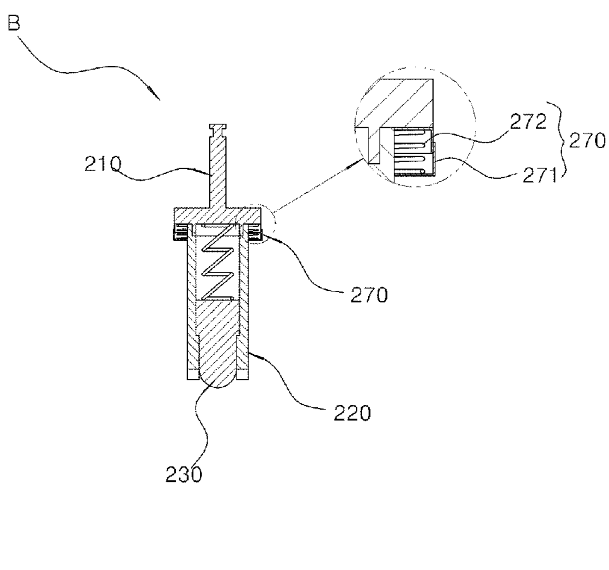
[Fig. 14]



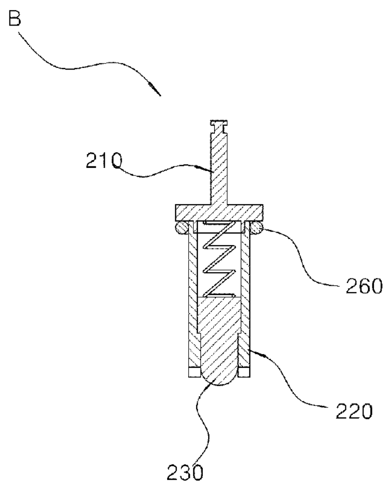
[Fig. 15]



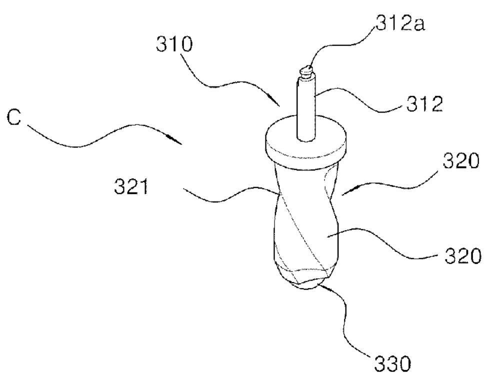
[Fig. 16]



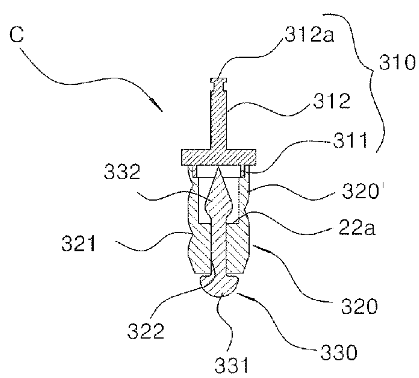
[Fig. 17]



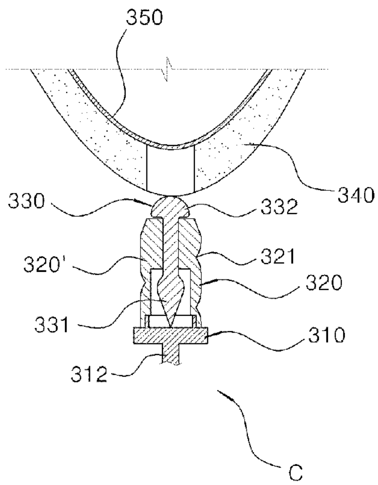
[Fig. 18]



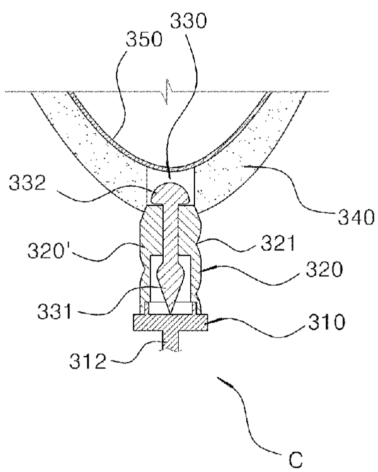
[Fig. 19]



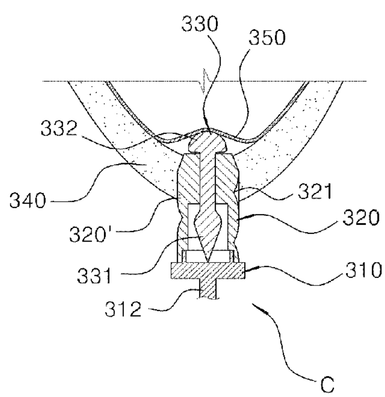
[Fig. 20]



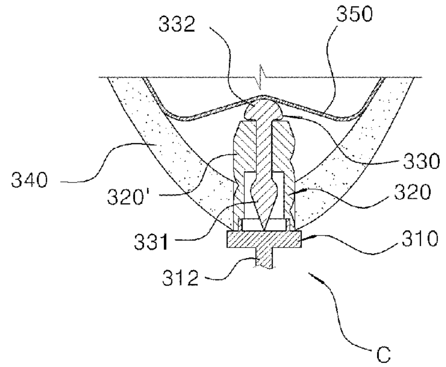
[Fig. 21]



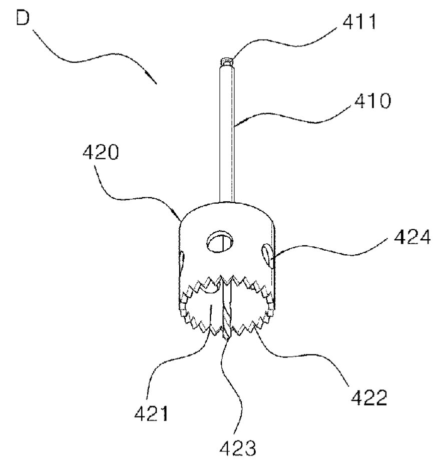
[Fig. 22]



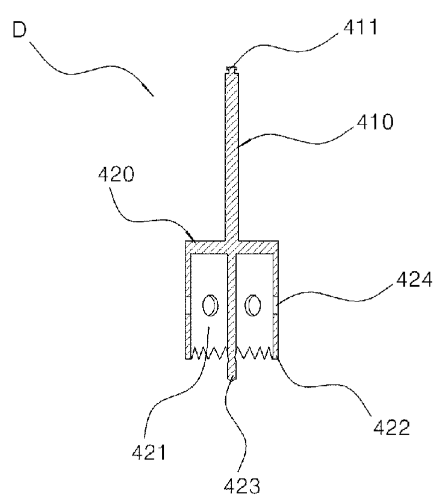
[Fig. 23]



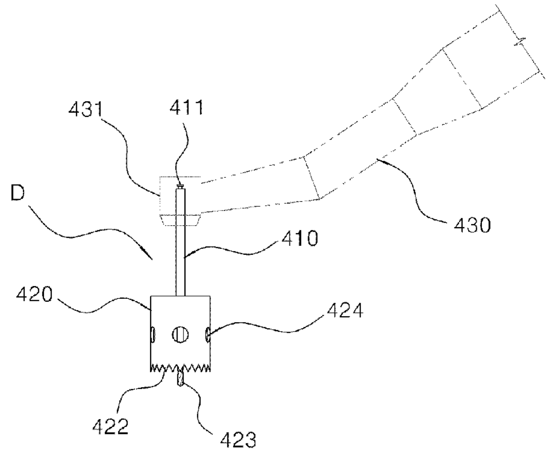
[Fig. 24]



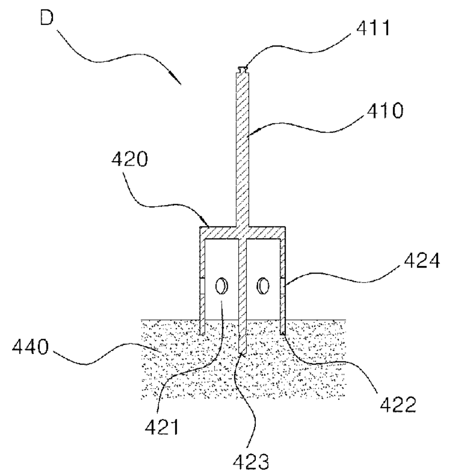
[Fig. 25]



[Fig. 26]



[Fig. 27]



[Fig. 28]