



- (51) International Patent Classification:
A61B 13/00 (2006.01) *A61B 1/24* (2006.01)
- (21) International Application Number:
PCT/US2016/037789
- (22) International Filing Date:
16 June 2016 (16.06.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
104120860 26 June 2015 (26.06.2015) TW
104127061 19 August 2015 (19.08.2015) TW
15/149,468 9 May 2016 (09.05.2016) US
- (72) Inventor; and
(71) Applicant : **HSU, Tzu-Li** [US/US]; 90 Coppermine Road,
Princeton, NJ 08540 (US).
- (74) Agent: **LAO, Kenneth Q.**; Ware, Fressola, Maguire &
Barber LLP, Bradford Green, Building Five, 755 Main
Street, P.O. Box 224, Monroe, CT 06468 (US).
- (81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

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

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

Published:

- with international search report (Art. 21(3))
- with amended claims and statement (Art. 19(1))

(54) Title: TONGUE ANTERIORIZER AND METHOD OF OPERATING SAME

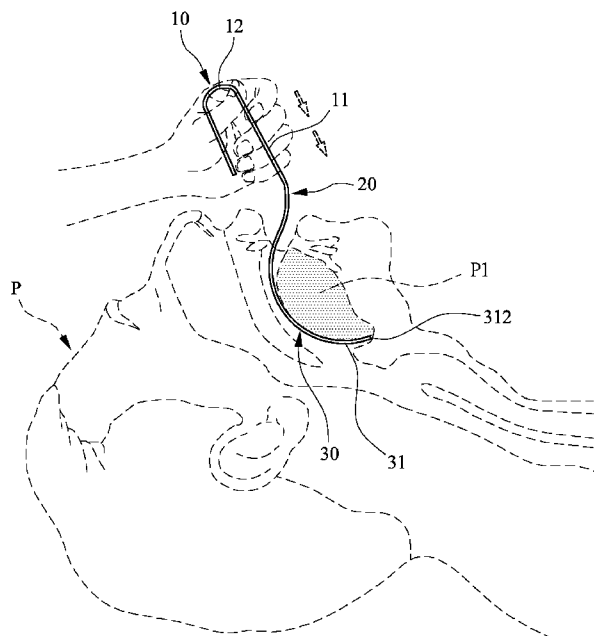


FIG. 4A

(57) Abstract: A tongue anteriorizer includes a handle and a tongue lifting part having a curved portion. The tongue lifting part is configured to move the tongue anteriorly, open the laryngopharyngeal area, and make endotracheal intubation simple, safe and efficient.



TONGUE ANTERIORIZER AND METHOD OF OPERATING SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The invention relates to medical devices and more particularly to a tongue anteriorizer capable of moving the tongue anteriorly and then lifting it to open the laryngopharyngeal space for upper airway management, and a method of operating same.

10 2. Description of Related Art

Endotracheal intubation is the process of inserting the endotracheal tube into the trachea. It is the most important procedure for general anesthesia and respiratory resuscitation. Because of variance in oral anatomy, it can be very difficult to do and become "difficult intubation". When that happens, it may cause damage to the airway.

15 If it failed completely, the patient will be in a disaster situation.

There are four groups of medical device for endotracheal intubation, namely, laryngoscope, video laryngoscope, video stylet, and fiberoptic scope.

Laryngoscope is the most common device used for endotracheal intubation. After inserting it into the mouth, it pushes the tongue and mandible forward at about
20 45-degree angle to open the temporomandibular joint (TMJ) and the laryngopharyngeal space. However, this method is not easy to use on small chin, big tongue, and obese patient because the open space in the oral cavity is small, and it is not easy for laryngoscope to have enough space to work efficiently. For experienced physicians, the success rate for endotracheal intubation is about 90 to 95%. Further,
25 endotracheal intubation failure may injure tissues of the mouth, or even causes the life of a patient.

Video laryngoscope improves on the laryngoscope by adding the video camera. It

provides better visibility but does not solve the problems of the laryngoscope.

Video stylet is inside the endotracheal tube and is guided forward by its video image. Because it does not have functionality to open the space, the secretion of the mouth can make it very difficult to see. Pushing it forward, it may move the tongue
5 together and change the normal anatomy around the larynx. When this happens, it is very easy to be disoriented and fails the intubation.

The diameter of fiberoptic scope is smaller and it has a suction function. Its success rate is the best among all intubation devices. However, the learning period is long, and it is time consuming, i.e., very often it will take more than one try to finish the
10 procedure. It is also expensive and easily damaged.

All the problems from the above intubation devices come from not able to open the oral airway properly. Thus, the need for improvement still exists.

SUMMARY OF THE INVENTION

15 Thus, the first aspect of the present invention is a tongue anteriorizer, comprising a handle including a main portion having a handle end; and a tongue lifting part including an arc member having a first part end formed with the handle end, and a second part end.

According to an embodiment of the present invention, the tongue lifting part is
20 made from a plate-like strip having a uniform thickness.

According to an embodiment of the present invention, the width of the arc member is greater than a width of the main portion.

According to an embodiment of the present invention, the tongue anteriorizer further comprises a connecting part including a connecting member having a first end
25 formed with the handle end of the main portion, and a second end integrally joined to the first part end of the tongue lifting part.

According to an embodiment of the present invention, the handle, the tongue

lifting part and the connecting part are integrally formed together to be gripped for operation.

According to an embodiment of the present invention, the width of the arc member is greater than a width of the connecting member.

5 According to an embodiment of the present invention, the width of the connecting part is smaller than a width of the main portion and the arc member.

According to an embodiment of the present invention, the curved length of the connecting member is less than one-third of the curved length of the arc member.

10 According to an embodiment of the present invention, the rail includes two opposite elongated projections, and the groove member includes a groove shaped complimentarily to the rail; wherein the projections are formed with the first end of the main portion; and wherein the groove is formed with the curved portion.

According to an embodiment of the present invention, the projections are formed as a projection element, and wherein the groove is formed as an elongated concave
15 element shaped complimentarily to the projection element so that the projection element is configured to insert into the concave element to form a connecting element.

According to an embodiment of the present invention, the connecting member is a curve oriented in a direction opposite to a curved direction of the tongue lifting part.

20 According to an embodiment of the present invention, the tongue anteriorizer further comprises a first side, a second side and at least one rib, wherein the arc member has a concave surface on the first side and the rib is arranged on the second side of the tongue anteriorizer for structural strength enhancement.

According to an embodiment of the present invention, the subtense (X) is defined
25 by connecting at the first part end and the second part end of the arc member; and the main portion is configured at a predetermined angle with respect to the subtense (X), and wherein the predetermined angle is between 60 to 210-degrees.

According to an embodiment of the present invention, the maximum length of a line from the arc member to the subtense (X) and perpendicular thereto is a length of a depth (Y) of the tongue lifting part, wherein ratio of the length of the depth (Y) to a length of the subtense (X) is $1/4$ to $1/2$.

5 According to an embodiment of the present invention, the enlargement of the curved portion formed by the inclined shoulder adjacent to the second end of the tongue lifting part is wider than a width of the curved portion of the tongue lifting part.

 According to an embodiment of the present invention, the plurality of protrusions is formed on a long strip surface of an enlargement of the curved portion of the tongue
10 lifting part.

 According to an embodiment of the present invention, the width of the upper portion of the curved portion is narrower than that of the main portion; the narrower portion is connected to the curved portion of the tongue lifting part by the inclined shoulder.

15 According to an embodiment of the present invention, the arc member includes a plurality of protrusions.

 The second aspect of the present invention is a method of operating a tongue anteriorizer including a handle and a tongue lifting part having an arc member, comprising the steps of: holding the handle and inserting the arc member of the
20 tongue lifting part into a mouth of a patient until it reaching a base of a posterior part of the tongue; hooking the posterior part of the tongue by a front end of the arc member, lifting the tongue, and pulling the handle in a direction out of the mouth to cause the arc member of the tongue lifting part to exert force on the tongue; and pulling the tongue by the tongue lifting part to move anteriorly along the top surface of the
25 tongue.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a tongue anteriorizer according to a first preferred embodiment of the invention;

FIG. 2 is a side elevation of the tongue anteriorizer;

5 FIG. 3A is a side elevation view of a first aspect of the first preferred embodiment of the invention illustrating the tongue anteriorizer made in a predetermined shape of 180-degree;

FIG. 3B is a side elevation view of a second aspect of the same illustrating the tongue anteriorizer made in a predetermined shape of 210-degree;

10 FIG. 3C is a side elevation view of a third aspect of the same illustrating the tongue anteriorizer made in a predetermined shape of 150-degree;

FIG. 3D is a side elevation view of a fourth aspect of the same illustrating the tongue anteriorizer made in a predetermined shape of 135-degree;

15 FIG. 3E is a side elevation view of a fifth aspect of the same illustrating the tongue anteriorizer made in a predetermined shape of 120-degree;

FIG. 3F is a side elevation view of a sixth aspect of the same illustrating the tongue anteriorizer made in a predetermined shape of 90-degree;

20 FIGS. 4A, 4B, 4C, 4D, and 4E are side views showing steps of inserting the tongue anteriorizer of FIG. 3A, into the base of the posterior part of the tongue of a patient, respectively;

FIG. 5 is a side view showing of inserting the tongue anteriorizer of FIG. 3B into the oral part of a patient;

FIG. 6 is a side view similar to FIG. 5 showing the tongue anteriorizer in a shape of 60-degree;

25 FIGS. 7A, 7B, and 7C are side views showing steps of inserting the tongue anteriorizer of FIG. 3F into the base of the posterior part of the tongue of a patient respectively;

FIG. 8 is a perspective view of a tongue anteriorizer according to a second preferred embodiment of the invention;

FIG. 9 is a perspective view of the second configuration of a tongue anteriorizer of FIG. 8;

5 FIG. 10 is an exploded view of a tongue anteriorizer according to a third preferred embodiment of the invention in the exploded perspective view;

FIG. 11 is a perspective view of the tongue anteriorizer of FIG. 10 in the combination state ;

10 FIG. 12 is a perspective view of a first configuration of a tongue anteriorizer according to a fourth preferred embodiment of the invention;

FIG. 13 is a perspective view of the second configuration of the tongue anteriorizer of FIG. 12;

FIG. 14 is a perspective view of a tongue anteriorizer according to a fifth preferred embodiment of the invention;

15 FIG. 15 is a perspective view of a tongue anteriorizer according to a sixth preferred embodiment of the invention;

FIG. 16 is a perspective view of a tongue anteriorizer according to a seventh preferred embodiment of the invention; and

20 FIG. 17 is a perspective view of a tongue anteriorizer according to a eighth preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a tongue anteriorizer in accordance with the invention comprises a handle 10, a connecting part 20, and a tongue lifting part 30 as discussed
25 in detail below.

The handle 10 includes a main portion 11, an extension 13 substantially parallel to the main portion 11, and a bent interconnection 12 interconnecting the main portion

11 and the extension 13. In actual use, the length of the main portion 11 of the handle 10 is approximately the length of the palm of user's hand held. The connecting part 20 includes a curved connecting member 21 having an end 211 formed with a handle end 111 of the main portion 11, and the other end 212 formed with a curved portion 31 of the tongue lifting part 30. It is understood that the curved portion 31 of the tongue lifting part 30 is made from a plate-like strip having a uniform thickness. The curved portion 31 of the tongue lifting part 30 has a first end 311 and a second end 312, and the second end 312 is open. As viewed from the FIG. 2, the first end 311 (212) is a conversion point of two curves of the curved portion 31 and the curved connecting member 21. It is also to be understood that the point of the first end 311 (212) is substantially existed in all the figures. Further, the curved portion 31 has a width defined by two substantially parallel edges 316 (see FIG. 1).

It is noted that the handle 10 may be shaped differently from the shown one in other embodiments. It is further noted that in addition to the connecting member 21 of the connecting part 20 can be shaped as a curved shape as shown in FIGS. 3A to 3E, it can also be shaped as a straight part (see FIG. 3F). Alternatively, the connecting member 21 can be shaped other than a curve or a straight line in other embodiments depending on actual requirement. The tongue lifting part 30 can be made from a long strip of flat material by bending it into a predetermined shape, i.e. bending only along the long dimension 310 (see FIG. 2). Furthermore, it is noted that the curved portion 31 is made from a long dimension 310 and a short dimension 316, wherein the long dimension 310 is curved to form the curved portion 31 and the short dimension 316 is substantially straight, and wherein a subtense (X) is defined by joining the first end 311 and the second end 312 of the curved portion 31 and forms an angular relationship with the straight handle end 111 of the main portion 11, defining an angle ranged from 60 degrees to 210 degrees, respectively, as shown in FIGS. 3A-3F, and FIGS. 5, 6.

A maximum distance from the subtense (X) to the curved portion 31 is indicated by a dotted line is a depth (Y). It will be noted that the curved portion 31 of the tongue lifting part 30 is an arc of a circle or an arc of an ellipse itself, the length of the curved portion 31 is smaller than that of the semicircle or than that of the semi-ellipse itself. It means that the length of the subtense (X) is smaller than that of radius of circle or than that of major axis of the ellipse.

Preferably, the ratio of the length of the depth (Y) to that of the subtense (X) is in the range from 1/4 to 1/2, for example, the length of the subtense (X) used for an infant, a children and an adult are about 5-7 cm, 7-9 cm and 9-13 cm respectively.

As shown in FIGS. 3A to 3F and 4A to 4E, the connecting part 20 is curved, the connecting member 21 is configured to made in a predetermined angle, and the tongue anteriorizer may be configured to shape in any other desired angle corresponding to the subtense (X), respectively. Operation of the first configuration of the first preferred embodiment of the tongue anteriorizer of the invention is described in detail below. A medical employee may use one hand to hold the main portion 11 of the handle 10 and insert the curved portion 31 of the tongue lifting part 30 into the mouth of a patient (P) until the second end 312 reaches the base of the posterior part of the tongue (P1) (see FIG. 4A). It is noted that the tongue (P1) can be moved anteriorly. Further, the posterior part of the tongue (P1) can be hooked by the second end 312 of the curved portion 31 prior to lifting the tongue (P1) (see FIG. 4B). Next, the employee may pull the main portion 11 of the handle 10 in a direction out of the mouth to cause the curved portion 31 of the tongue lifting part 30 to exert force on the tongue (P1) (see FIGS. 4C to 4D). Thus, the tongue (P1) can be pulled by the curved portion 31 of the tongue lifting part 30 to move anteriorly along the top surface of the tongue (P1). As a result, the laryngopharyngeal space is open and increased, thereby allowing an endoscope (A) to easily insert into the mouth and positioning an end 201 of the endoscope (A) at a correct position in a natural manner (see FIG. 4E).

It is understood that whether insertion of the endoscope or endotracheal intubation is success or not depending on moving the tongue anteriorly and lifting it correctly. The size and shape of the curved portion 31 of the tongue lifting part 30 have been carefully calculated after considering ergonomics and the natural moving of the muscles of the tongue (P1). Therefore, the tongue anteriorizer of the invention is effective in the design and makes the device ergonomic.

Furthermore, as viewed from the FIGS. 4A-4E, and FIGS. 7A-7C, it is noted that the curvature portion 31 of the tongue lifting part 30 is substantially two parallel edges 316 with a uniform thickness. When it is inserted into the mouth until it reaches a base of a posterior part of the tongue and hooked then pulled the tongue out very convenient in accordance with the moving muscle natural trend of the tongue without having any feeling hurt for the patient. The feature of the tongue lifting part 30 in the design might make the device ergonomic.

Referring to FIGS. 3F, 6 and 7A to 7C, a second configuration of the first preferred embodiment of the tongue anteriorizer of the invention is shown. In this configuration of the first preferred embodiment, the connecting member 21 is made from a straight part, it means that in this configuration, the straight part of connecting member 21 is directly connected to the main portion 11 of the handle 10, and the first end 311 of the curved portion 31 is directly connected to the connecting member 21, such that the curved portion 31 is substantially equivalent to have a first end 311 directly connected to the main portion 11 of the handle 10 and an opposing second end 312 is open. As viewed from the FIG. 3F, the first end 311 (212) is a conversion point of the curved portion 31 and the straight part of connecting member 21. The straight part of the connecting member 21 can also be configured to provide a predetermined angle relationship with the subtense (X), respectively as mentioned above. Operation of the second configuration of the first preferred embodiment of the tongue anteriorizer of the invention is substantially the same as that of the first

configuration described above. Thus, a detailed description thereof is omitted for the sake of brevity.

Referring to FIG. 8, a tongue anteriorizer in accordance with a second preferred embodiment of the invention is shown. The characteristics of the second preferred
5 embodiment are substantially the same as that of the first preferred embodiment except the following: A rib 40 is formed on the middle portion of the back of the tongue anteriorizer to increase the rigidity of the tongue anteriorizer.

Referring to FIG. 9, a tongue anteriorizer in accordance with the second preferred embodiment of the invention in a second configuration is shown. The characteristics
10 in a second configuration of the second preferred embodiment are substantially the same as that of the first preferred embodiment except the following: Two ribs 40, 40 are formed on both sides of the back of the tongue anteriorizer to increase the rigidity of the tongue anteriorizer.

Referring to FIGS. 10 and 11, a tongue anteriorizer in accordance with a third
15 preferred embodiment of the invention is shown. The characteristics of the third preferred embodiment are substantially the same as that of the first preferred embodiment except the following: A joint is formed on the connecting member of the connecting part 20A. The joint includes a rail 221A formed with the main portion 11 of the handle 10 and having two opposite elongated projections 231A, and a groove
20 member 222A formed with the curved portion 31 of the tongue lifting part 30 and having a groove 232A. The groove 232A is shaped complementarily to the rail 231A so that the rail 231A can be slidably inserted into the groove 232A to fasten the handle 10 and the tongue lifting part 30 together. This is a two-piece embodiment of the tongue anteriorizer of the invention and it facilitates manufacturing, assembly, and transport.

25 Referring to FIGS. 12 and 13, a tongue anteriorizer in accordance with a fourth preferred embodiment of the invention is shown. The characteristics of the fourth preferred embodiment are substantially the same as that of the first preferred

embodiment except the following: In a first configuration, two opposite flat shoulders 314A are formed between the connecting member 21 of the connecting part 20 and the curved portion 31A of the tongue lifting part 30A so that width of the curved portion 31A of the tongue lifting part 30A is greater than that of the connecting member 21 of the connecting part 20. In a second configuration, the shoulders 314A formed between the connecting member 21 of the connecting part 20 and the curved portion 31A of the tongue lifting part 30A are two opposite inclined shoulders.

Referring to FIG. 14, a tongue anteriorizer in accordance with a fifth preferred embodiment of the invention is shown. The characteristics of the fifth preferred embodiment are substantially the same as that of the first preferred embodiment except the following: A plurality of protrusions 32B are formed on a long strip surface 313B of the curved portion 31B of the tongue lifting part 30B. The provision of the protrusions 32B can prevent the tongue lifting part 30B from slipping relative to the tongue.

Referring to FIG. 15, a tongue anteriorizer in accordance with a sixth preferred embodiment of the invention is shown. The characteristics of the sixth preferred embodiment are substantially the same as that of the first preferred embodiment except the following: A plurality of protrusions 32C are formed on a long strip surface 330C of an enlargement 33C of the curved portion 31C of the tongue lifting part 30C adjacent to the second end 312. Two opposite inclined shoulders 314C are formed between the enlargement 33C and the curved portion 31C of the tongue lifting part 30C.

Referring to FIG. 16, a tongue anteriorizer in accordance with a seventh preferred embodiment of the invention is shown. The characteristics of the seventh preferred embodiment are substantially the same as that of the sixth preferred embodiment except the following. The handle 10D, the connecting part 20D and the tongue lifting part 30D are formed together by a plurality of narrower width portions wherein a wider

portion 11D and a narrower portion are formed for the handle 10D, a narrower portion 21D is formed for the connecting part 20D and the upper narrower portion 31D and the lower wider portion 33C are formed for the curved portion 312 of the tongue lifting part 30D so that the width of the curved portion 31D of the tongue lifting part 30D and the narrower portion 21D of the connecting part 20D are changed their width narrower than that of the above embodiments. It is to be understood that the optimum values of the slightly flexible deformation of the above-mentioned narrower portions for operating the tongue anteriorizer of the invention are provided for the particular patient.

Referring to FIG. 17, a tongue anteriorizer in accordance with a eighth preferred embodiment of the invention is shown. The characteristics of the eighth preferred embodiment are substantially the same as that of the first preferred embodiment except the following. The curved portion 31E of the tongue lifting part 30E are formed by a long strip narrower portion 315E and a long strip wider portion 31E adjacent to the narrower portion 315E. Two opposite inclined shoulders 314E are formed between the narrower portion 315E and the wider portion 31E of the curved portion 312 of the tongue lifting part 30E. It is noted that the optimum value of the slightly flexible deformation for both of the connecting part 20 and the tongue lifting part 30E has been carefully calculated after considering ergonomics.

It is envisaged by the invention that when the tongue, especially its base, can be moved anteriorly and lifted, there will be no difficult intubation. The tongue anteriorizer can move the tongue anteriorly, open the laryngopharyngeal area, and make all endotracheal intubation simple, safe, easy and efficient.

It is further noted that a method of operating a tongue anteriorizer of the invention comprises a handle and a tongue lifting part having an arc member, comprising the steps of:

(1) holding the handle and inserting the arc member of the tongue lifting part into

a mouth of a patient until it reaching a base of a posterior part of the tongue;

(2) hooking the posterior part of the tongue by a front end of the arc member, lifting the tongue, and pulling the handle in a direction out of the mouth to cause the arc member of the tongue lifting part to exert force on the tongue; and

- 5 (3) pulling the tongue by the tongue lifting part to move anteriorly along the top surface of the tongue.

While the invention has been described in terms of various embodiments, those skilled in the art will recognize that the invention can be practiced with modifications within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A tongue anteriorizer comprising:

a handle including a main portion having a handle end; and

5 a tongue lifting part including an arc member having a first part end formed with the handle end, and a second part end.

2. The tongue anteriorizer of claim 1, wherein the tongue lifting part is made from a plate-like strip having a uniform thickness.

10

3. The tongue anteriorizer of claim 1, wherein a width of the arc member is greater than a width of the main portion.

4. The tongue anteriorizer according to claim 1, further comprising:

15

a connecting part including a connecting member having a first end formed with the handle end of the main portion, and a second end integrally joined to the first part end of the tongue lifting part.

5. The tongue anteriorizer according to claim 4, wherein the handle, the tongue
20 lifting part and the connecting part are integrally formed together to be gripped for operation.

6. The tongue anteriorizer of claim 5, wherein a width of the arc member is greater than a width of the connecting member.

25

7. The tongue anteriorizer of claim 5, wherein a width of the connecting part is smaller than a width of the main portion and the arc member.

8. The tongue anteriorizer of claim 5, wherein the curved length of the connecting member is less than one-third of the curved length of the arc member.

9. The tongue anteriorizer of claim 5, wherein the rail includes two opposite
5 elongated projections, and the groove member includes a groove shaped
complimentarily to the rail; wherein the projections are formed with the first end of the
main portion; and wherein the groove is formed with the curved portion.

10. The tongue anteriorizer of claim 9, wherein the projections are formed as a
10 projection element, and wherein the groove is formed as an elongated concave
element shaped complimentarily to the projection element so that the projection
element is configured to insert into the concave element to form a connecting
element.

15 11. The tongue anteriorizer of claim 4 or 5, wherein the connecting member is a
curve oriented in a direction opposite to a curved direction of the tongue lifting part .

12. The tongue anteriorizer of claim 1 or 4 or 5, further comprising a first side, a
second side and at least one rib, wherein the arc member has a concave surface on
20 the first side and the rib is arranged on the second side of the tongue anteriorizer for
structural strength enhancement.

13. The tongue anteriorizer according to claim 1 or 5, wherein a subtense (X) is
defined by connecting at the first part end and the second part end of the arc member;
25 wherein the main portion is configured at a predetermined angle with respect to the
subtense (X), and wherein the predetermined angle is between 60 to 210-degrees.

14. The tongue anteriorizer of claim 13, wherein a maximum length of a line from the arc member to the subtense (X) and perpendicular thereto is a length of a depth (Y) of the tongue lifting part, wherein ratio of the length of the depth (Y) to a length of the subtense (X) is $1/4$ to $1/2$.

5

15. The tongue anteriorizer of claims 1 or 5, wherein an enlargement of the curved portion formed by the inclined shoulder adjacent to the second end of the tongue lifting part is wider than a width of the curved portion of the tongue lifting part.

10 **16.** The tongue anteriorizer of claim 15, wherein a plurality of protrusions are formed on a long strip surface of an enlargement of the curved portion of the tongue lifting part.

15 **17.** The tongue anteriorizer of claim 1 or 5, wherein a width of the upper portion of the curved portion is narrower than that of the main portion, the narrower portion is connected to the curved portion of the tongue lifting part by the inclined shoulder.

18. The tongue anteriorizer of claim 1 or 5, wherein the arc member includes a plurality of protrusions.

20

19. A method of operating a tongue anteriorizer including a handle and a tongue lifting part having an arc member, comprising the steps of:

holding the handle and inserting the arc member of the tongue lifting part into a mouth of a patient until it reaching a base of a posterior part of the tongue;

25 hooking the posterior part of the tongue by a front end of the arc member, lifting the tongue, and pulling the handle in a direction out of the mouth to cause the arc member of the tongue lifting part to exert force on the tongue; and

pulling the tongue by the tongue lifting part to move anteriorly along the top surface of the tongue.

AMENDED CLAIMS

received by the International Bureau on 7 November 2016 (07.11.2016)

WHAT IS CLAIMED IS:

1. A tongue anteriorizer comprising:

a handle including a main portion having a handle end; and

5 a tongue lifting part including an arc member having a first part end formed with the handle end, and a second part end;

wherein the tongue lifting part is made from a plate-like strip having a uniform thickness;

wherein a subtense (X) is defined by connecting at the first part end and the second part end of the arc member;

10 wherein the main portion is configured at a predetermined angle with respect to the subtense (X); and

wherein a maximum length of a line from the arc member to the subtense (X) and perpendicular thereto is a length of a depth (Y) of the tongue lifting part, wherein ratio of the length of the depth (Y) to a length of the subtense (X) is 1/4 to 1/2.

15 2. (Canceled)

3. The tongue anteriorizer of claim 1, wherein a width of the arc member is greater than a width of the main portion.

20 4. A tongue anteriorizer comprising:

a handle including a main portion having a handle end;

a tongue lifting part including an arc member having a first part end formed with the handle end, and a second part end; and

25 a connecting part including a connecting member having a first end formed with the handle

end of the main portion, and a second end integrally joined to the first part end of the tongue lifting part;

wherein the tongue lifting part is made from a plate-like strip having a uniform thickness; and

wherein the connecting member is a curve oriented in a direction opposite to a curved
5 direction of the tongue lifting part.

5. (Canceled)

6. The tongue anteriorizer of claim 4, wherein a width of the arc member is greater than a width
10 of the connecting member.

7. (Canceled)

8. The tongue anteriorizer of claim 4, wherein a curved length of the connecting member is less
15 than one-third of the curved length of the arc member.

9. The tongue anteriorizer of claim 1 or 4, wherein a rail includes two opposite elongated
projections, and a groove member includes a groove shaped complementarily to the rail; wherein
the projections are formed with a first end of the main portion; and wherein the groove is formed
20 with a curved portion, wherein the projections are formed as a projection element, and wherein
the groove is formed as an elongated concave element shaped complementarily to the projection
element so that the projection element is configured to insert into the concave element to form a
connecting element.

25 10. (Canceled)

11. (Canceled)

12. The tongue anteriorizer of claim 1 or 4, further comprising a first side, a second side and at least one rib, wherein the arc member has a concave surface on the first side and the rib is arranged on the second side of the tongue anteriorizer for structural strength enhancement.

13. The tongue anteriorizer according to claim 1 or 20 wherein the predetermined angle is individually formed between 60-degrees to 210-degrees for each tongue anteriorizer.

14. The tongue anteriorizer of claim 4, wherein a maximum length of a line from the arc member to the subtense (X) and perpendicular thereto is a length of a depth (Y) of the tongue lifting part, wherein ratio of the length of the depth (Y) to a length of the subtense (X) is 1/4 to 1/2.

15. The tongue anteriorizer of claims 1 or 4, wherein an enlargement of a curved portion formed by an inclined shoulder adjacent to the second part end is wider than a width of the curved portion of the tongue lifting part.

16. The tongue anteriorizer of claim 15, wherein a plurality of protrusions are formed on a longitudinal strip surface of an enlargement of the curved portion of the tongue lifting part.

17. The tongue anteriorizer of claim 1 or 4, wherein a width of an upper portion of the curved portion is narrower than that of the main portion, a narrower portion is connected to a curved portion of the tongue lifting part by an inclined shoulder.

18. The tongue anteriorizer of claim 1 or 4, wherein the arc member includes a plurality of protrusions.

19. A method of operating a tongue anteriorizer including a handle and a tongue lifting part
5 having an arc member, comprising the steps of:

holding the handle and inserting the arc member of the tongue lifting part into a mouth of a patient until it reaching a base of a posterior part of the tongue;

hooking the posterior part of the tongue by a front end of the arc member, lifting the tongue, and pulling the handle in a direction out of the mouth to cause the arc member of the tongue

10 lifting part to exert force on the tongue; and

pulling the tongue by the tongue lifting part to move the tongue anteriorly.

20. The tongue anteriorizer according to claim 4, wherein a subtense (X) is defined by connecting at the first part end and the second part end of the arc member; and wherein the main
15 portion is configured at a predetermined angle with respect to the subtense (X).

21. The tongue anteriorizer according to claim 1 or 14, wherein the tongue lifting part is an arc of a circle and the length of the subtense (X) is smaller than that of radius of circle.

20 22. (new) The tongue anteriorizer according to claim 1 or 14 wherein the tongue lifting part is an arc of an ellipse and the length of the subtense (X) is smaller than that of major axis of the ellipse.

23. The tongue anteriorizer according to claim 1 or 14, wherein the length of the subtense (X) used for an infant, a children and an adult are about 5-7 cm, 7-9 cm and 9-13 cm respectively.

25

Statement under Article 19(1)

This amendment is made under Article 19 within two months of the mailing date of the search report (mailed September 7, 2016) in order to overcome the claim rejection in Box No. V of the written opinion.

On account of the amendment, claims 1, 4, 6, 8, 9 and 12-19 differ from the claims originally filed. Claims 2, 5, 7, 10 and 11 have been cancelled. Claim 3 remains unchanged. Claims 20-24 have been added.

Basis for the amendment can be found in the LETTER ACCOMPANYING AMENDMENT UNDER ARTICLE 19.

Date: November 7, 2016



Kenneth Q. Lao
Attorney for the Applicant
U.S. Registration No. 40,061

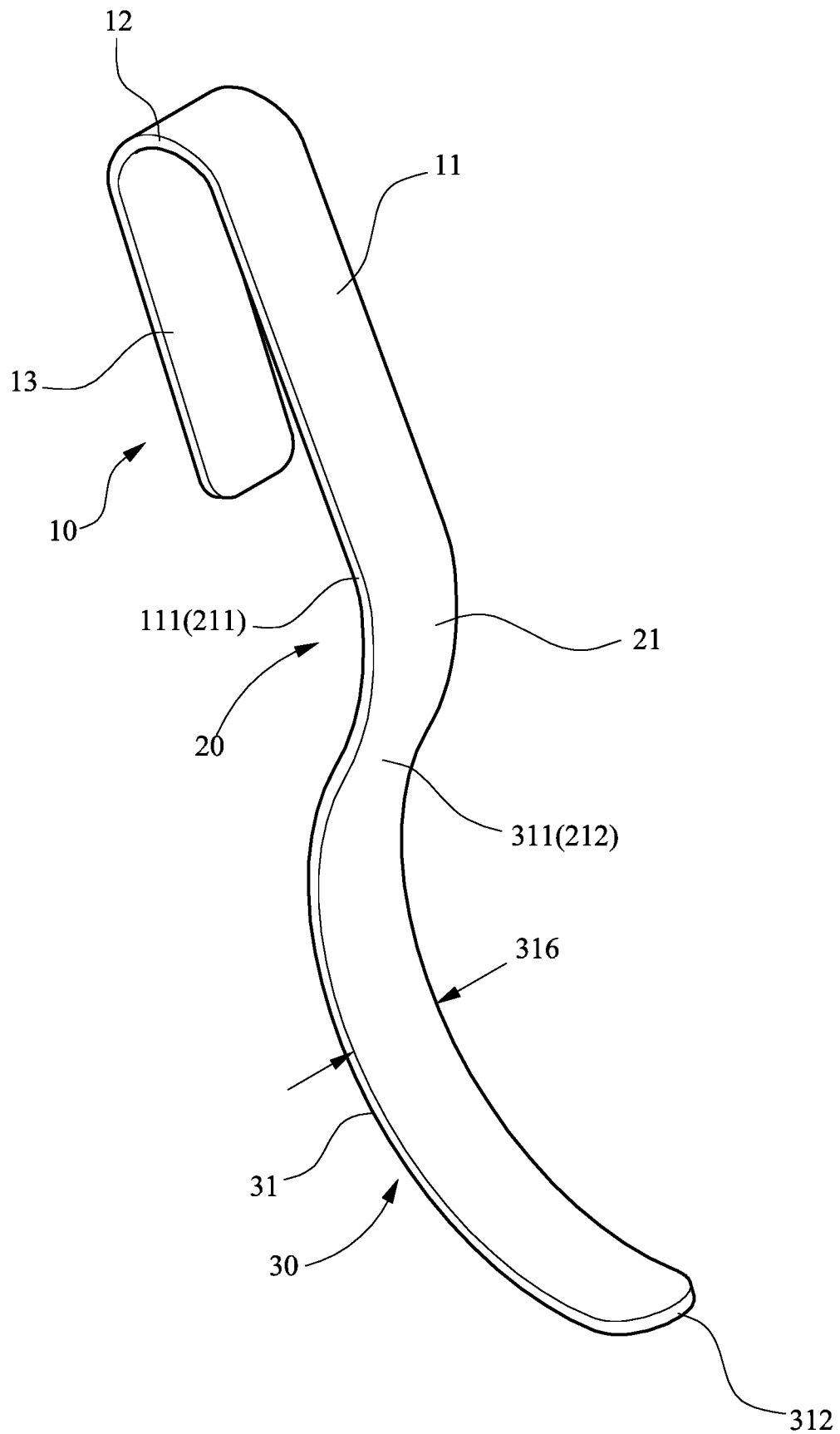


FIG.1

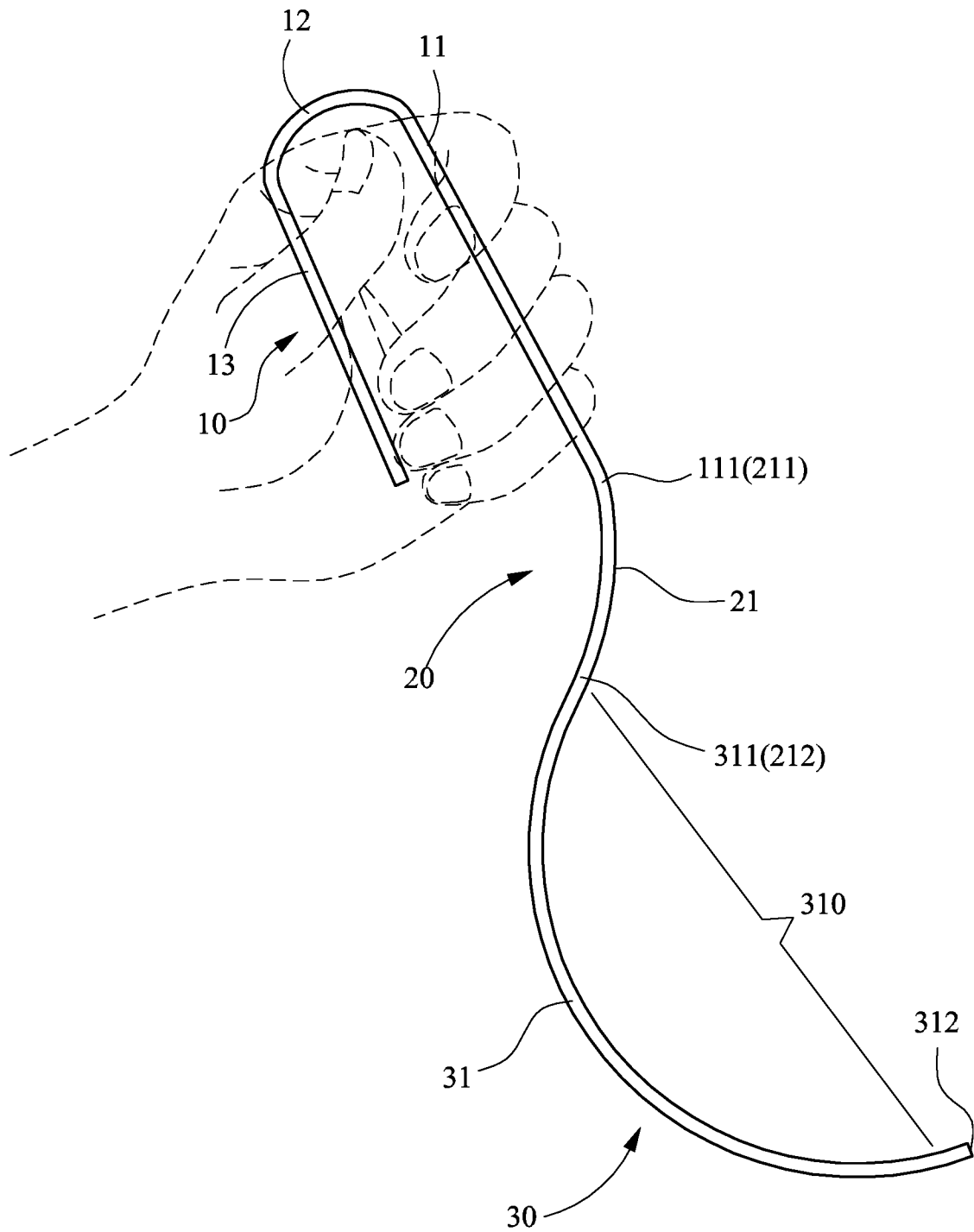


FIG.2

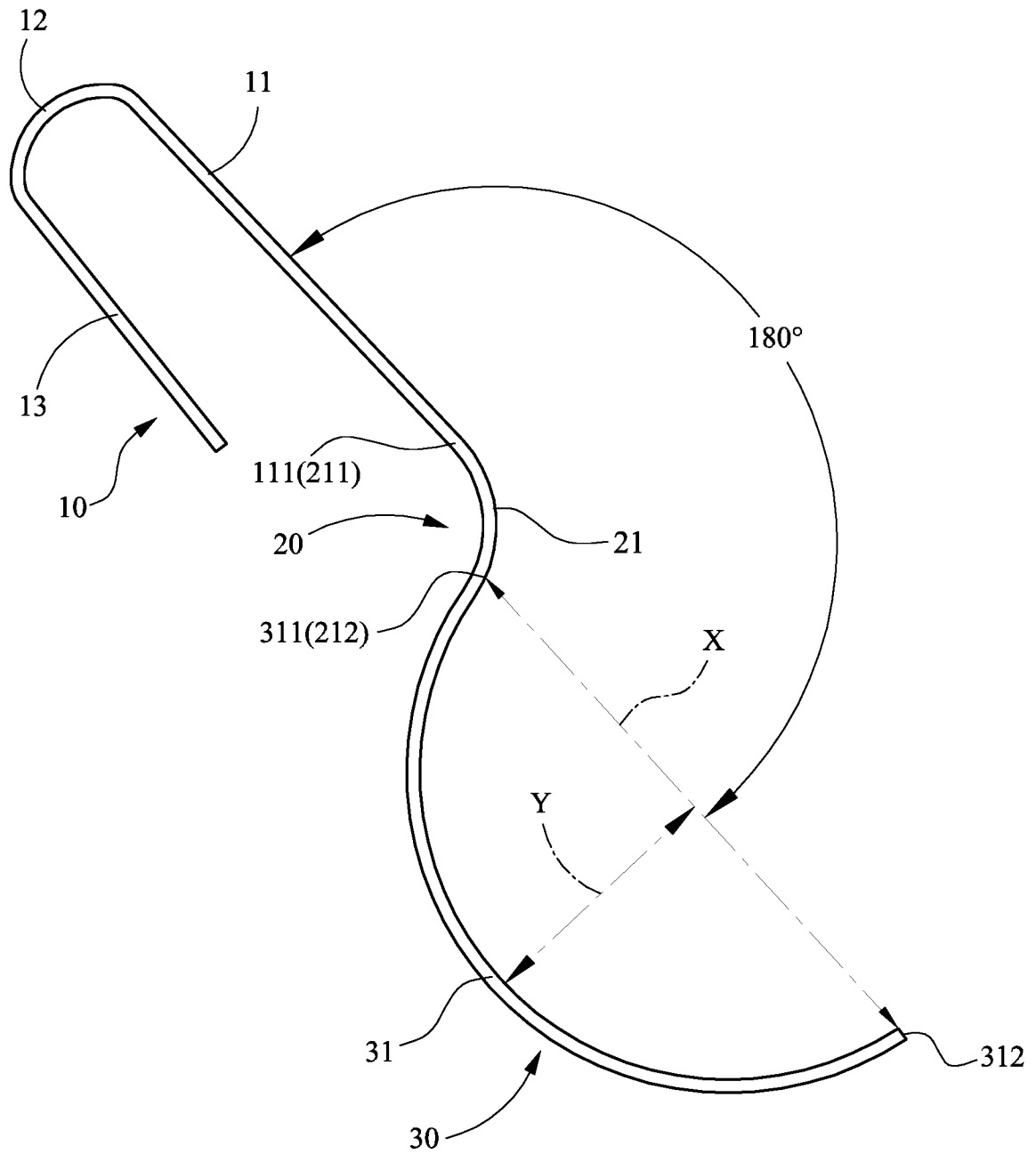


FIG.3A

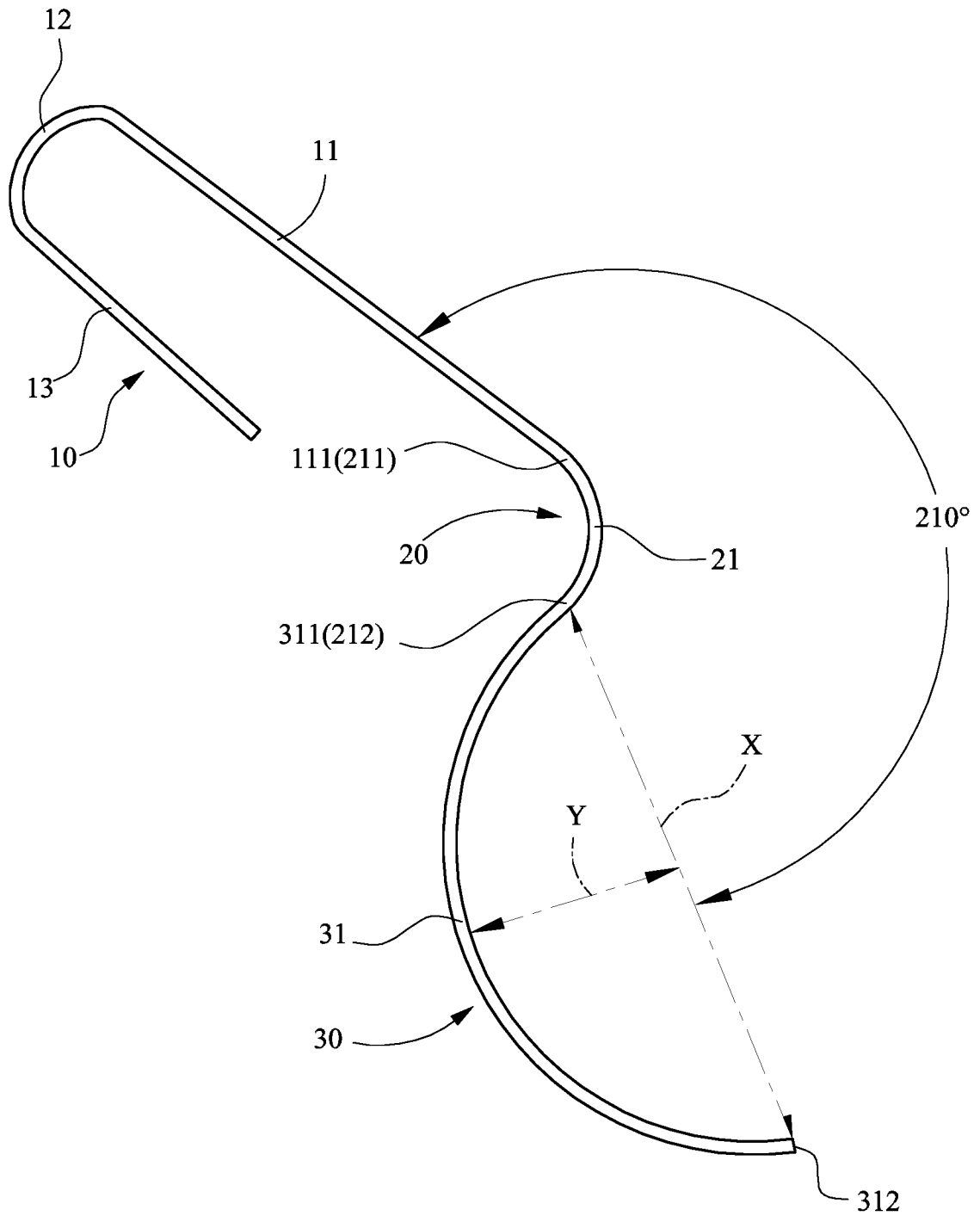


FIG.3B

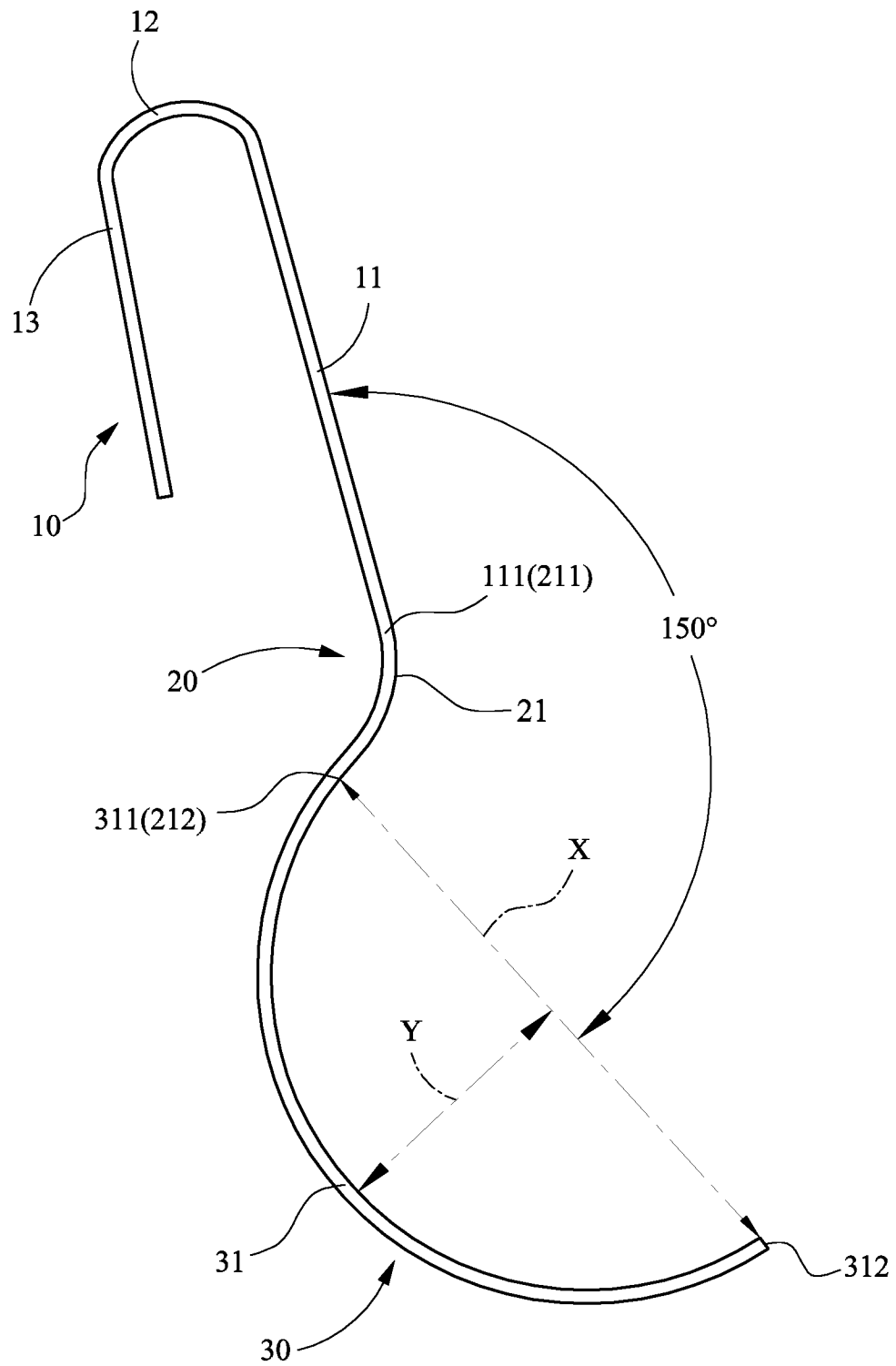


FIG.3C

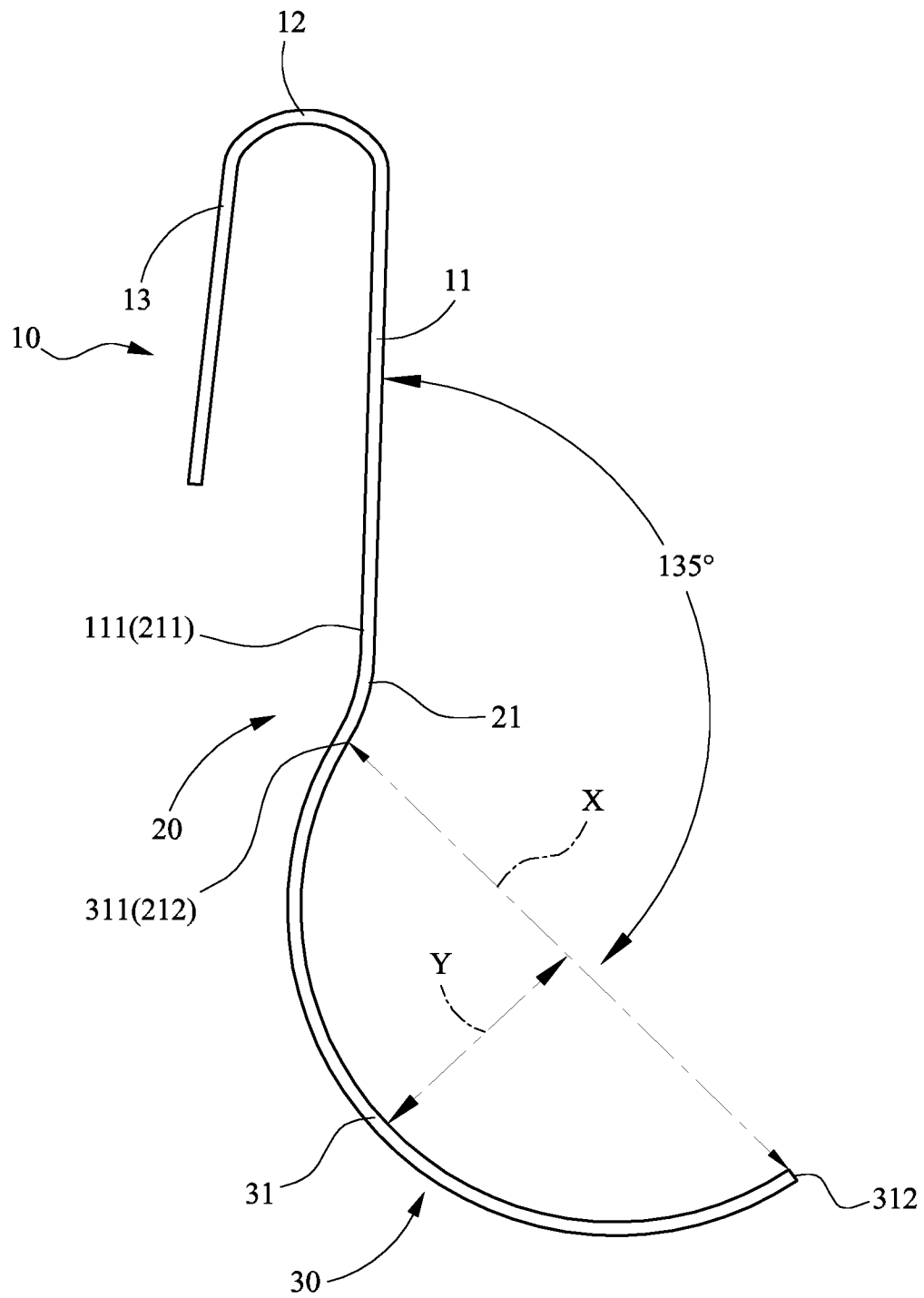


FIG.3D

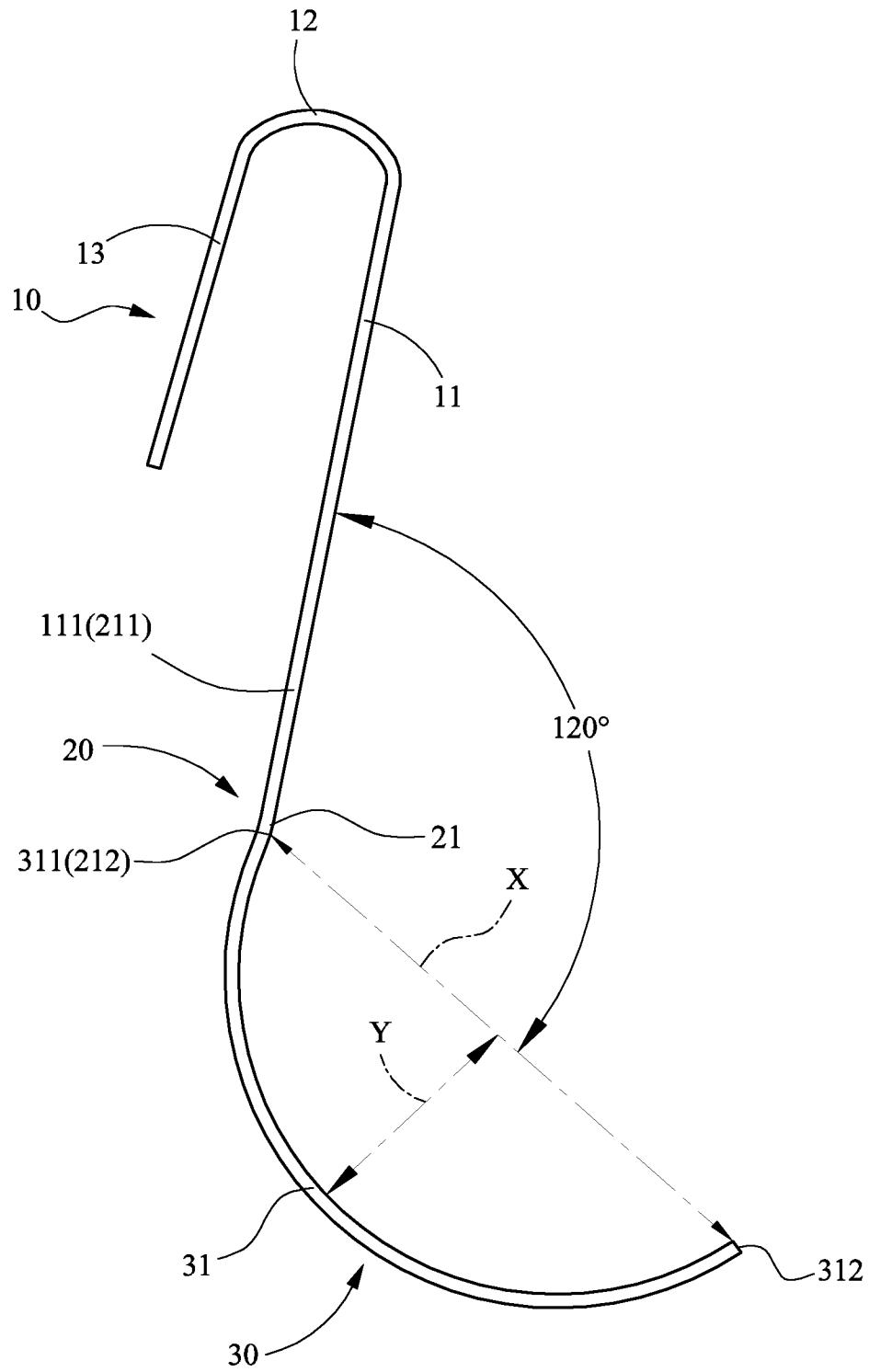


FIG.3E

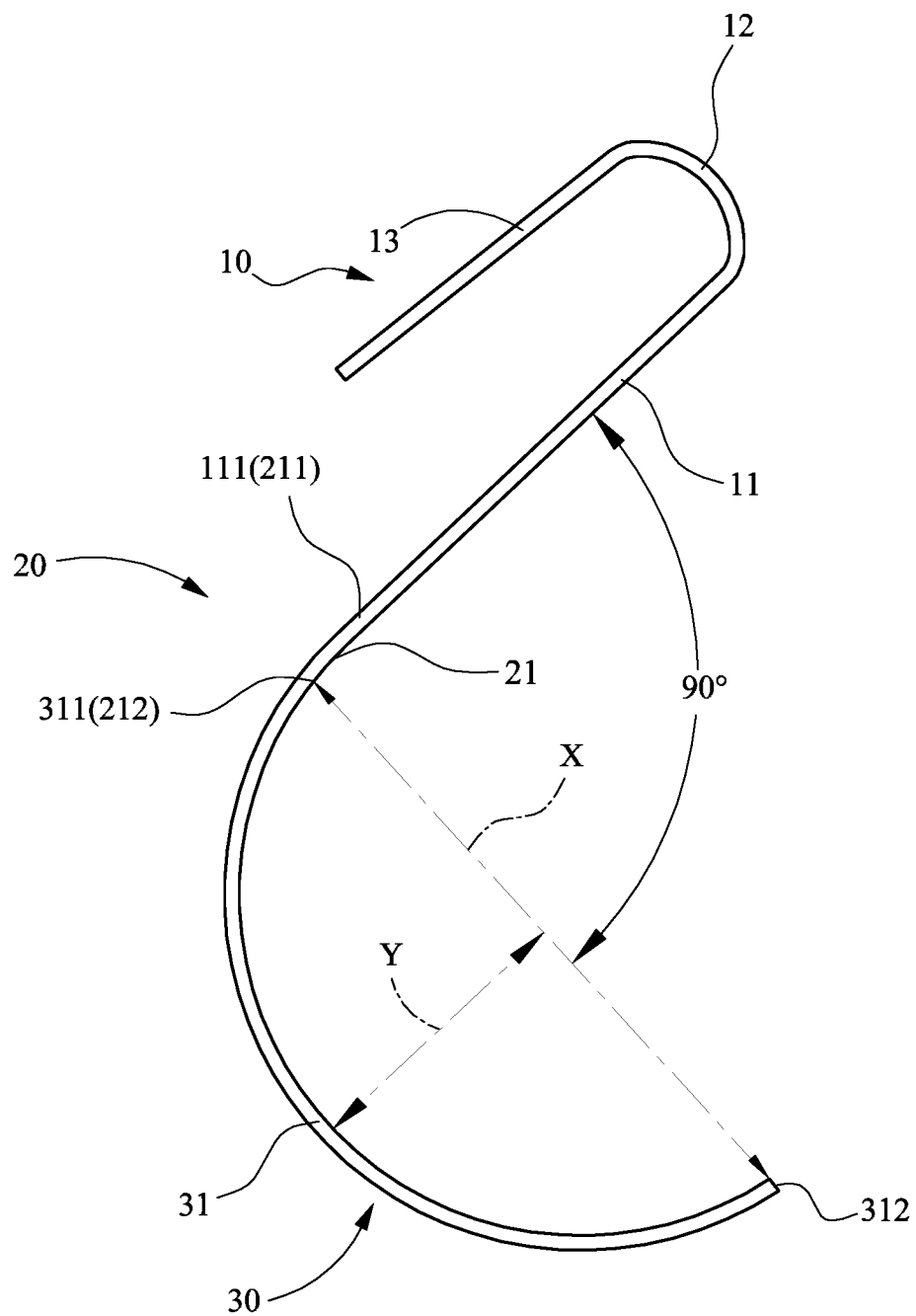


FIG.3F

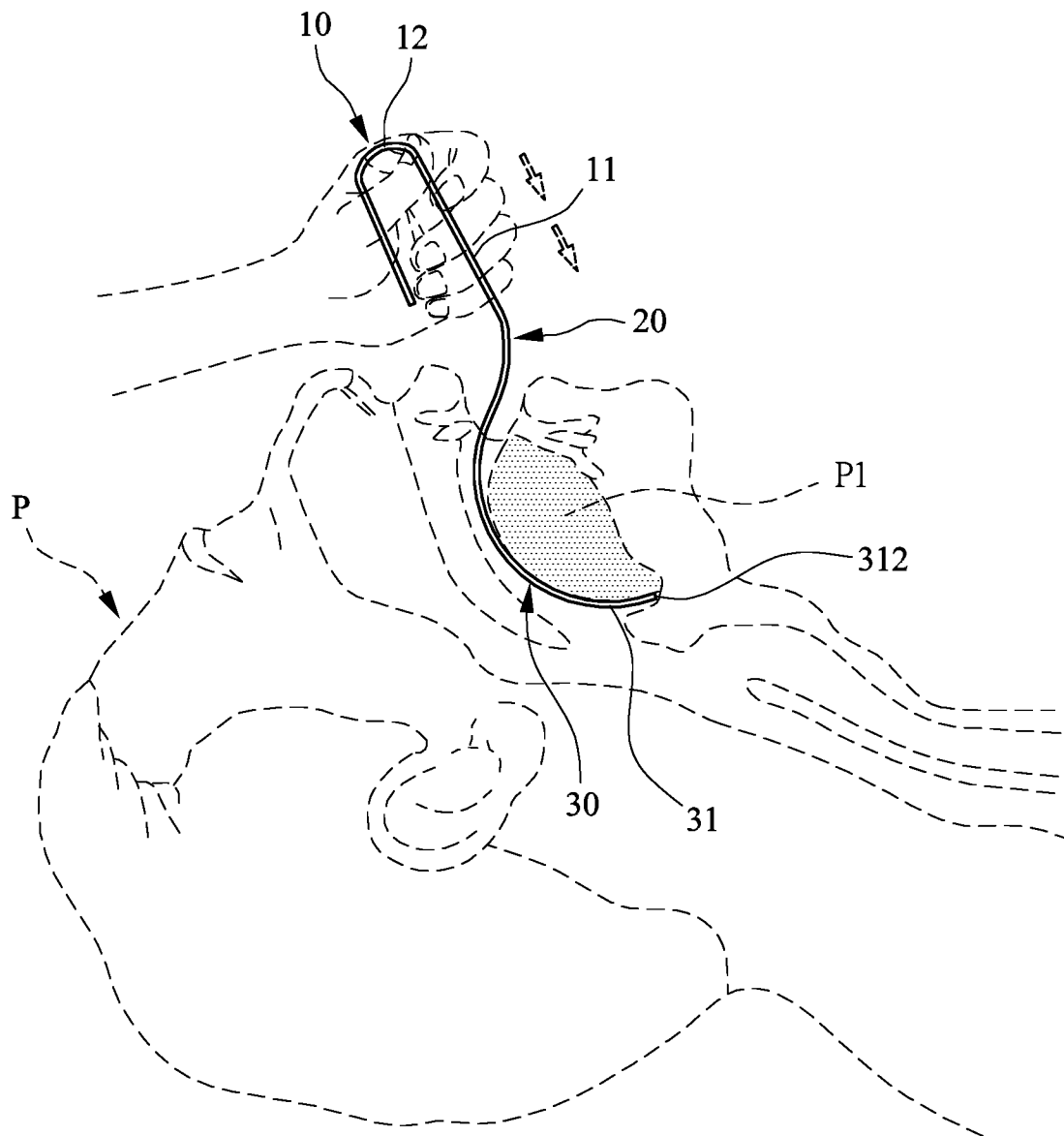


FIG.4A

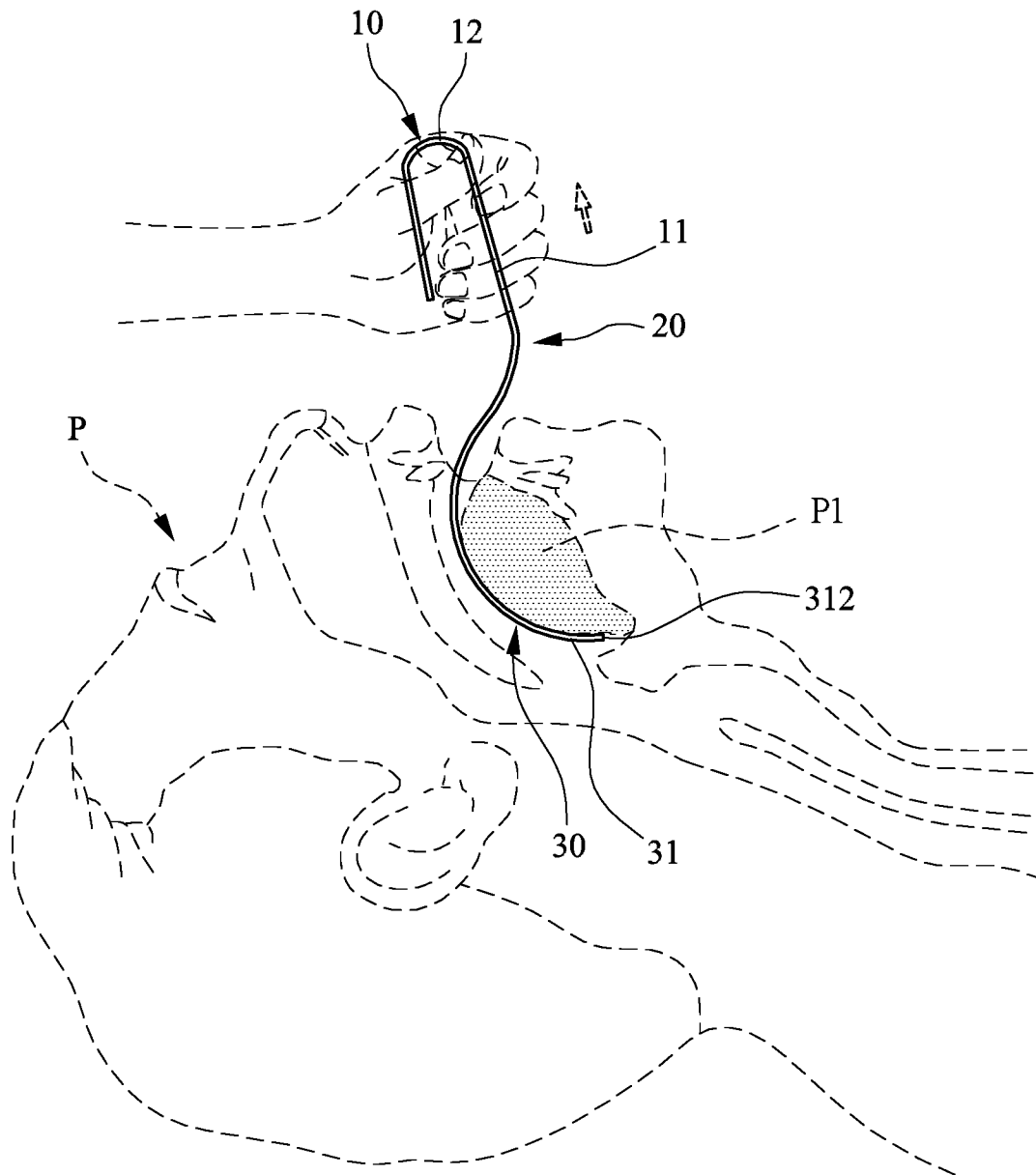


FIG.4B

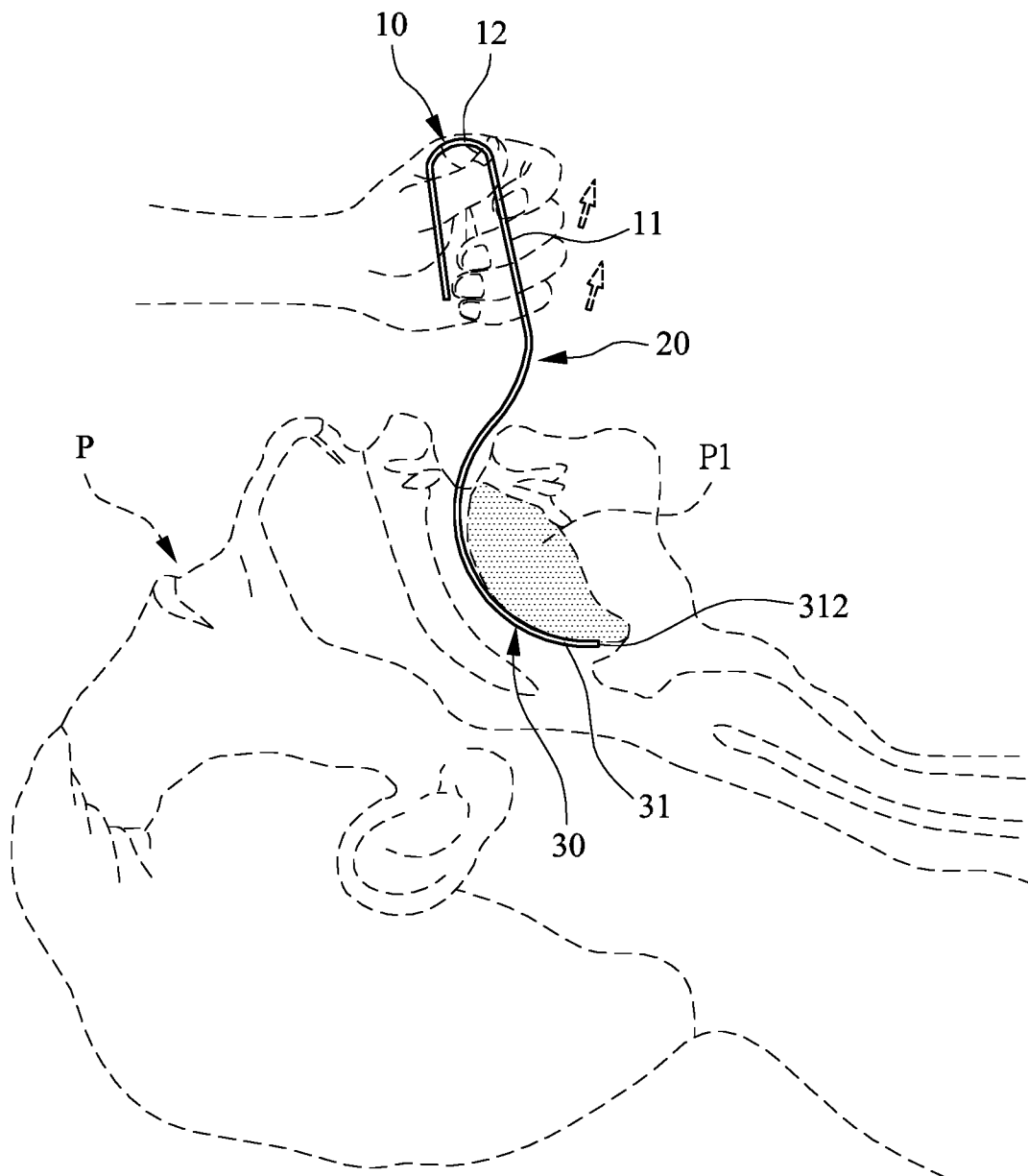


FIG.4C

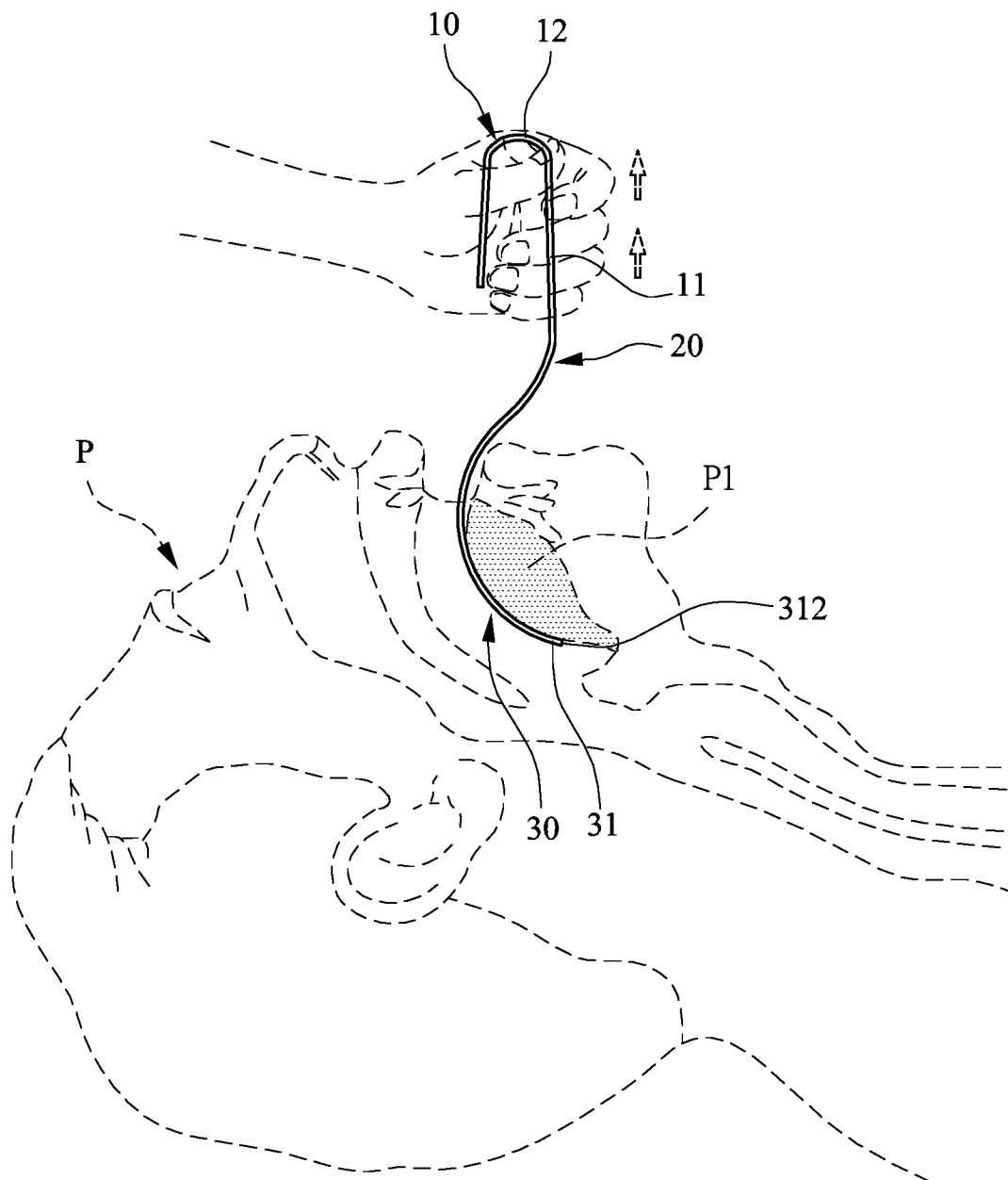


FIG. 4D

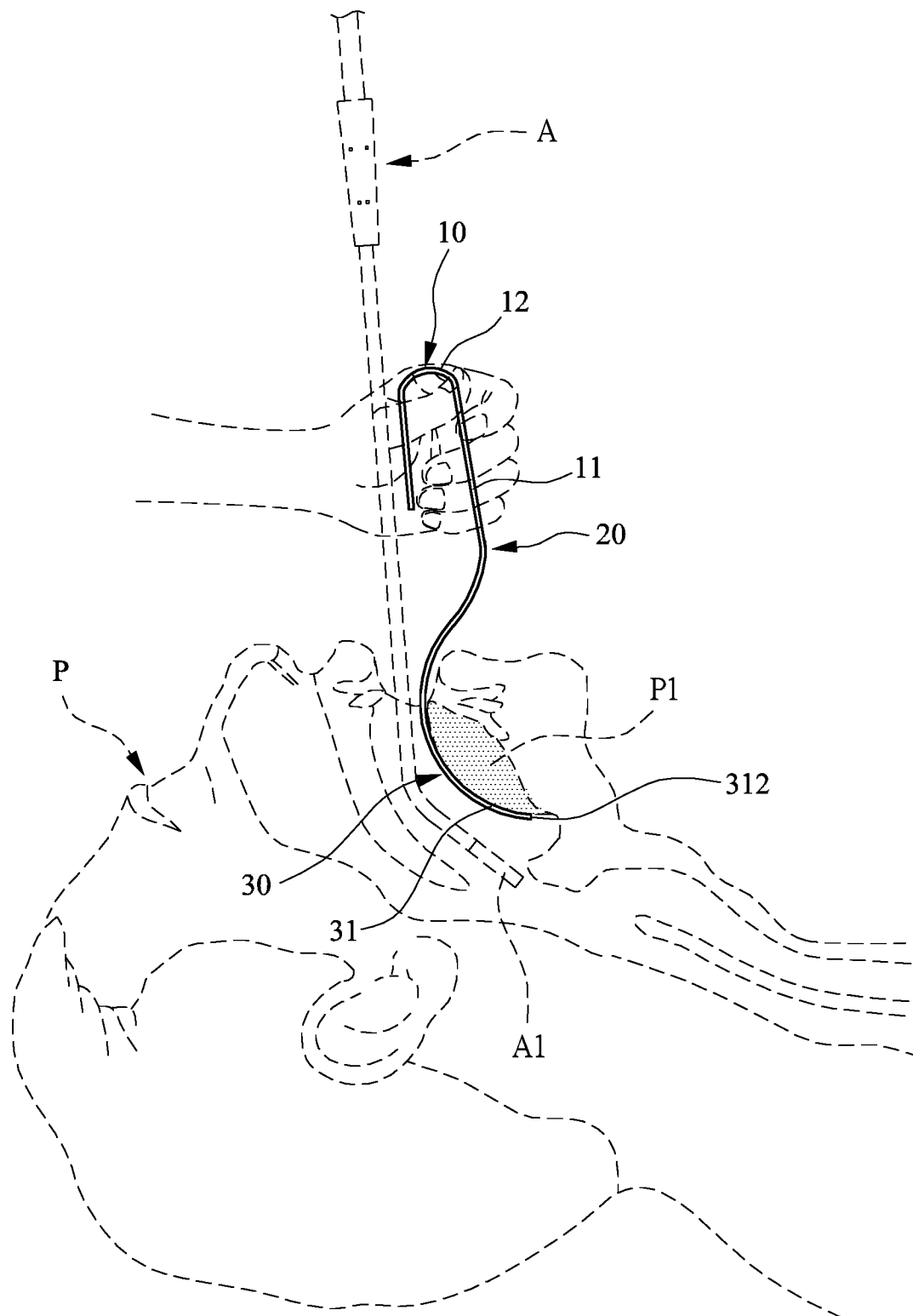


FIG. 4E

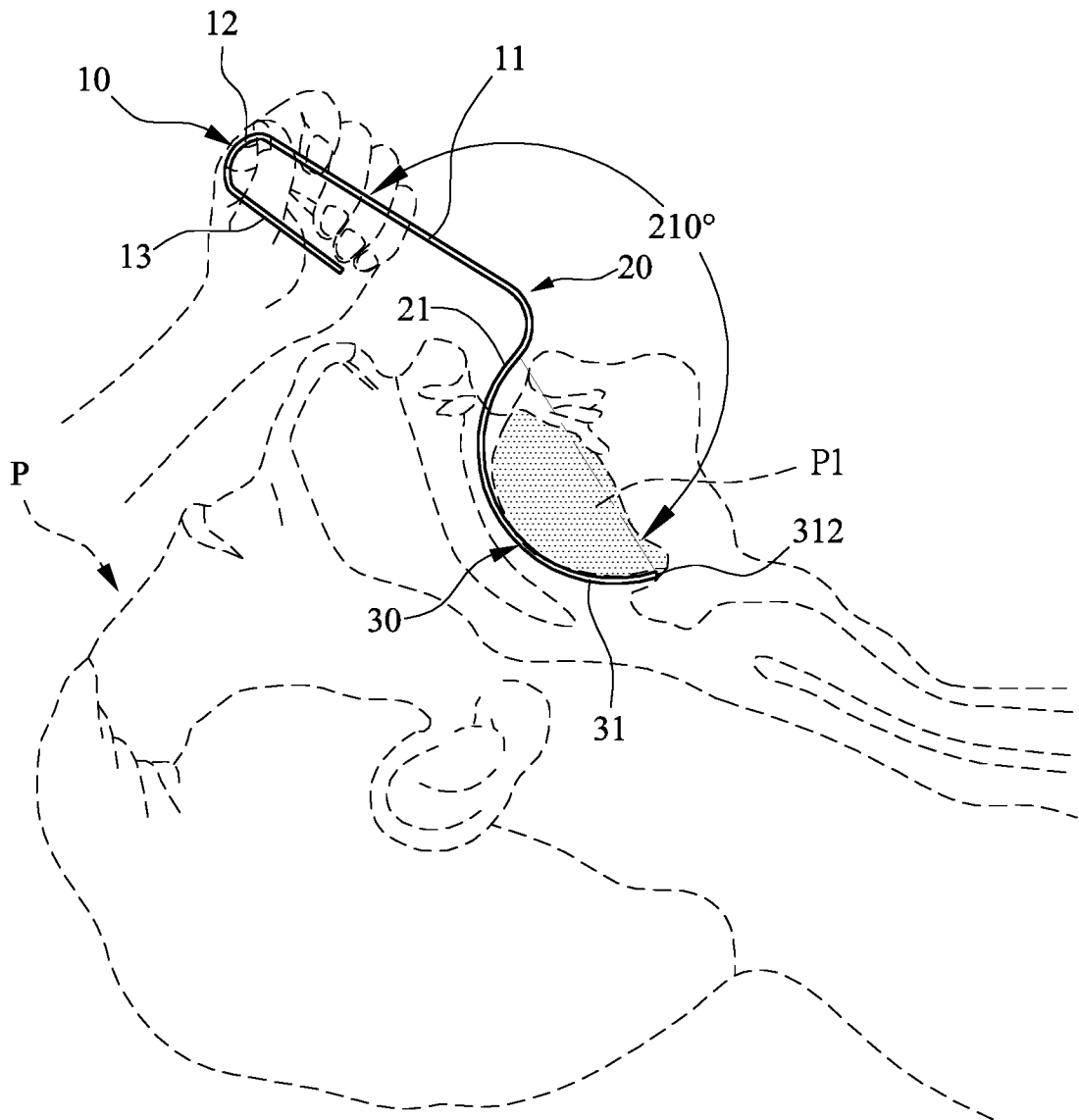


FIG.5

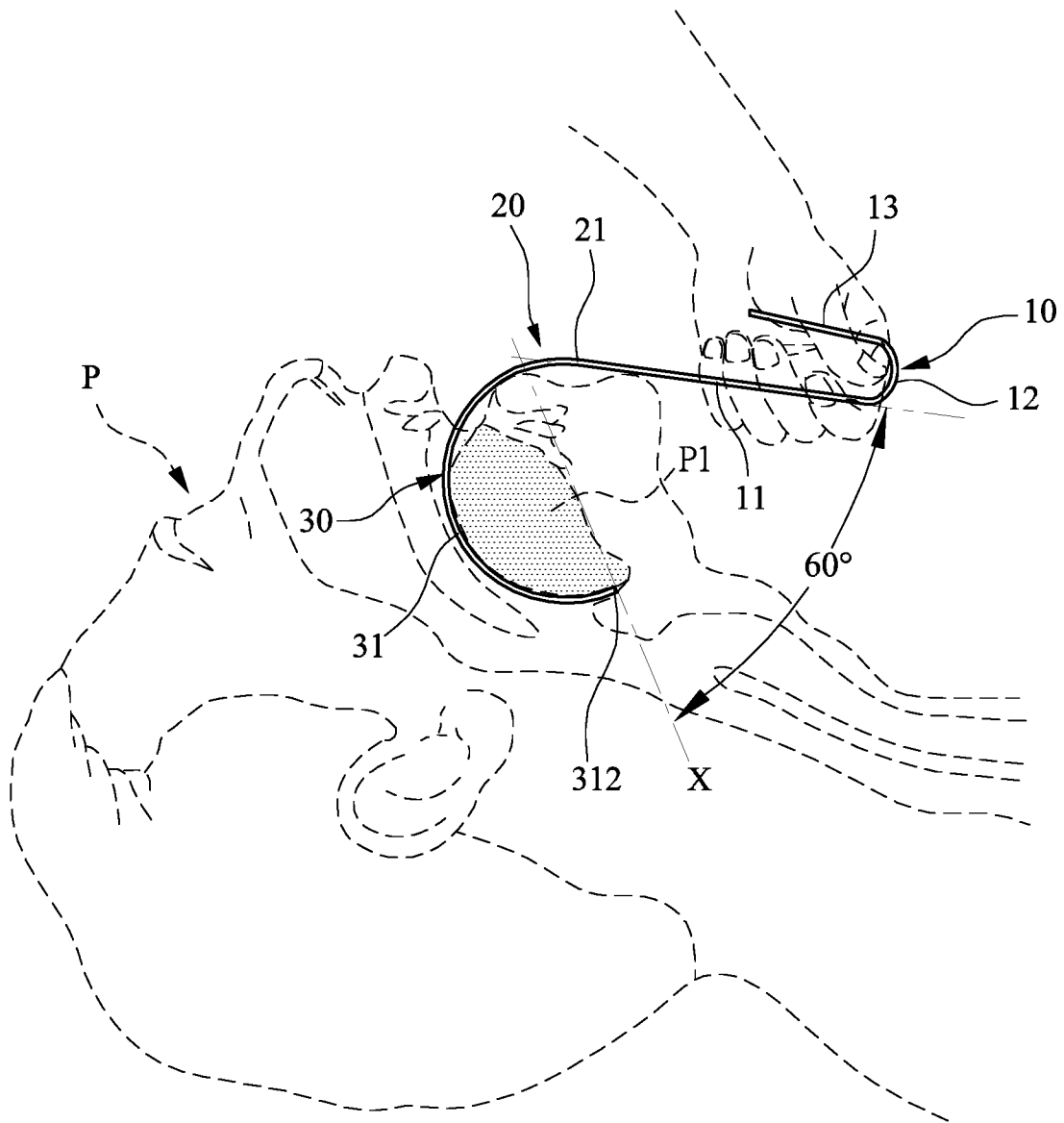


FIG.6

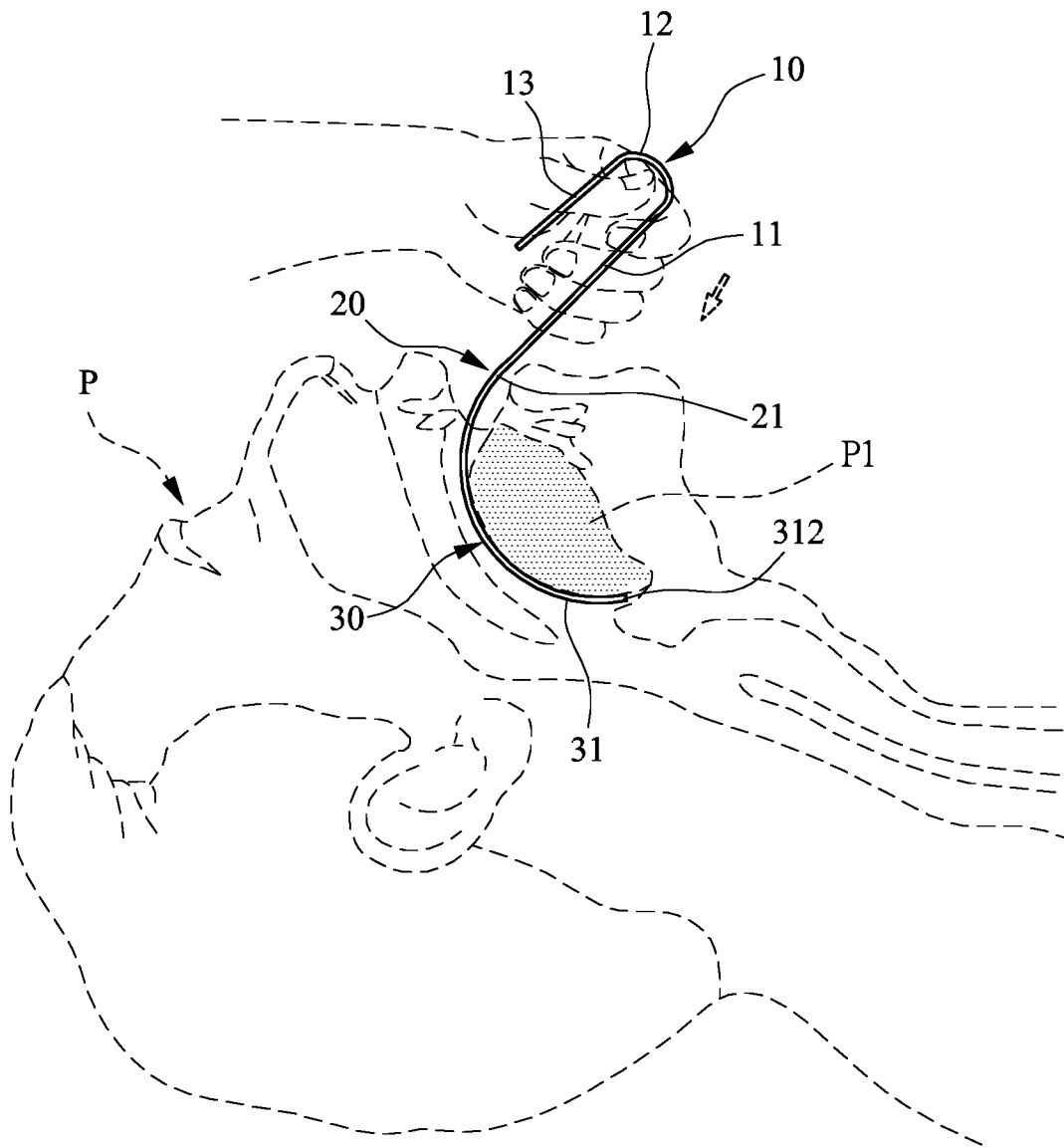


FIG.7A

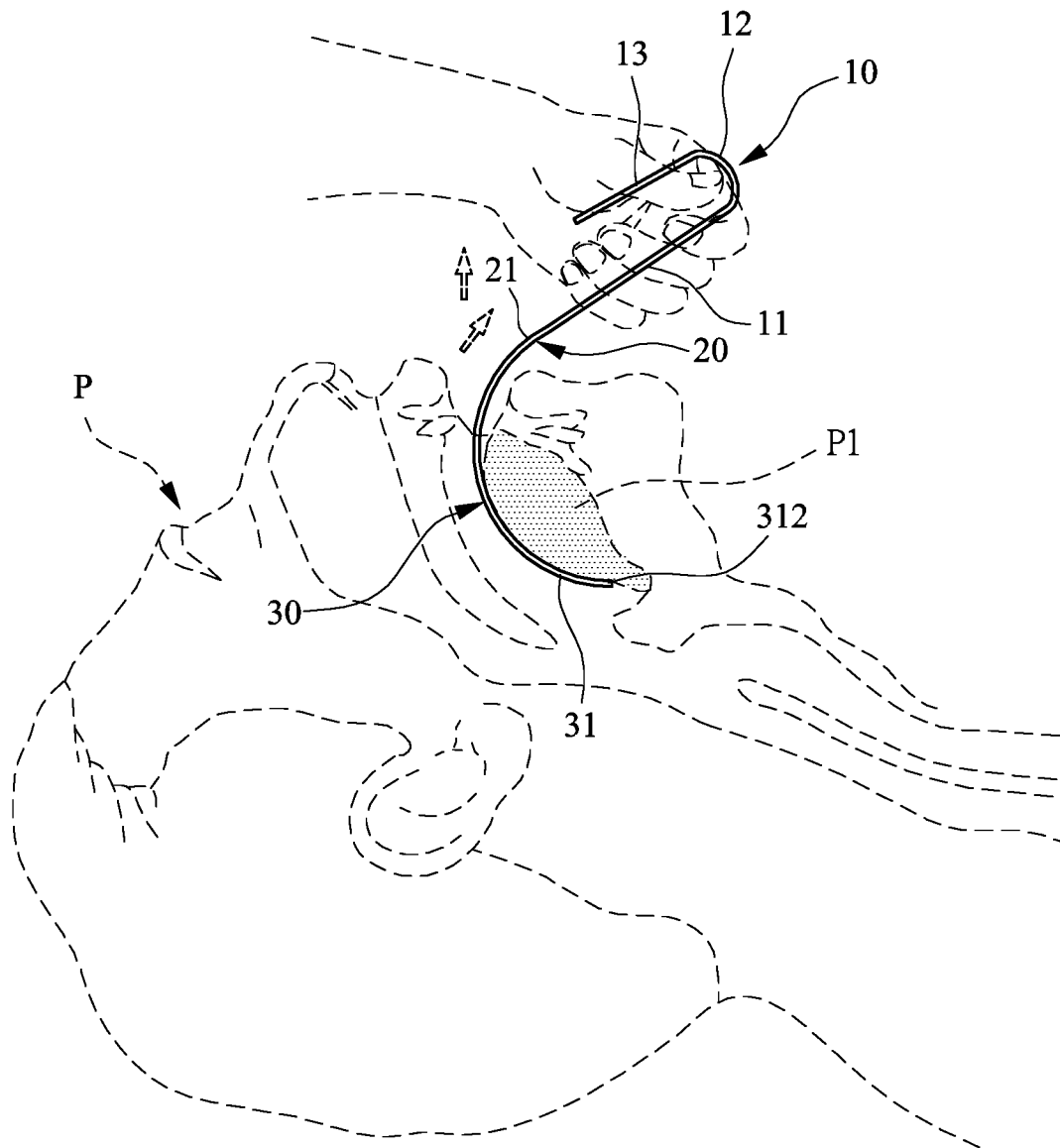


FIG. 7B

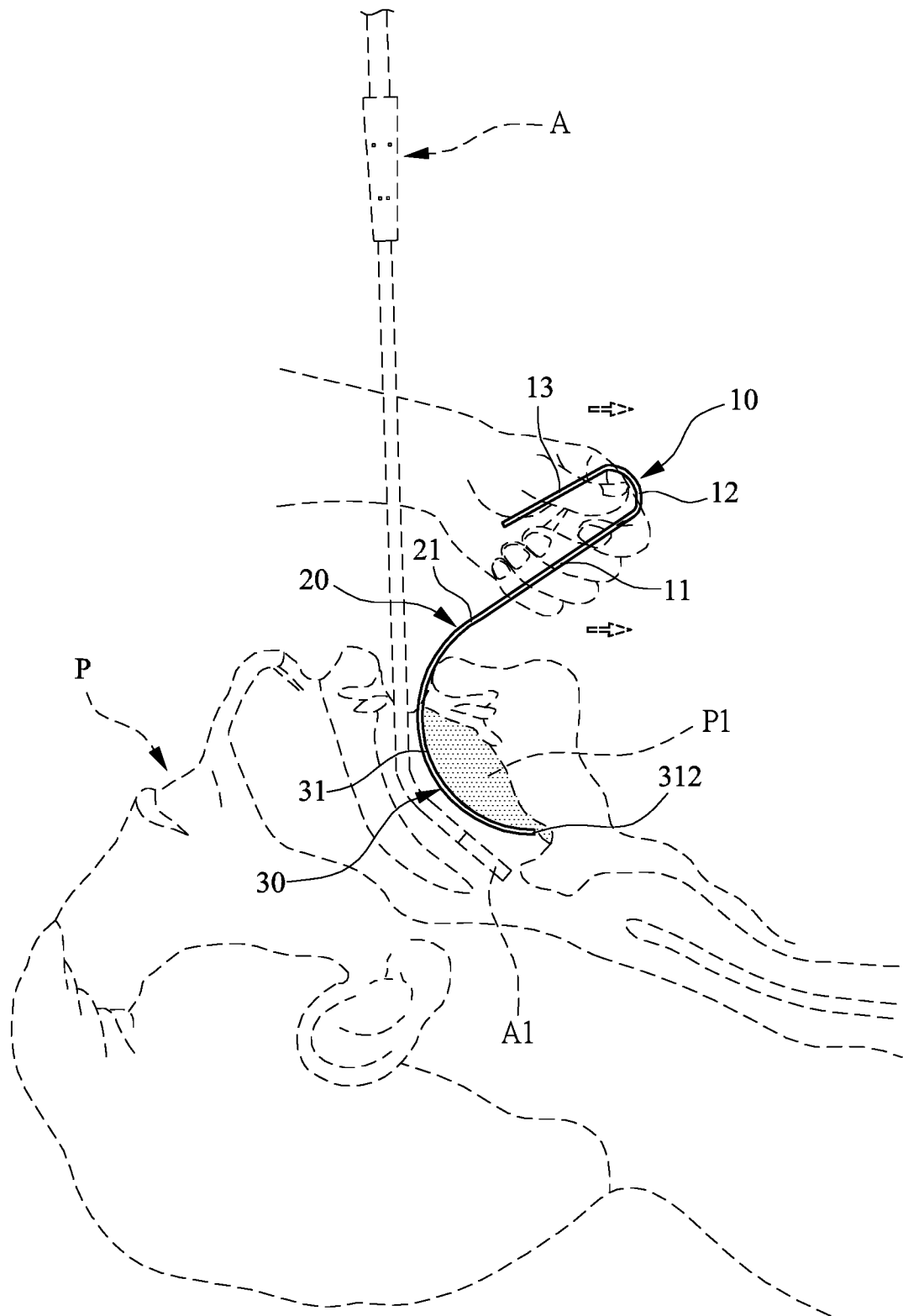


FIG. 7C

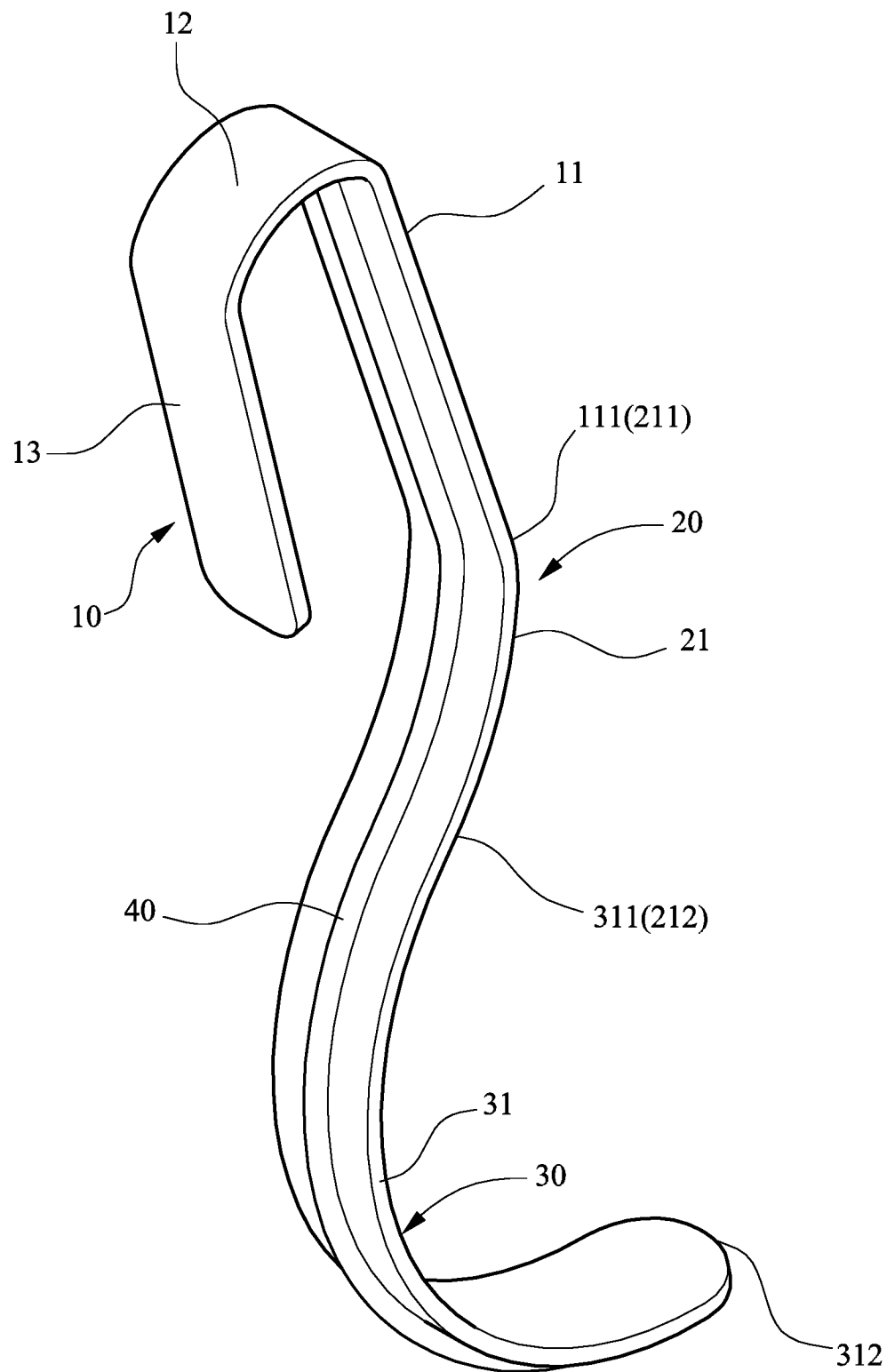


FIG. 8

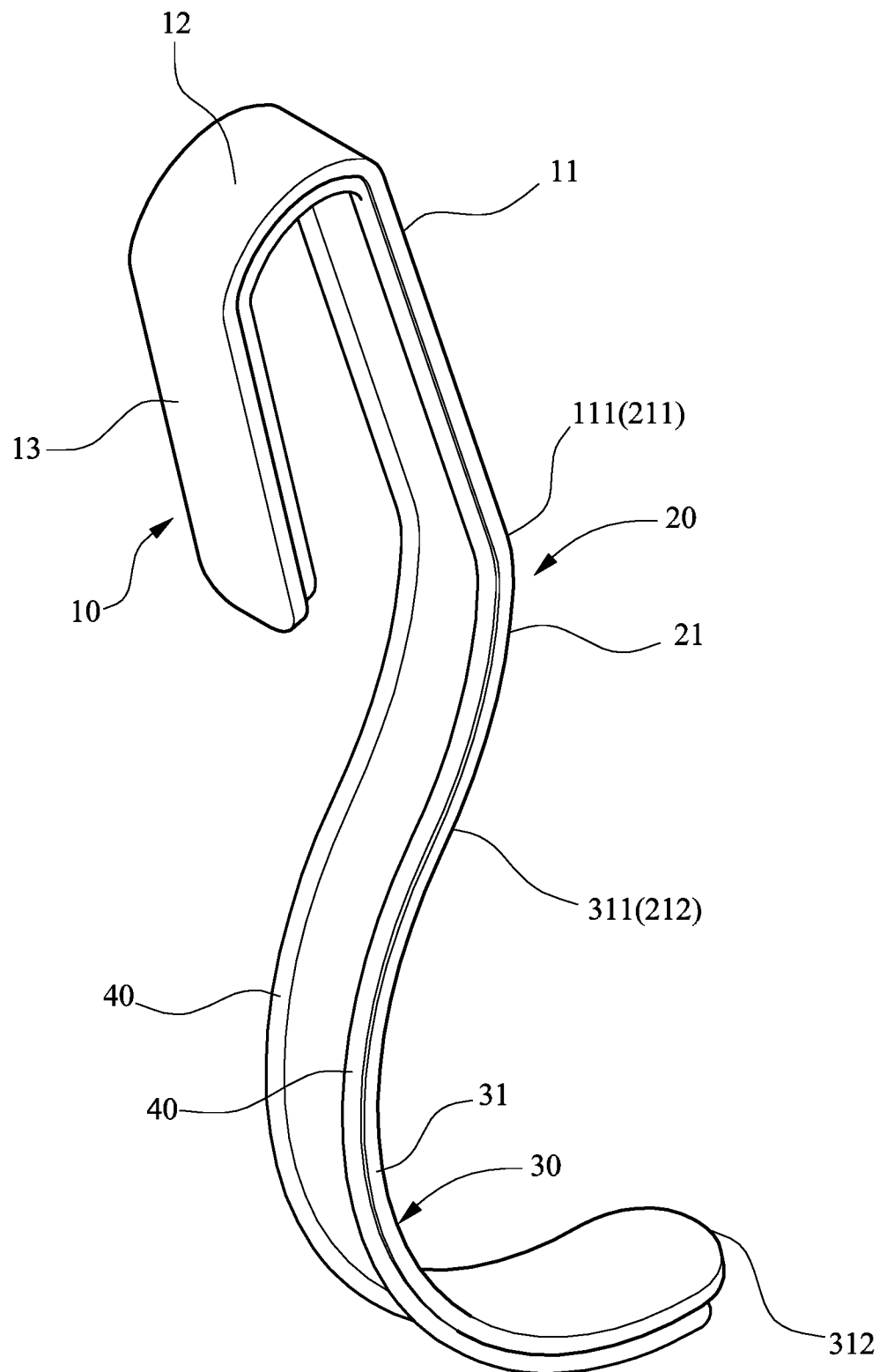


FIG.9

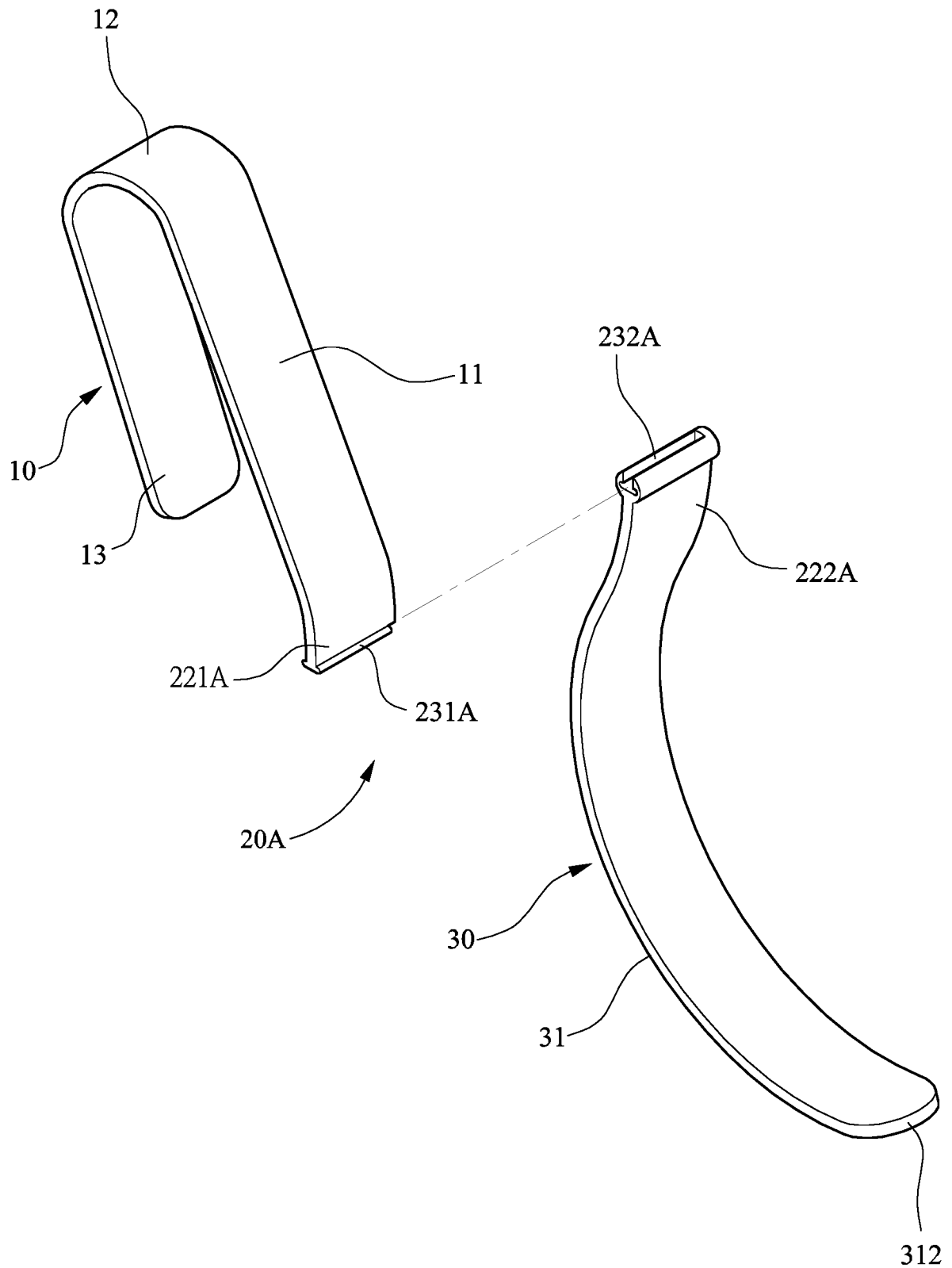


FIG. 10

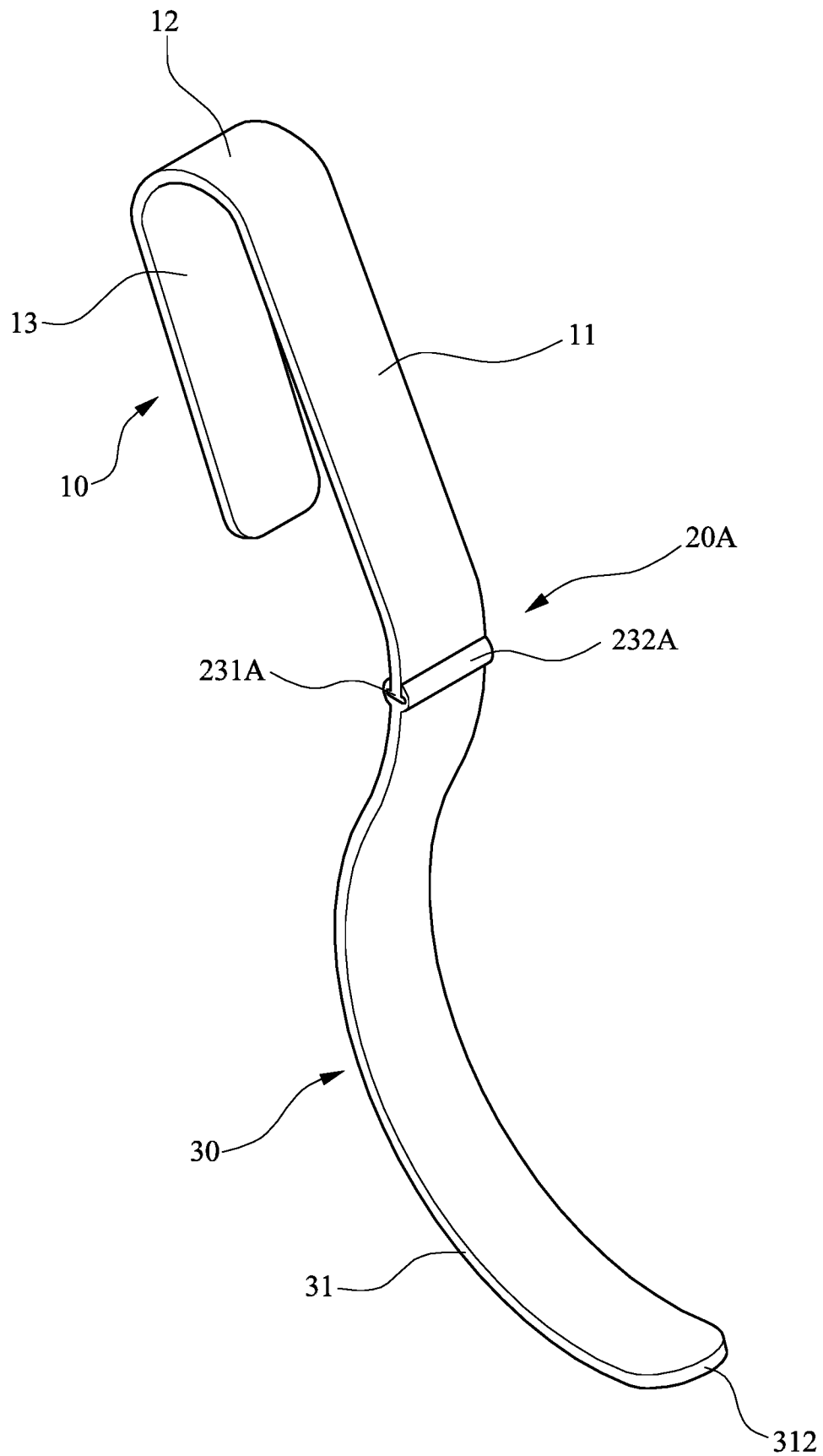


FIG.11

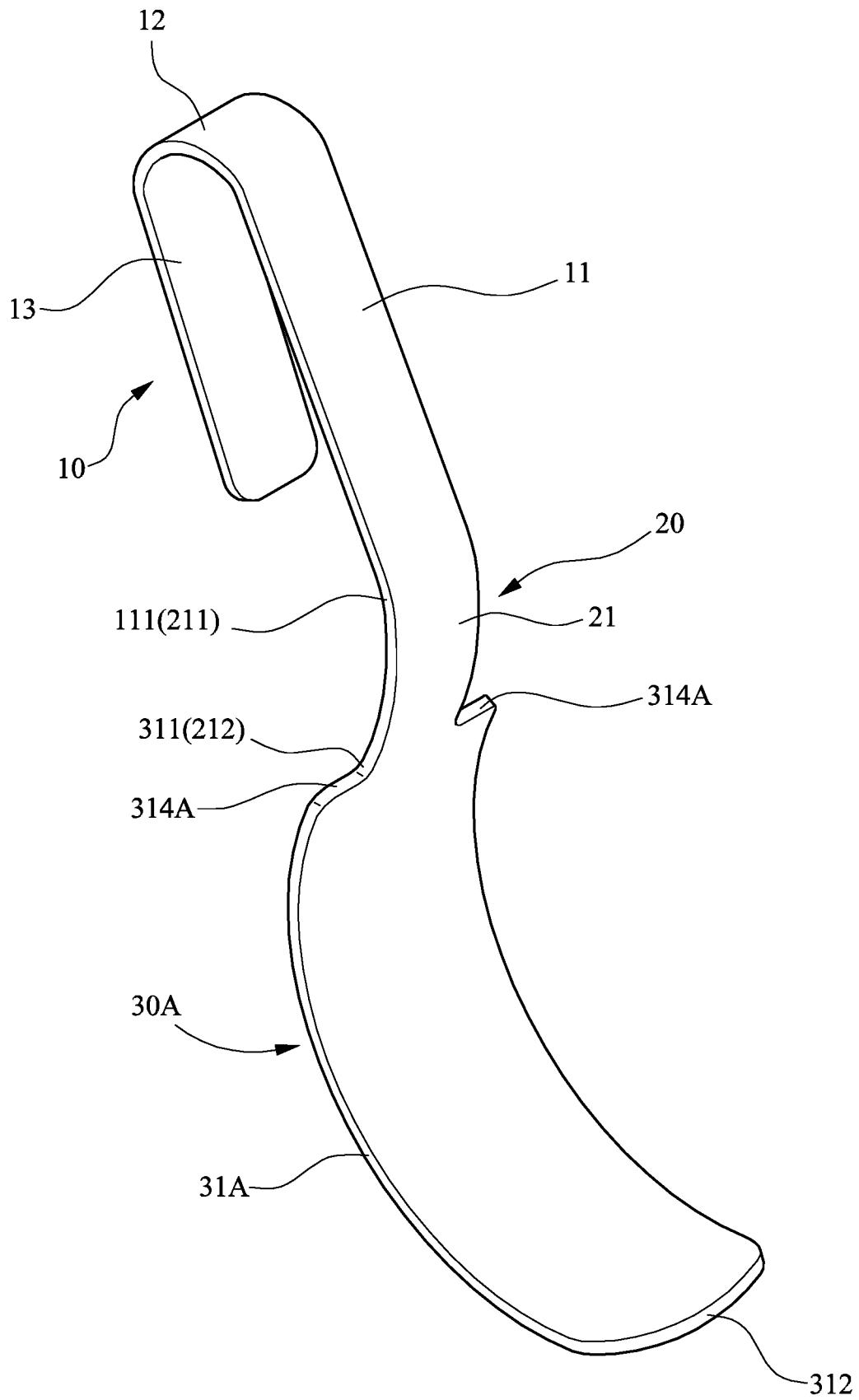


FIG.12

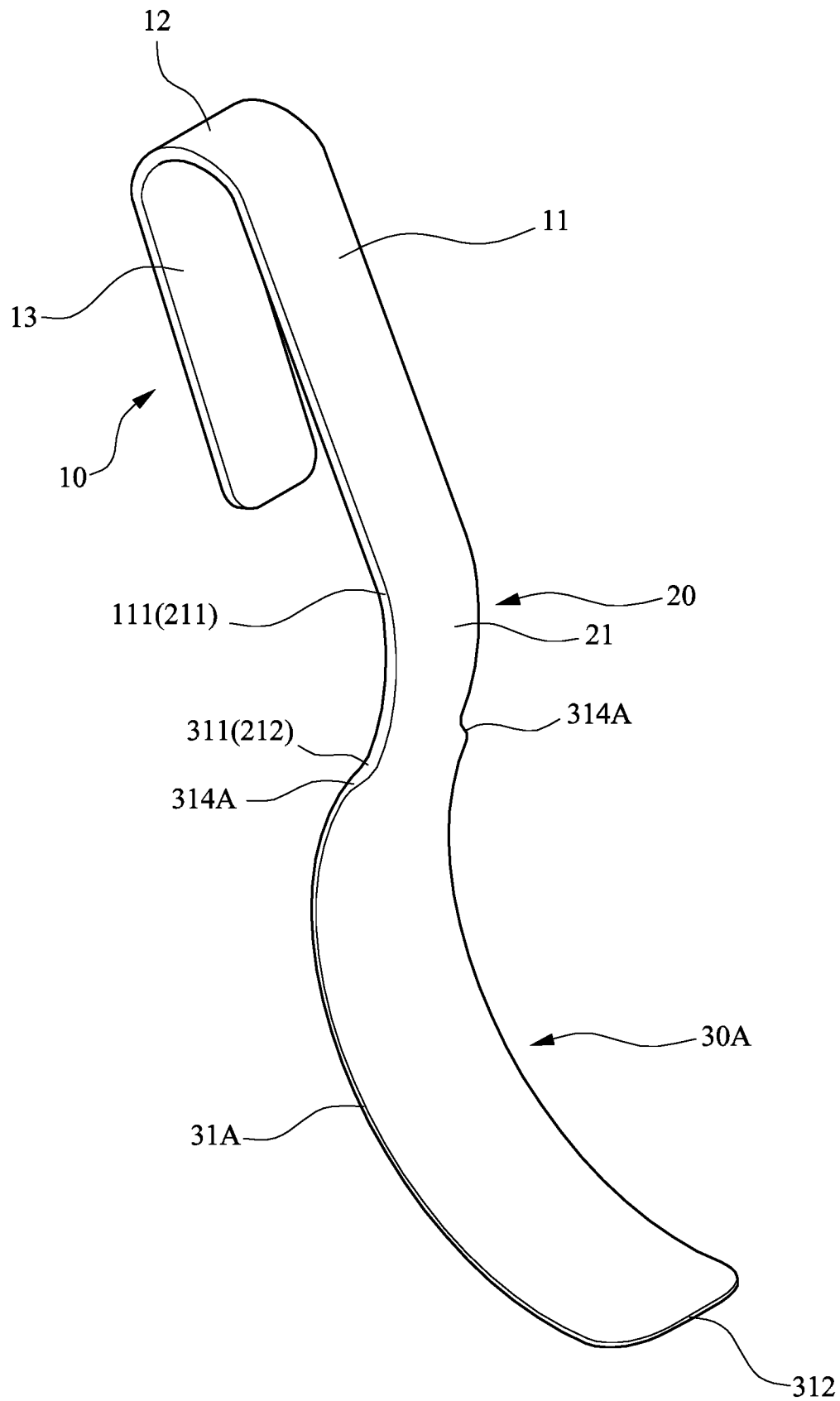


FIG.13

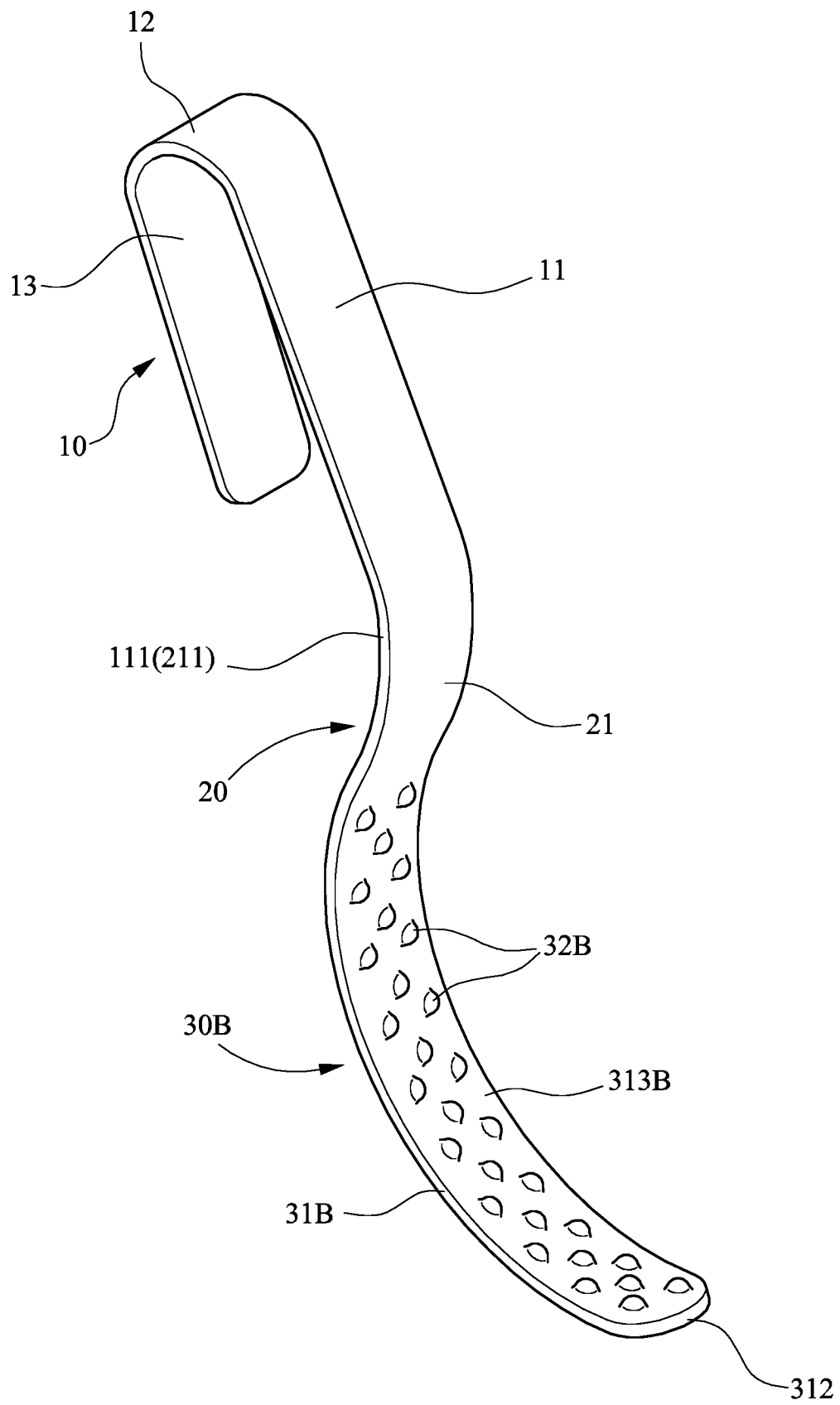


FIG.14

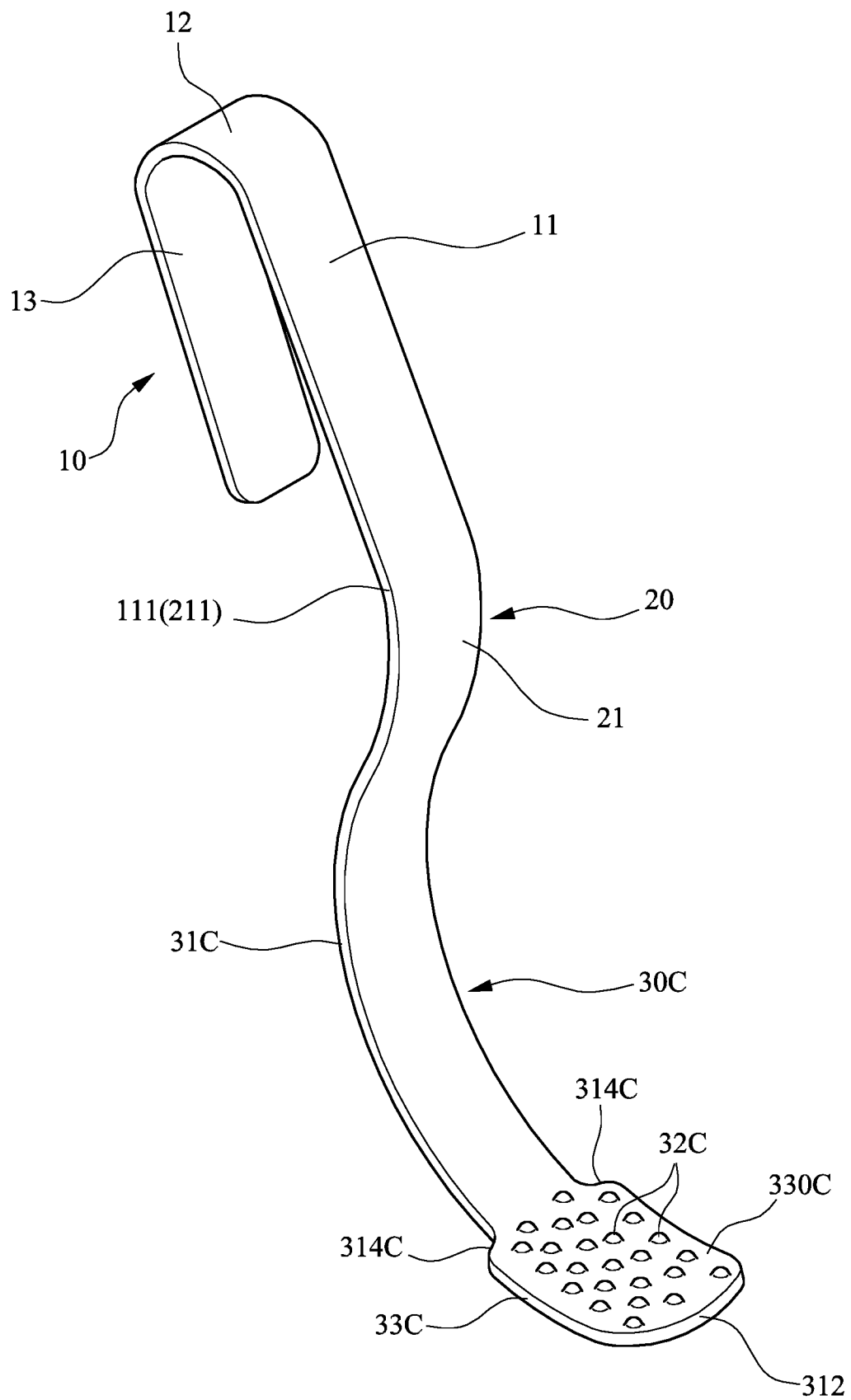


FIG.15

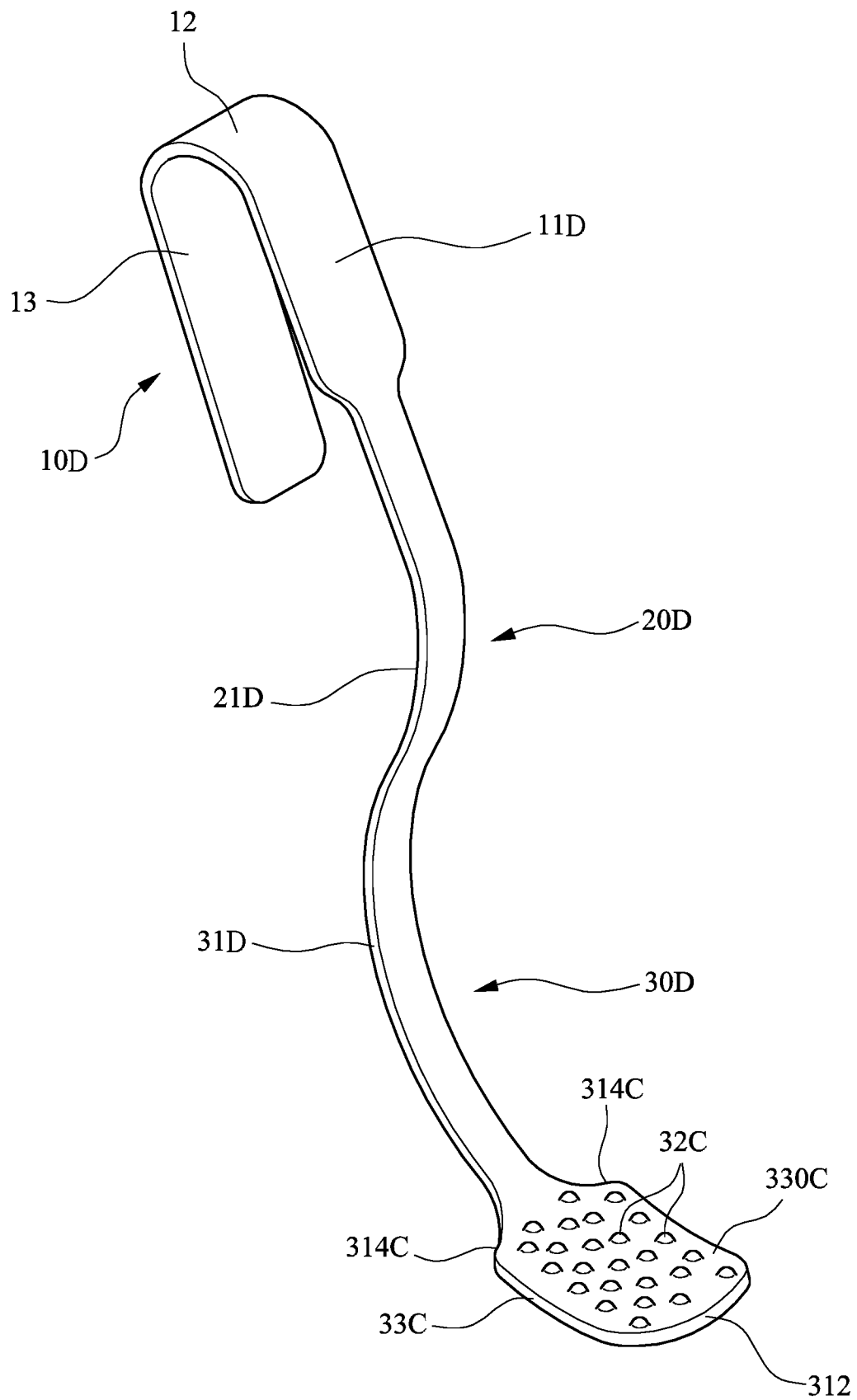


FIG.16

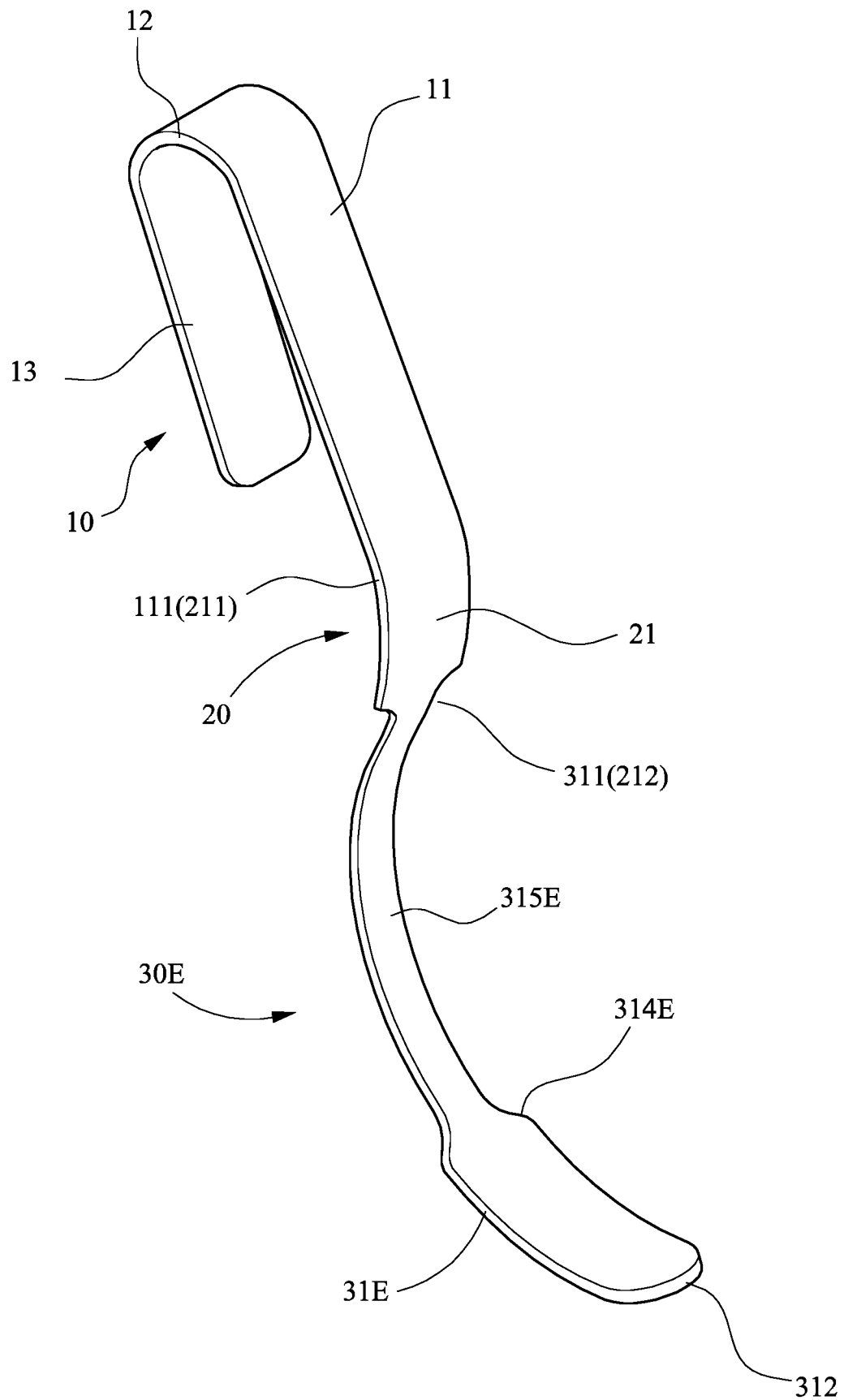


FIG.17

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/37789

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B13/00, A61B1/24 (2016.01)

CPC - A61B13/00, A61B1/24, A61M16/0495

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8)- A61B13/00, A61B1/24 (2016.01)

CPC- A61B13/00, A61B1/24, A61M16/0495

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

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

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google Scholar; EBSCO; PubMed; curv*, arc*, circ*, ellip*, arch*, curl*, bow*, anterioriz*, move*, manipul*, grasp*, push*, pull, tongue*, endotracheal*, handle, grasp*, hold*, grip*, handgrip*, retractor, s-shaped, s-retractor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,045,499 A (PITESKY, I) 04 April 2000 (04.04.2000), Figure 5; column 4, lines 49-67	1, 4, 5, 12, 18, 19
X	US 5,743,853 A (LAUDERDALE, R) 28 April 1998 (28.04.1998), Figure 4; column 1, lines 35-45	1, 2, 4, 5, 8, 11, 15, 18
---		13, 14, 16
Y		
X	US 2001/0034474 A1 (RYAN, B) 25 October 2001 (25.10.2001); Figures 1, 2, 3 and 8; paragraphs [0014], [0015]	1, 3-7, 17
X	US 2012/0271118 A1 (WHITE, W) 25 October 2012 (25.10.2012), Figure 3; paragraph [0025], [0026]	1, 5, 9, 10
Y	US 5,467,763 A (MCMAHON, M, et al.) 21 November 1995 (21.11.1995), Figures 7A, 8, 9, 13, 14, 16, 17; column 7, lines 5-13	13, 14
Y	US 5,667,481 A (VILLALTA, J et al.) 16 September 1997 (16.09.1997), Figure 1; column 3, lines 1-4; column 5, lines 57-65;	16
A	US 2001/0039949 A1 (LOUBSER, P) 15 November 2001 (15.11.2001), see whole document	1-19
A	US 6,901,928 B2 (LOUBSER, P) 07 June 2005 (07.06.2005), see whole document	1-19
A	US 4,610,243 A (RAY, C) 09 September 1986 (09.09.1986), see whole document	1-19



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

"T"

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

"X"

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

"Y"

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

"&"

document member of the same patent family

Date of the actual completion of the international search

10 August 2016 (10.08.2016)

Date of mailing of the international search report

07 SEP 2016

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Shane Thomas

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774