

(19) World Intellectual Property Organization
International Bureau



PCT



(43) International Publication Date
15 January 2009 (15.01.2009)

(10) International Publication Number
WO 2009/008606 A2

(51) International Patent Classification:
A61C 1/00 (2006.01)

(21) International Application Number:

PCT/KR2008/003644

(22) International Filing Date: 25 June 2008 (25.06.2008)

(25) Filing Language: English

(26) **Publication Language:** English

(30) Priority Data:

10-2007-0067898 6 July 2007 (06.07.2007) KR

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

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GO, GW, ML, MR, NE, SN, TD, TG).

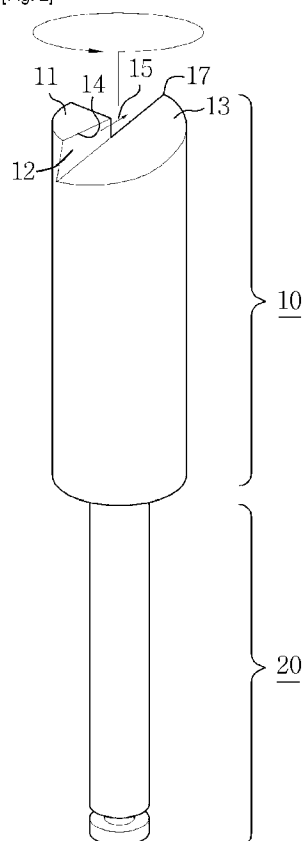
Published:

— *without international search report and to be republished upon receipt of that report*

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(54) Title: REAMER FOR OPERATING IMPLANT IN MAXILLARY SINUS

[Fig. 2]



(57) Abstract: The present invention relates to a reamer for operating an implant in a maxillary sinus, which forms a cutting front end portion on a depressed face so as to perform a rapid cutting operation for a bone by means of the cutting front end portion and a cut edge and thus to form a bone fragment, such that a mucosa of the maxillary sinus is lifted before the reamer is in contact with the mucosa of the maxillary sinus, thereby allowing the implant operation in the maxillary sinus to be easily and safely achieved, and which forms a tapered portion on the reamer used for an initial implant operation so as to allow the reamer to be easily advanced, the tapered portion being downwardly slanted from an initial inclined edge to a final inclined edge so as to reduce the frictional pressure against the portion to be cut, thereby improving a cutting speed thereof.

Description

REAMER FOR OPERATING IMPLANT IN MAXILLARY SINUS

Technical Field

- [1] The present invention relates to a reamer for operating an implant in a maxillary sinus, which is adapted to form a hole in a bone to plant the implant during a dental implant operation, and more particularly, to a reamer for operating an implant in a maxillary sinus, which forms a cutting front end portion on a depressed face so as to perform a rapid cutting operation for a bone by means of the cutting front end portion and a cut edge and thus to form a bone fragment, such that a mucosa of the maxillary sinus is lifted before the reamer is in contact with the mucosa of the maxillary sinus, thereby allowing the implant operation in the maxillary sinus to be achieved in easy and safe manners, and which forms a tapered portion on the reamer used for an initial implant operation so as to allow the reamer to be easily advanced, the tapered portion being downwardly slanted from an initial inclined edge to a final inclined edge in such a manner as to reduce the frictional pressure against the portion to be cut, thereby improving a cutting speed thereof.

Background Art

- [2] Referring to a conventional reamer for operating an implant, as shown in FIG.1, the conventional reamer includes a cutting part 110 for forming a hole for planting the implant in a bone, and a connection part 120 having a diameter smaller than that of the cutting part 110 and downwardly extending from the lower portion of the cutting part 110, wherein the cutting part 110 includes: a protruding face 111 formed on the top surface thereof in such a manner as to upwardly upheave a partial surface including an outer circumference of the cutting part 110 of the entire top surface of the cutting part 110 to form a stepped jaw 112; a depressed face 113 formed on the top surface thereof in such a manner as to depress a partial surface of the entire top surface of the cutting part 110 to be opposite to the protruding face 111 according to the formation of the protruding face 111, the depressed face 113 having a reverse inclination in a clockwise direction; a cut edge 114 horizontally formed on a connected portion between the stepped jaw 112 and the protruding face 111 so that the cut edge 114 evenly disperses a force while being in horizontal line contact with a mucosa of the maxillary sinus even though the cut edge 114 is in contact with the mucosa of the maxillary sinus so as to allow a dentist to perform a cutting work safely without damaging the mucosa of the maxillary sinus; and a discharge path 115 longitudinally formed on the cutting part 110 in such a manner as to cut an area ranging from a partial surface of the top surface of the cutting part 110, i.e., a predetermined portion between the protruding face 111 and

the depressed face 113 to a portion which is slightly shorter than the lower end of the cutting part 110.

[3] Such the conventional reamer for operating the implant is disclosed in Korean Patent Registration No.10-0630304 issued to the same applicant as the present invention.

[4] According to the conventional reamer for operating the implant, the cut edge 114 performs the cutting operation for the bone in a safe manner while being in horizontal line contact with a portion to be cut, but it may come into contact with the mucosa of the maxillary sinus. Further, since the cutting operation is conducted only by the cut edge 114, the cutting speed may be undesirably decreased.

[5] Moreover, the upper end portion of the cutting part 110 has a tapered portion 116 formed on the outer periphery thereof so as to allow the cutting operation to be easily conducted, but when the cutting part 110 is rotated in an axial direction, the tapered portion 116 has the same size in every direction of 360 °, such that the frictional pressure against the portion to be cut at the time of cutting is applied evenly to the entire surface of the tapered portion 116, thereby making the cutting speed badly decreased.

Disclosure of Invention

Technical Problem

[6] Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide a reamer for operating an implant in a maxillary sinus which removes the contact possibility of the portion to be cut with a mucosa of the maxillary sinus so as to completely prevent the mucosa of the maxillary sinus from being damaged, wherein a cutting front end portion is formed on a depressed face so as to perform a rapid cutting operation, while a cut edge performs the cutting operation, thereby obtaining a complete cutting result, such that the bone is broken along the cut edge by the upward pressurizing force of the cut edge for the cutting operation before the cutting front end portion or the cut edge of the reamer comes into contact with the mucosa of the maxillary sinus and thus forms a circular bone fragment, which allows the mucosa of the maxillary sinus to be lifted before the reamer comes into contact with the mucosa of the maxillary sinus.

[7] It is another object of the present invention to provide a reamer for operating an implant in a maxillary sinus which forms a tapered portion downwardly extended from an initial inclined edge to a final inclined edge so as to reduce the frictional pressure against the portion to be cut, thereby allowing a cutting speed to be increased, and which lifts the mucosa of the maxillary sinus by means of the cut edge having no tapered portion without damaging the mucosa of the maxillary sinus, once a hole in a

bone is formed and expanded.

Technical Solution

- [8] To achieve the above object, according to the present invention, there is provided a reamer for operating an implant in a maxillary sinus including a cutting part 10 for forming a hole for planting the implant in a bone, and a connection part 20 having a diameter smaller than that of the cutting part 10 and downwardly extending from the lower portion of the cutting part 10, the cutting part 10 including: a protruding face 11 formed on the top surface thereof in such a manner as to upwardly upheave a partial surface including an outer circumference of the cutting part 10 of the entire top surface of the cutting part 10 to form a stepped jaw 12; a depressed face 13 formed on the top surface thereof in such a manner as to depress a partial surface of the entire top surface of the cutting part 10 to be opposite to the protruding face 11 according to the formation of the protruding face 11; a cut edge 14 horizontally formed on a connected portion between the stepped jaw 12 and the protruding face 11; and a discharge path 15 longitudinally formed between the side surfaces of the depressed face 13 and the protruding face 11, wherein the depressed face 13 is upwardly slanted as it goes toward the front side of the stepped jaw 12 and is narrow in width as it goes toward the end of the upper portion thereof so as to form a cutting front end portion 17 at the upper end thereof.
- [9] Further, the depressed face 13 and the protruding face 11 of the cutting part 10 form a tapered portion 16 around the outer peripheries thereof in such a manner as to form an initial inclined edge 18 at the boundary portion between the discharge path 15 and the outer periphery of the depressed face 13 and to form a final inclined edge 19 at the boundary portion between the discharge path 15 and the outer periphery of the protruding face 11, wherein the tapered portion 16 is decreased at an angle with respect to the axis of the reamer and is increased in width as it goes from the initial inclined edge 18 to the final inclined edge 19.

Advantageous Effects

- [10] The reamer according to the present invention has the following advantages.
- [11] First, the circular bone fragment is formed by means of the cutting front end portion formed on the depressed face and the cut edge, which fundamentally prevents the reamer and the mucosa of the maxillary sinus from coming into contact with each other, thereby safely lifting the mucosa of the maxillary sinus.
- [12] Second, since the cutting is achieved continuously by means of the cutting front end portion and the cut edge, the rapid cutting speed for the bone can be obtained.
- [13] Third, the reamer having the tapered portion adapted to form the hole at an initial step has the frictional pressure against the portion to be cut gradually reduced from the

initial inclined edge toward the final inclined edge, thereby improving the cutting speed and obtaining the rapid implant operation.

Brief Description of the Drawings

- [14] FIG.1 is a perspective view showing a conventional reamer for operating an implant.
- [15] FIG.2 is a perspective view showing a reamer for operating an implant in a maxillary sinus according to a preferred embodiment of the present invention.
- [16] FIG.3 is a perspective view showing a use state of the reamer for operating an implant in a maxillary sinus according to the preferred embodiment of the present invention.
- [17] FIG.4 is a perspective view showing a reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention.
- [18] FIG.5 is a perspective view showing the back surface of the reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention.
- [19] FIG.6 is a back view showing the reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention.
- [20] FIG.7 is a flow chart showing the implant operation processes of the reamer according to the preferred embodiments of the present invention.
- [21] FIG.8 is a flow chart showing the main operation processes of the reamer according to the preferred embodiments of the present invention.

Mode for the Invention

- [22] FIG.2 is a perspective view showing a reamer for operating an implant in a maxillary sinus according to a preferred embodiment of the present invention, FIG.3 is a perspective view showing a use state of the reamer for operating an implant in a maxillary sinus according to the preferred embodiment of the present invention, FIG.4 is a perspective view showing a reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention, FIG.5 is a perspective view showing the back surface of the reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention, FIG.6 is a back view showing the reamer for operating an implant in a maxillary sinus according to another preferred embodiment of the present invention, FIG.7 is a flow chart showing the implant operation procedure of the reamer according to the preferred embodiments of the present invention, and FIG.8 is a flow chart showing the main operation processes of the reamer according to the preferred embodiments of the present invention. Hereinafter, an explanation on the structure of a reamer for operating an implant in a maxillary sinus according to preferred embodiments of the present invention will be discussed with reference to the attached drawings.

- [23] As shown in FIGS.2 and 3, a reamer for operating an implant in a maxillary sinus according to the present invention includes a cutting part 10 for forming a hole for planting the implant in a bone, and a connection part 20 having a diameter smaller than that of the cutting part 10 and downwardly extending from the lower portion of the cutting part 10, the cutting part 10 including: a protruding face 11 formed on the top surface thereof in such a manner as to upwardly upheave a partial surface including an outer circumference of the cutting part 10 of the entire top surface of the cutting part 10 to form a stepped jaw 12; a depressed face 113 formed on the top surface thereof in such a manner as to depress a partial surface of the entire top surface of the cutting part 10 to be opposite to the protruding face 11 according to the formation of the protruding face 11; and a cut edge 14 horizontally formed on a connected portion between the stepped jaw 12 and the protruding face 11, wherein the depressed face 13 has a cutting front end portion 17 adapted to be rotated to conduct a circular cutting operation, and the cut edge 14 conducts the inner surface after the circular cutting of the cutting front end portion 17.
- [24] That is, the depressed face 13 is upwardly slanted as it goes toward the front side (in an arrow direction as shown in FIG.2) of the stepped jaw 12 and is narrow in width as it goes toward the end of the upper portion thereof so as to form the cutting front end portion 17 at the upper end thereof.
- [25] The cutting front end portion 17 is tapered and sharp at the end thereof so as to allow a bone 32 to be easily cut, and it has the same height as or longer or shorter than the cut edge 14 according to the thickness of a bone fragment 38 to be formed.
- [26] The reason why the height of the cutting front end portion 17 is different from that of the cut edge 14 is that a relatively thin bone fragment 38 is formed at a strong bone, and contrarily, a relatively thick bone fragment 38 is formed at a weak bone, such that even at any bones, the mucosa 31 of the maxillary sinus 30 is safely cut and lifted.
- [27] As the cutting front end portion 17 is formed like this, the bone 32 is cut first by means of the cutting front end portion 17 and next by means of the cut edge 14, thereby conducting the cutting operation two times. According to the reamer for operating an implant in a maxillary sinus according to the present invention, therefore, the bone fragment 38 is formed between the mucosa 31 of the maxillary sinus 30 and the reamer, such that there is no contact between the reamer of this invention and the mucosa 31 of the maxillary sinus 30, and the cutting force in the reamer of this invention is more excellent than that obtained only by means of only the cut edge 14 in the conventional reamer.
- [28] Furthermore, the bone fragments cut by means of the cut edge 14 are gathered on the depressed face 13 and serve to lift the circular bone fragment 38 upwardly, thereby naturally performing the bone graft in the lifted maxillary sinus 30.

- [29] The cutting part 10 like the conventional reamer for operating an implant has a discharge path 15 adapted to discharge the waste matters of the bone 32 after the cutting, and the connection part 20 is extended downwardly from the lower portion of the cutting part 10.
- [30] FIGS.4 to 6 show the reamer adapted to form a hole 33, which has a tapered portion 16 formed along the outer periphery of the upper portion of the cutting part 10, that is, along the outer peripheries of the depressed face 13 and the protruding face 11.
- [31] As shown in FIG.6, the tapered portion 16 is formed around the outer peripheries of the depressed face 13 and the protruding face 11 in such a manner as to form an initial inclined edge 18 at the boundary portion between the discharge path 15 and the outer periphery of the depressed face 13 and to form a final inclined edge 19 at the boundary portion between the discharge path 15 and the outer periphery of the protruding face 11, wherein the tapered portion 16 is formed inclinedly downwardly along the outer peripheries of the depressed face 13 and the protruding face 11 in such a manner as to be decreased at an angle θ with respect to the axis of the reamer as it is rotated from the initial inclined edge 18 to the final inclined edge 19.
- [32] In other words, the tapered portion 16 becomes increased in width as it goes from the initial inclined edge 18 toward the final inclined edge 19.
- [33] On the other hand, according to the conventional reamer for operating an implant, when the tapered portion formed around the outer peripheries of the depressed face 13 and the protruding face 11 is inclined horizontally, that is, symmetrically at the opposing both sides to each other with respect to the axis of the reamer, the tapered portion is in constant contact with the bone 32 during cutting, while the frictional pressures applied to the tapered portion are the same, thereby making the upwardly advancing speed undesirably slow.
- [34] In the reamer for operating the implant in the maxillary sinus according to the present invention, however, the tapered portion 16 of the cutting part 10 is decreased at an angle θ with respect to the axis of the reamer as it goes from the initial inclined edge 18 formed around the outer periphery of the depressed face 13 toward the final inclined edge 19 formed around the outer periphery of the protruding face 11, such that a frictional pressure generated upon contact with the bone 32 is highest on the initial inclined edge 18 where the angle θ with respect to the axis of the reamer at the time of cutting is largest and the frictional pressure generated upon contact with the bone 32 is smallest on the final inclined edge 19 where the angle θ with respect to the axis of the reamer becomes gradually small, which makes the upward advancing speed desirably raised, thereby allowing the rapid formation speed of the hole 33 in the bone 32 to a desired diameter to be obtained.
- [35] As described above, in the reamer for operating the implant in the maxillary sinus

according to the present invention, the cutting front end portion 17 is formed on the depressed face 13 so as to perform the cutting operation for the outer surface of the bone 32, and next, the cut edge 14 performs the cutting operation for the inner surface of the bone 32, such that when the quantity of the bone 32 remaining after the cutting of the cutting front end portion 17 is smaller than the cutting force for the inner surface by the cut edge 14, the bone 32 is broken to form the bone fragment 38, thereby fundamentally preventing the reamer and the mucosa 31 of the maxillary sinus 30 from coming into contact with each other. In addition, the double cutting is achieved by means of the cutting front end portion 17 and the cut edge 14, thereby improving the cutting force, and the tapered portion 16 is formed on the reamer adapted to form the hole 33 in an initial step in such a manner as to be decreased at an angle θ with respect to the axis of the reamer as it goes from the initial inclined edge 18 toward the final inclined edge 19, thereby improving the advancing speed during cutting. Hereinafter, referring to the drawings, a process of operating the implant using the reamer of the present invention will be described as follows.

- [36] As shown in FIG.7, the process of operating the implant is made in the same way as the conventional reamer for operating an implant.
- [37] That is, the operation is progressed in the arrow direction as shown in FIG.7.
- [38] First, the dentist measures a distance to the maxillary sinus 30 on an autoradiograph, and then, to rapidly cut a compact bone 35, cuts the bone 32 to a safe portion which does not damage the mucosa 31 of the maxillary sinus 30, using a general drill 37 for operating the implant 30, thereby forming the hole 33.
- [39] After that, the dentist inserts the reamers of various diameters ranging from a smaller one to a larger one into the hole 33 to expand and deepen the hole 33 till the diameter of the hole 33 becomes a diameter suitable for planting the implant 34. When the hole 33 suitable for planting the implant 34 is formed, the dentist cuts the compact bone 35 with the final reamer having no tapered portion 16 and lifts the mucosa 31 of the maxillary sinus 30.
- [40] When the compact bone 35 is cut by the reamer, the hole 33 is filled with mixture of autogenous bone, which is extracted from a patient, and a synthetic bone, and in the above state, the mucosa 31 of the maxillary sinus 30 is lifted in such a manner as to upwardly lift the bone while the reamer is rotated and advances.
- [41] The above operation is repeatedly performed till a grafted bone 36 sufficient for planting the implant 34 is secured. After that, when the grafted bone 36 is in a state where the implant 34 can be planted in the grafted bone 36 after a predetermined period of time, the implant 34 is planted and fixed in the hole 33 formed in the compact bone 35 of the maxillary sinus 30, and thereby, the operation is completed.
- [42] As described above, the reamer of the present invention can operate the implant in

the maxillary sinus in very safe and rapid manners, and an explanation on the effects through the process of operating the implant will be in detail given.

[43] As shown in FIG.7, first, when the reamer having the tapered portion 16 is rotated to form the hole 33 on the bone 32, the cutting front end portion 17 having the tapered sharp end cuts the outside of the bone 32 to a circular shape, and then, the cut edge 14 cuts the inside of the bone 32.

[44] In addition, since the cutting is achieved continuously by means of the cutting front end portion 17 and the cut edge 14, the rapid cutting speed for the bone 32 is obtained, and since the cutting front end portion 17 is tapered and sharp at the end thereof, the reamer of this invention obtains more excellent cutting force than the conventional reamer performing the cutting operation only by the cut edge 14.

[45] As shown in FIGS.7 and 8, the reamer having the tapered portion 16 is used to enhance the cutting speed till the bone fragment 38 is formed, and the reamer having no tapered portion 16 is used to safely operate the implant after the bone fragment 38 is formed.

[46] If the reamer having no tapered portion 16 is used, the mucosa 31 of the maxillary sinus 30 can be lifted in a very safe manner, as shown in FIG.8.

[47] In other words, the bone remaining through the cutting of the cutting front end portion 17 is broken by the cutting pressure applied from the cut edge 14 to form the circular bone fragment 38, which fundamentally prevents the reamer and the mucosa 31 of the maxillary sinus 30 from coming into contact with each other, thereby safely lifting the mucosa 31 of the maxillary sinus 30.

[48] At this time, the bone fragments of the inside of the bone cut by means of the cut edge 14 are gathered to upwardly lift the bone fragment 38 in the maxillary sinus 30, and then, the bone fragment 38 is naturally grafted in the maxillary sinus 30.

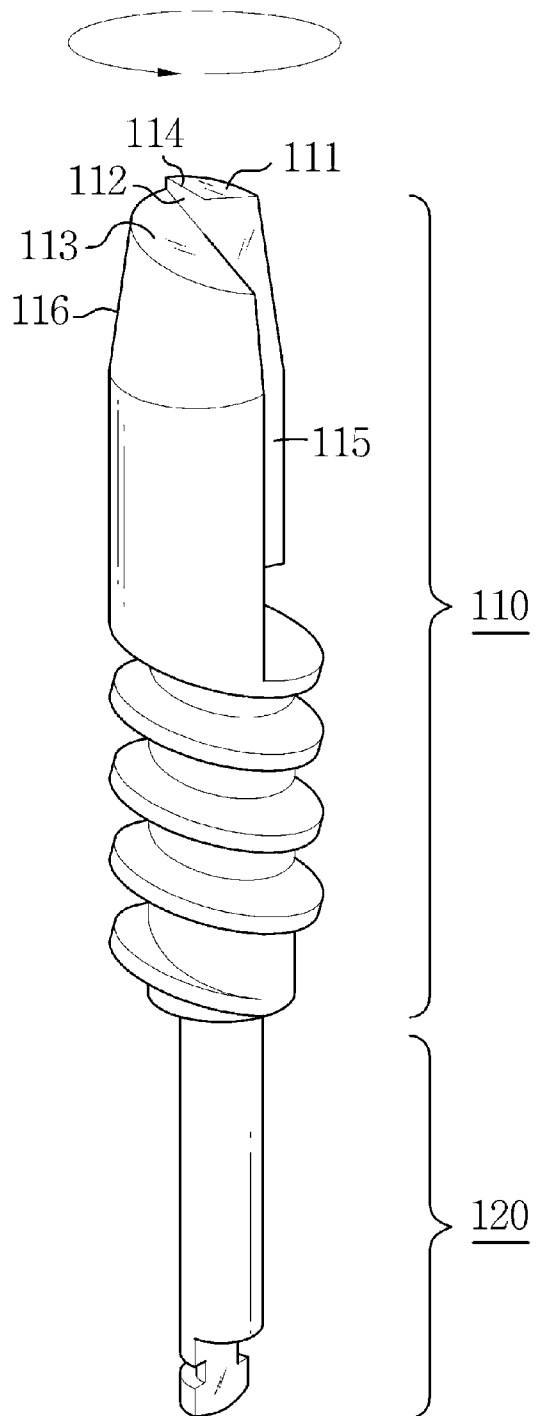
[49] Like this, when the reamer having no tapered portion 16 is used, the compact bone 35 is not cut to a plurality of pieces, but to the circular bone fragment 38, which is caused by the cutting front end portion 17 cutting the compact bone 35 to a circular shape as it is rotated around the axis of the reamer.

[50] As described above, since the reamer having the tapered portion 16 and the reamer having no tapered portion 16 are sequentially used, the operation time is reduced through the rapid cutting for the bone 32 to allow patient's pain to be greatly decreased and to allow the implant to be operated safely in the maxillary sinus 30.

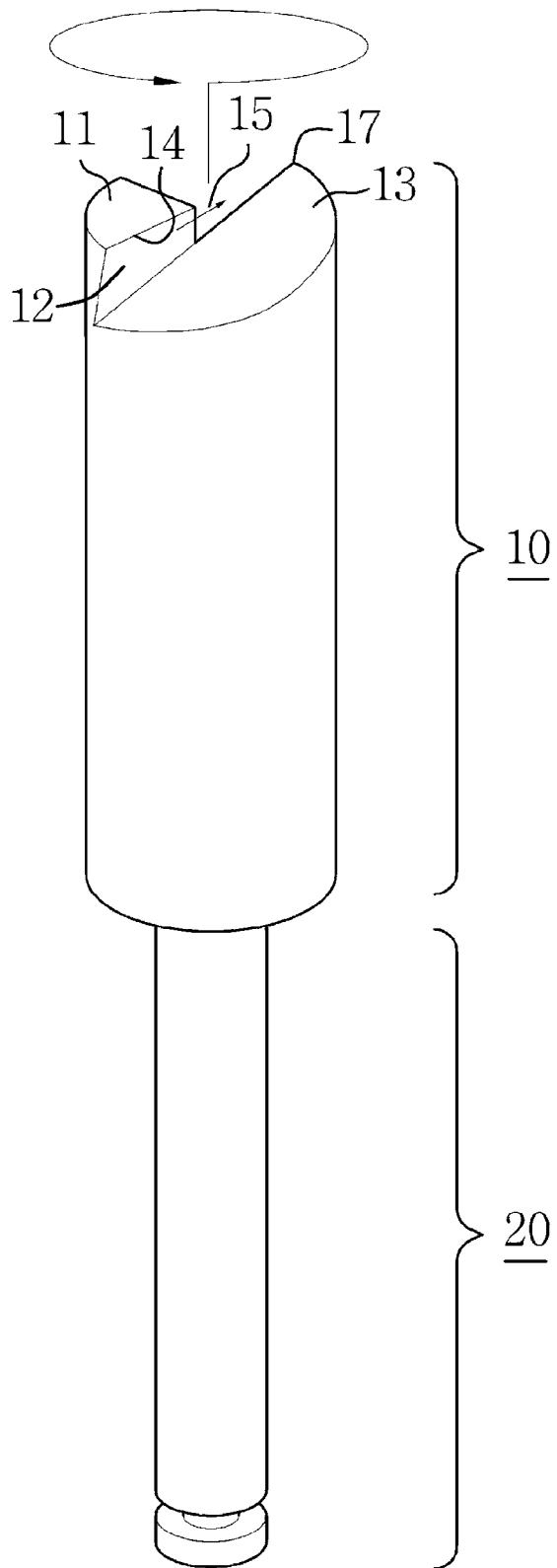
Claims

- [1] A reamer for operating an implant in a maxillary sinus, which includes a cutting part 10 for forming a hole for planting the implant in a bone, and a connection part 20 having a diameter smaller than that of the cutting part 10 and downwardly extending from the lower portion of the cutting part 10, wherein the cutting part 10 includes:
- a protruding face 11 formed on the top surface thereof in such a manner as to upwardly upheave a partial surface including an outer circumference of the cutting part 10 of the entire top surface of the cutting part 10 to form a stepped jaw 12;
 - a depressed face 13 formed on the top surface thereof in such a manner as to depress a partial surface of the entire top surface of the cutting part 10 to be opposite to the protruding face 11 according to the formation of the protruding face 11;
 - a cut edge 14 horizontally formed on a connected portion between the stepped jaw 12 and the protruding face 11; and
 - a discharge path 15 longitudinally formed between the side surfaces of the depressed face 13 and the protruding face 11,
- wherein the depressed face 13 is upwardly slanted as it goes toward the front side of the stepped jaw 12 and becomes narrow in width as it goes toward the end of the upper portion thereof so as to form a cutting front end portion 17 at the upper end thereof.
- [2] The reamer for operating an implant in a maxillary sinus as defined in claim 1, wherein the depressed face 13 and the protruding face 11 of the cutting part 10 form a tapered portion 16 around the outer peripheries thereof in such a manner as to form an initial inclined edge 18 at the boundary portion between the discharge path 15 and the outer periphery of the depressed face 13 and to form a final inclined edge 19 at the boundary portion between the discharge path 15 and the outer periphery of the protruding face 11, the tapered portion 16 being decreased at an angle θ with respect to the axis of the reamer and being increased in width as it is rotated from the initial inclined edge 18 toward the final inclined edge 19.

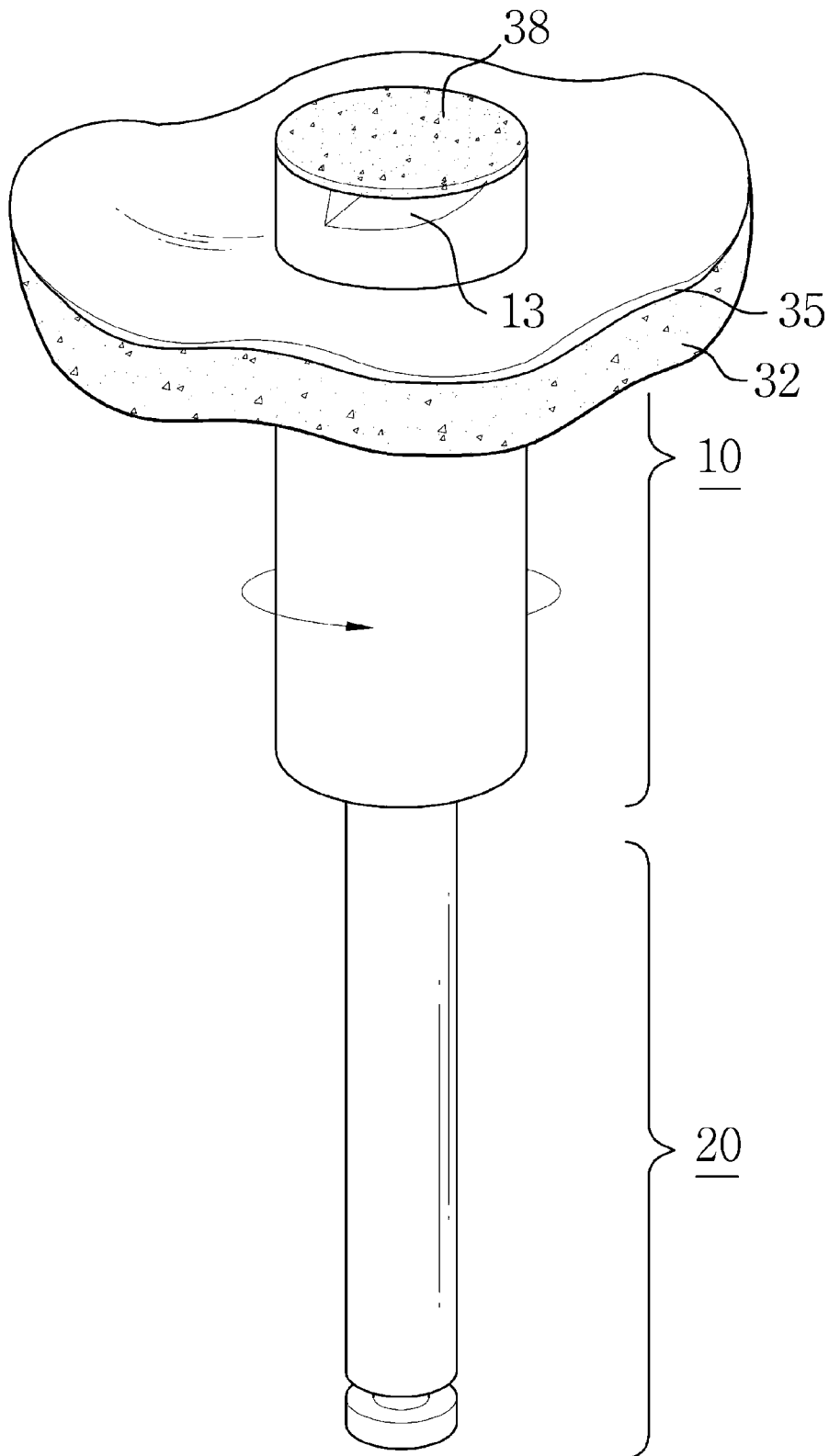
[Fig. 1]



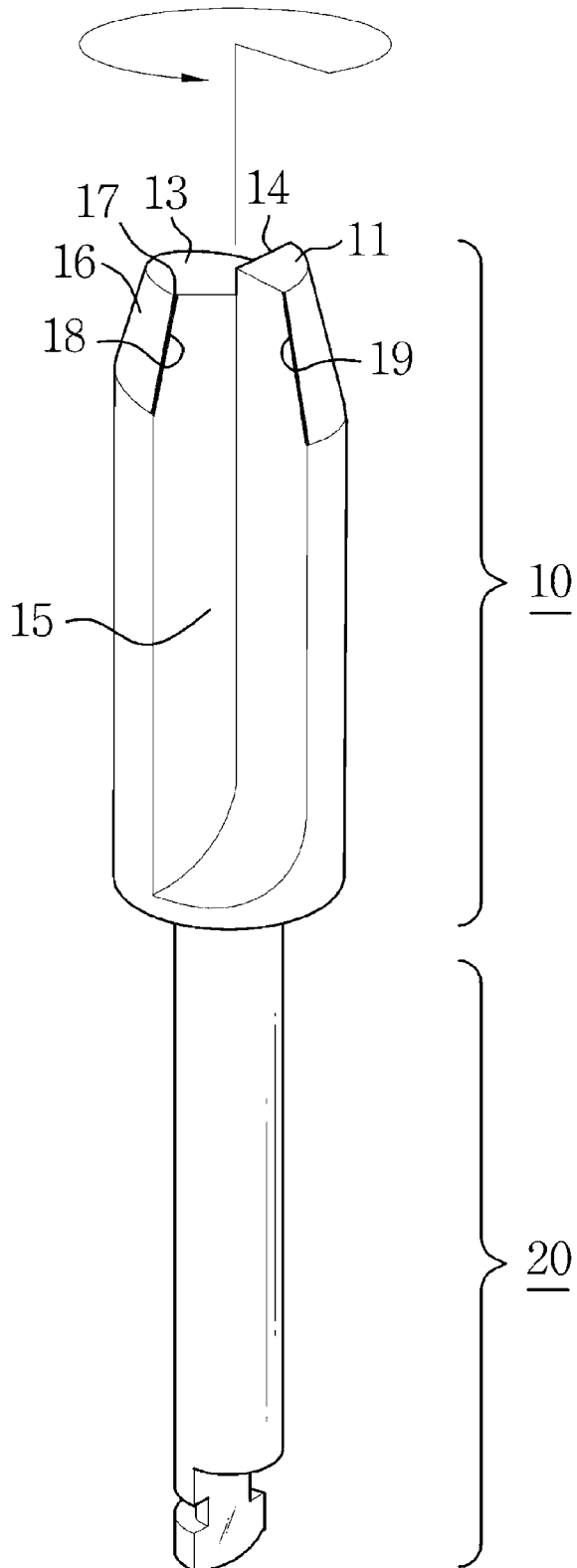
[Fig. 2]



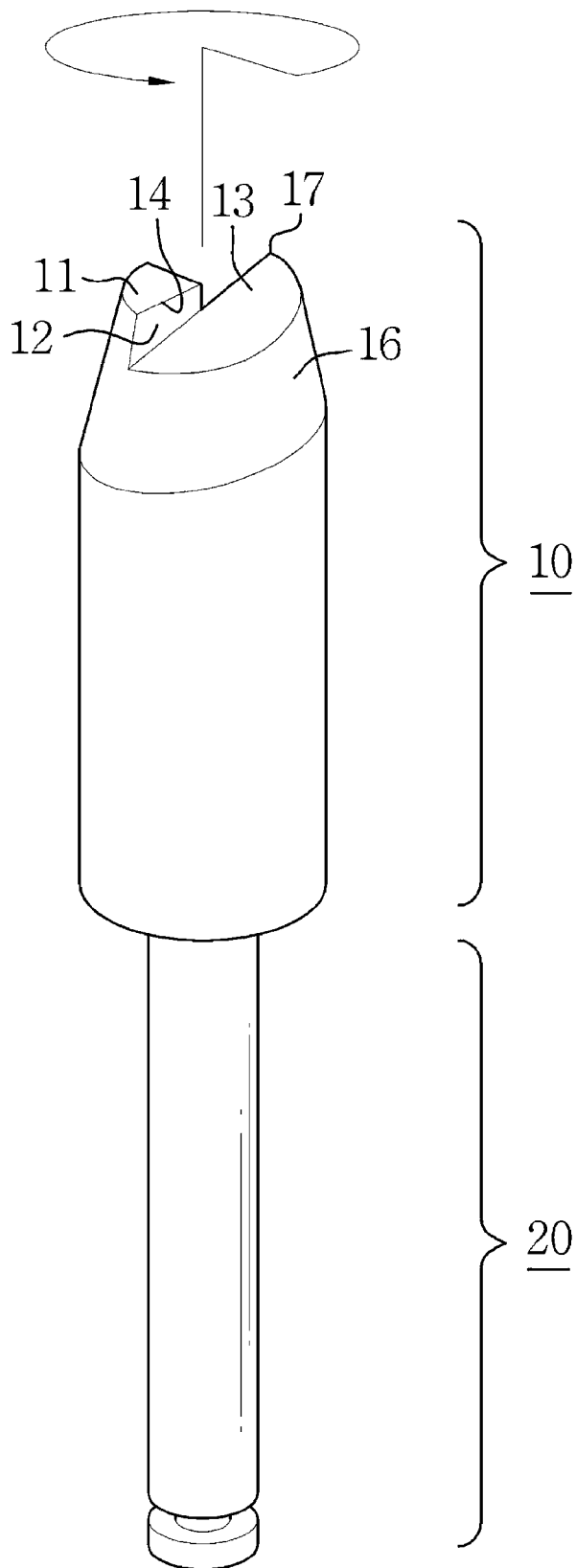
[Fig. 3]



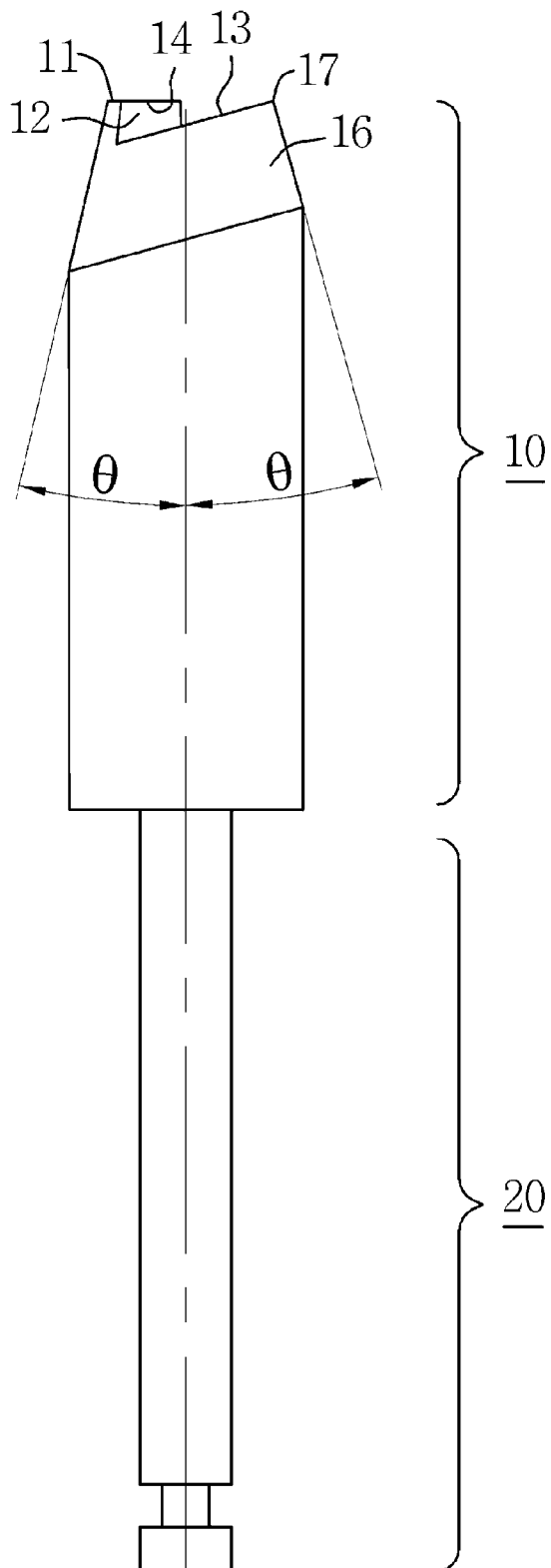
[Fig. 4]



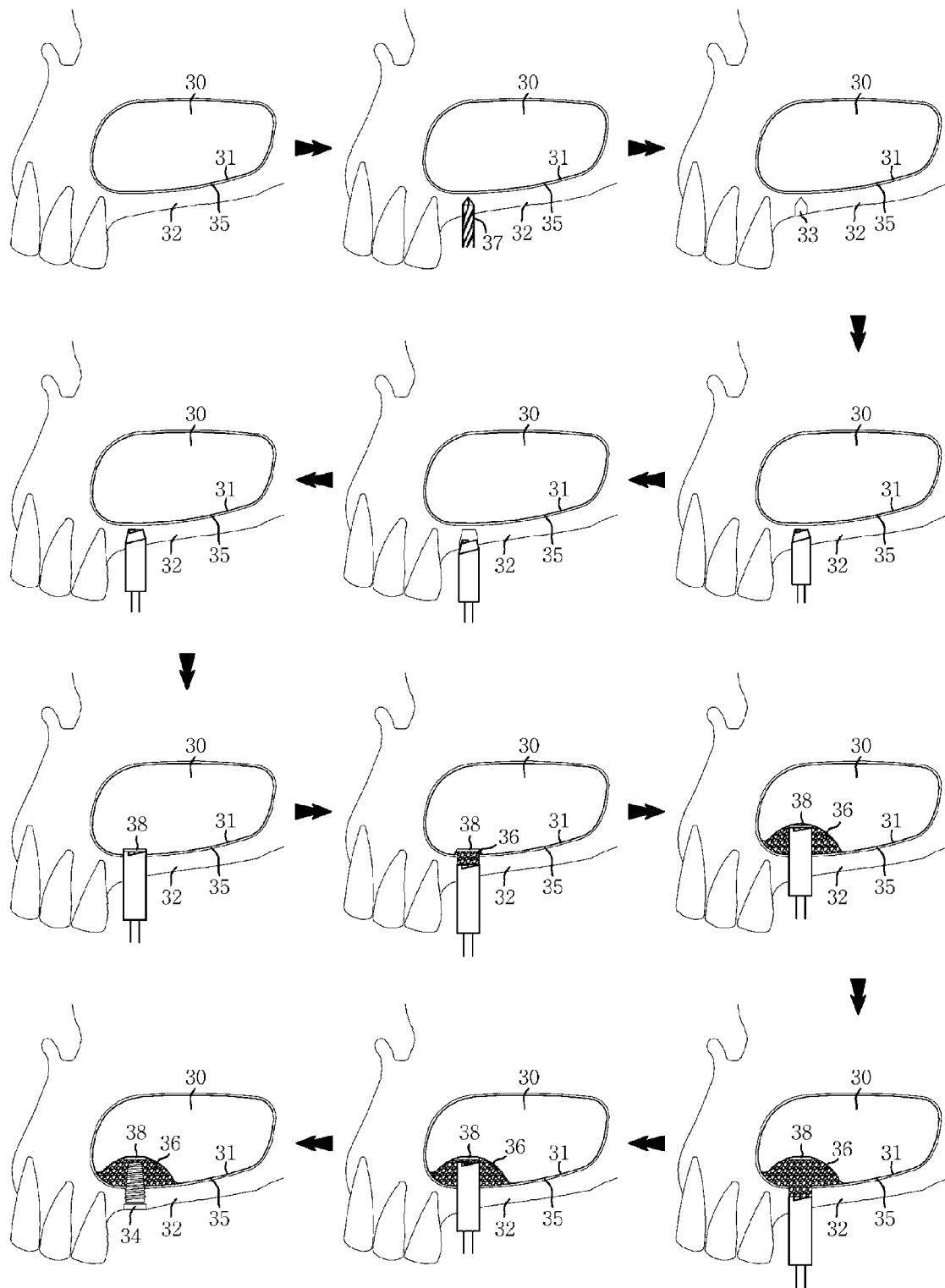
[Fig. 5]



[Fig. 6]



[Fig. 7]



[Fig. 8]

