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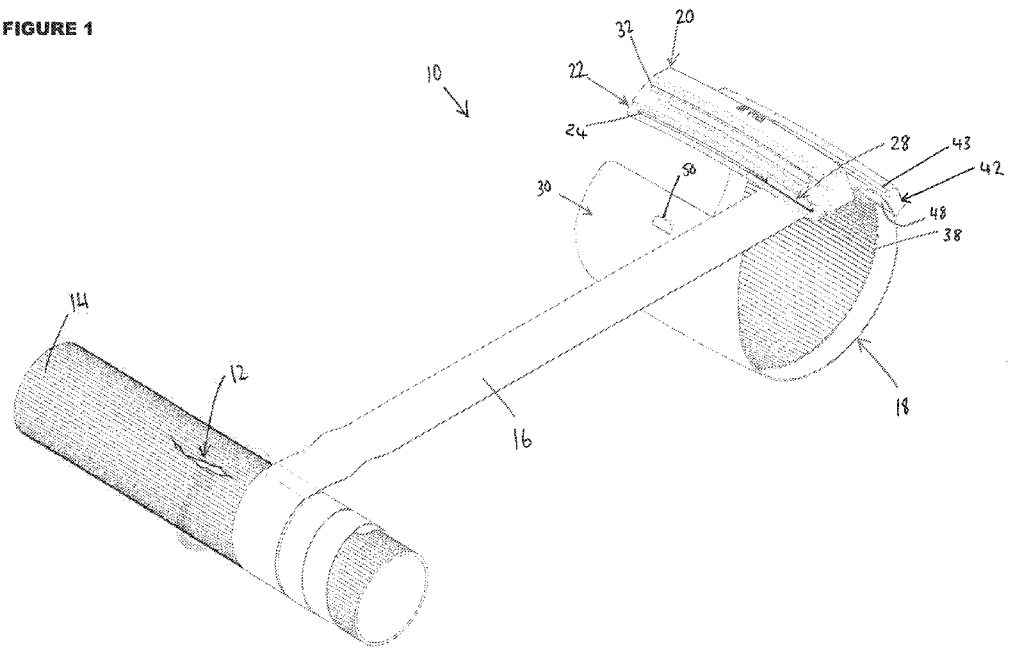
(54) **Title:** A SEALING DEVICE FOR SEALING A LEAK IN A PIPE

FIGURE 1



(57) **Abstract:** According to the invention there is provided a sealing device (10) for sealing a leak (12) in a pipe (14) which includes an elongate pipe wrapping member (16) which is configured to be wrapped around and overlay a leak (12) in a pipe (14) in a wrapped condition, a cover member (18) for covering the pipe wrapping member (16) substantially in the wrapped condition and a retaining arrangement (20) for retaining the cover member (18) and with it, the pipe wrapping member (16) in position relative the pipe (14) in a pipe sealing condition.

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A SEALING DEVICE FOR SEALING A LEAK IN A PIPE

FIELD OF THE INVENTION

This invention relates to a sealing device for sealing a leak in a pipe.

SUMMARY OF THE INVENTION

According to the invention there is provided a sealing device for sealing a leak in a pipe which includes: -

an elongate pipe wrapping member which is configured to be wrapped around and overlay a leak in a pipe in a wrapped condition;

a cover member for covering the pipe wrapping member substantially in the wrapped condition; and

a retaining arrangement for retaining the cover member and with it, the pipe wrapping member in position relative the pipe in a pipe sealing condition.

A connecting arrangement may be provided for allowing interconnection, preferably releasable, between the pipe wrapping member and the cover member. The connecting arrangement may include a receiving portion for receiving the pipe wrapping member complementally therein. The receiving portion may be sized, shaped and/or configured to allow displacement of the cover member relative the pipe wrapping member to facilitate substantial overlaying of the pipe wrapping member in the wrapped condition by the cover member. The receiving portion may be in the form

of any suitable elongate pin, channel, slot, aperture, groove or recess defined in the cover member which is configured to receive and retain an end region of the pipe wrapping member complementally therein, typically so as to allow the receiving portion to be displaceable relative the pipe wrapping member. The elongate pin, channel, slot, aperture, groove or recess may extend substantially the length of the cover member. Alternatively, the elongate pin, channel, slot, aperture, groove or recess may be defined in an extension which may extend from the retaining arrangement.

The cover member may be generally arcuate and/or C-shaped along its length or in cross-section so as to correspond with the curvature of the pipe to be sealed or repaired. The cover member may be sized so as to allow it to overlay the pipe wrapping member in the wrapped condition, preferably having a width that allows a free end region of the cover member to overlay itself at least partially in the pipe sealing condition.

The retaining arrangement may be mounted on the cover member. The retaining arrangement may include a receiving formation for receiving the free end region of the cover member complementally therein. The receiving formation may be in the form of an aperture or slot which may be sized, shaped and/or configured to receive the free end region of the cover member therethrough. The retaining arrangement may further include a retaining formation for retaining the free end region of the cover member in position relative the receiving formation. The retaining formation may include a rack-and-ratchet assembly, typically being in the form of teeth which extend from the cover member and inwardly the receiving formation

respectively. Alternatively, the retaining formation may be in the form of any suitable clamping assembly for clamping an overlaying free end region of the cover member relative itself in the pipe sealing condition.

The receiving formation may include a release mechanism for allowing the cover member to be released so as to be displaceable relative the receiving formation out of the pipe sealing condition.

A second retaining arrangement may be provided for assisting in retaining the overlaying free end region of the cover member in abutment with an overlaid portion of the cover member in the pipe sealing condition. Guides may be provided to allow the second retaining arrangement to be mounted displaceably on the cover member.

The retaining arrangements may be generally arcuate along their longitudinal and transverse axes in accordance with a curved profile defined by the pipe wrapping member in the wrapped condition. The receiving formations of the retaining arrangements may be generally arcuate in shape so as to correspond generally to the curvature of the retaining arrangements.

The pipe wrapping member may be manufactured from any suitable elastic material which may include any one or more of the group consisting of polyurethane, natural rubber, synthetic rubber and latex.

The cover member and retaining arrangements may be manufactured from any suitable plastic material which may include any one or more of the group including polypropylene, polycarbonate, polyethylene, silicone, nylon and polyvinyl chloride.

The retaining arrangements may be manufactured from a suitable metallic material.

A tightening means may be provided for tightening the cover member around the pipe wrapping member. The tightening means may include an aperture defined in the cover member for receiving an end region of a lever therethrough to allow a user to tighten the cover member in the pipe sealing condition.

DETAILED DESCRIPTION OF THE INVENTION

A sealing device for sealing a leak in a pipe in accordance with the invention will now be described by way of a non-limiting example, with reference to the accompanying drawings herebelow.

In the drawings: -

Figures 1 to 6 show perspective views of a first embodiment of a sealing device in accordance with the invention, through various stages of use;

Figure 7 shows a sectioned side view of a portion of the sealing device shown in Figure 5;

Figure 8 shows a perspective view of a second embodiment of a sealing device in accordance with the invention;

Figure 9 shows a side view of the sealing device shown in Figure 8;

Figure 10 shows a sectioned side view of the sealing device shown in Figures 8 and 9;

Figure 11 shows a perspective view of a third embodiment of a sealing device in accordance with the invention;

Figure 12 shows a side view of the sealing device shown in Figure 11;

Figure 13 shows a sectioned side view of a portion of the sealing device shown in Figures 11 and 12;

Figures 14 and 15 show enlarged perspective and front views of a portion of the sealing device shown in Figures 11 to 13;

Figures 16 and 17 show perspective views of a fourth embodiment of the sealing device in accordance with the invention;

Figure 18 shows a sectioned side view of a portion of the sealing device shown in Figures 16 and 17; and

Figures 19 to 24 show further embodiments of the sealing device in accordance with the invention.

In a first embodiment of the invention, shown in Figures 1 to 7, reference numeral **10** refers generally to a sealing device for sealing a leak **12** in a pipe **14** in accordance with the present invention.

In this embodiment, the sealing device **10** includes an elongate pipe wrapping member **16** which is configured to be wrapped around and overlay the leak **12** in the pipe **14** in a wrapped condition, a cover member **18** for covering the pipe wrapping member **16** substantially in the wrapped condition and a retaining arrangement **20** for retaining the cover member **18** and with it, the pipe wrapping member **16** in position relative the pipe **14** in a pipe sealing condition.

A connecting arrangement **22** is provided for allowing releasable interconnection between the pipe wrapping member **16** and the cover member **18**. The connecting arrangement **22** includes a receiving portion in the form of an elongate slot **24** for receiving the pipe wrapping member **16** complementally therethrough. The elongate slot **24** is sized, shaped and configured to allow displacement of the cover member **18** relative the pipe wrapping member **16** to facilitate substantial overlaying of the pipe wrapping member **16** in the wrapped condition by the cover member **18**. The elongate slot **24** is configured to receive and retain an end region **28** of the pipe wrapping member **16** complementally therein. Typically, the elongate slot **24** extends substantially the length of the cover member **18**.

The cover member **18** is generally arcuate or C-shaped along its length or in cross-section so as to correspond with the curvature of the pipe **14** to be sealed or repaired. The cover member **18** is sized so as to allow it to overlay the pipe wrapping member **16** in the wrapped condition, preferably having a width that allows a free end region **30** of the cover member **18** to overlay itself in the pipe sealing condition.

The retaining arrangement **20** is mounted on the cover member **18**. The retaining arrangement **20** includes a receiving formation in the form of an aperture or elongate slot **32** for receiving the free end region **30** of the cover member **18** complementally therethrough. The retaining arrangement **20** further includes a retaining formation in the form of a rack-and-ratchet assembly **36** for retaining the free end region **30** of the cover member **18** in position relative the elongate slot **32**. More particularly, the rack-and-ratchet assembly **36** includes teeth **38** and **39** which extend from the cover member **18** and inwardly the elongate slot **32** respectively.

A release mechanism **40** is provided for allowing the cover member **18** to be released and displaceable relative the elongate slot **32** in the pipe sealing condition.

A second retaining arrangement **42** is provided for assisting in retaining an overlaying free end region **44** of the cover member **18** in position relative an overlaid portion **46** of the cover member **18** in the pipe sealing condition and which includes an elongate slot **43** similar to elongate slot **32**. Guides **48** are provided to allow the second retaining arrangement **42** to be mounted displaceably on the cover member **18**.

The retaining arrangements **20** and **42** are generally arcuate along their longitudinal and transverse lengths to correspond generally to the curve of the pipe wrapping member **16** in the wrapped condition. The elongate slots **32** and **43** of the

retaining arrangements **20** and **42** are generally arcuate in shape along their length so as to correspond generally to the curvature of the retaining arrangements **20** and **42**.

A tightening means in the form of a plurality of tightening apertures **50** are provided for facilitating tightening of the cover member **18** around the pipe wrapping member **16** in the pipe sealing condition. The tightening apertures **50** are defined in the cover member **18** for receiving an end region **52** of a lever **54** therethrough to allow a user to tighten the cover member **18** in the pipe sealing condition.

In use, and as shown in Figures 1 to 4, a user wraps the pipe wrapping member **16** around the leak **12** in the pipe **14** and then proceeds to align the cover member **18** and the pipe wrapping member **16** to allow the cover member **18** to substantially overlay the pipe wrapping member **16**. As shown in Figures 5 to 7, the user then feeds the free end region **30** of the cover member **18** through the elongate slot **32** of the retaining arrangement **20** so as to overlay the free end region **30** of the cover member **18** over itself and to allow complementary retaining engagement of the teeth **38** and **39** so as to retain the free end region **30** of the cover member **18** in position relative the elongate slot **32**. As shown in Figure 6, the user then continues to tighten the cover member **18** over itself and feeds the overlaying free end region **44** into and through the elongate slot **43** of the second retaining arrangement **42** so as to overlay the free end region **30** of the cover member **18** over itself and to allow complementary retaining engagement of the teeth **38** and teeth (not shown) defined in the second retaining arrangement **42** so as to retain the free end region **30** of the cover member **18** in position relative the elongate slot **32.** Additionally, the second retaining arrangement

42 allows a user to retain the free end region **30** in substantial abutment with the overlaid portion **46** of the cover member **18.**

The teeth (not shown) of the second retaining arrangement **42** then engage the teeth **38** overlaying free end region **44** of the cover member **18** and the guides **48** allow the user to slide the second retaining arrangement **42** along the cover member **18** thereby pulling the overlaying free end region **44** and tightening the cover member **18** on the pipe wrapping member **16** in the pipe sealing condition.

Referring now to a second embodiment of the invention, as shown in Figures 8 to 10, reference numerals **118** and **120** refer generally to a cover member and a retaining arrangement of a sealing device in accordance with the invention. In this embodiment, an elongate slot **124** is defined in the retaining arrangement **120** substantially parallel an elongate slot or aperture **132**.

Shoulders **156** are defined in the cover member **118** at opposing transverse end regions **158** thereof for allowing guides (not shown) of the second retaining arrangement (not shown) to be received therein and slide onto the cover member **118**.

Referring now to a third embodiment of the invention, as shown in Figures 11 to 15, reference numeral **218** and **220** refer generally to a cover member and a retaining arrangement a sealing device in accordance with the invention. In this

embodiment, an elongate slot **224** is defined in the cover member **218** and extends substantially the length of an overlaid portion **246** thereof.

Referring now to a fourth embodiment of the invention, as shown in Figures 16 to 18, reference numeral **318** and **320** refer generally to a cover member and a retaining arrangement of a sealing device in accordance with the invention. In this embodiment, an elongate slot **324** of the connecting arrangement **322** is defined in a wall **360** of the retaining arrangement **320** along the length thereof. The elongate slot **324** extends between opposing transverse end walls **362** of the retaining arrangement **320**. The elongate slot **324** is substantially **bulbous**-shaped in cross-section so as to receive and retain an end region **328** of a pipe wrapping member **316** therein.

Teeth **364** are defined on an outer region **366** of the cover member **318** to engage with teeth (not shown) in a second retaining arrangement **342** to further assist with tightening of the cover member **318** over the pipe wrapping member **316**.

Referring now to a fifth embodiment of the invention, as shown in Figure 19, reference numeral **410** refers generally to sealing device in accordance with the invention. In this embodiment, a second retaining arrangement is in the form of a rack-and-ratchet assembly **436** which extends along the length of a cover member **418**.

Referring now to a sixth embodiment of the invention, as shown in Figure 20, reference numeral **510** refers generally to sealing device in accordance with the

invention. In this embodiment, a second retaining arrangement is in the form of a rack-and-ratchet assembly **536** which extends along the length of a cover member **518** and includes ridges **568** defined on an outer region **566** of the cover member **518** which engage complementally and releasably with a ridge engaging portion **568** of the rack-and-ratchet assembly **536**.

Referring now to a seventh embodiment of the invention, as shown in Figure 21, reference numeral **610** refers generally to sealing device in accordance with the invention. In this embodiment, a second retaining arrangement is in the form of a rack-and-ratchet assembly **636** which is located substantially centrally a cover member **618** and has a width smaller than the length of the cover member **618.**

Referring now to an eighth embodiment of the invention as shown in Figure 22, reference numerals **718** and **720** refer generally to a cover member and a retaining arrangement of a sealing device in accordance with the invention. In this embodiment, the retaining arrangement is in the form of a nut and bolt arrangement **770** for retaining a cover member **718** and with it, a pipe wrapping member (not shown) in position relative a pipe (not shown) in a pipe sealing condition.

Referring now to **a ninth embodiment** of the invention, as shown in Figures 23 and 24, reference numeral **810** refers generally to sealing device in accordance with the invention, for sealing a leak in a curved portion of a pipe such as an elbow. In this embodiment, retaining arrangements **820** and **842** and a cover member **818** have a width substantially equal to the width of a pipe wrapping member **816.**

The pipe wrapping members **16, 216, 316, 416, 516, 616 and 816** are manufactured from a suitable elastic material which includes any one or more of the group consisting of polyurethane, natural rubber, synthetic rubber and latex.

The cover members **18, 118, 218, 318, 418, 518, 618, 718** and **848,** and retaining arrangements **20, 120, 220, 320, 420 ,520 620, 720 and 820,** and **42, 442, 542, 642** and **842** are manufactured from a suitable plastic material which includes any one or more of the group including polypropylene, polycarbonate, polyethylene, silicone, nylon and polyvinyl chloride.

Although only certain embodiments of the invention have been described herein, it will be understood by any person skilled in the art that other modifications, variations, and possibilities of the invention are possible. Such modifications, variations and possibilities are therefore to be considered as falling within the spirit and scope of the invention and hence form part of the invention as herein described and/or exemplified. It is further to be understood that the examples are provided for illustrating the invention further and to assist a person skilled in the art with understanding the invention and is not meant to be construed as unduly limiting the reasonable scope of the invention.

The inventor regards it as an advantage that the invention may provide a simple and/or cost-effective solution for sealing a leak in a pipe with an elastic material without

the need to use additional parts, such as cable ties, to assist in sealing the leak in the pipe. The inventor regards it as a further advantage that the invention provides an elastic pipe wrapping member which is configured to form to the shape of the pipe thereby ensuring that the leak is covered and sealed.

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CLAIMS

1. A sealing device for sealing a leak in a pipe which includes: -

an elongate pipe wrapping member which is configured to be wrapped around and overlay a leak in a pipe in a wrapped condition;

a cover member for covering the pipe wrapping member substantially in the wrapped condition; and

a retaining arrangement for retaining the cover member and with it, the pipe wrapping member in position relative the pipe in a pipe sealing condition.

2. A sealing device as claimed in claim 1 wherein a connecting arrangement is provided for allowing interconnection between the pipe wrapping member and the cover member.

3. A sealing device as claimed in claim 2 wherein the connecting arrangement includes a receiving portion for receiving the pipe wrapping member complementally therein.

4. A sealing device as claimed in claim 3 wherein the receiving portion is sized, shaped and configured to allow displacement of the cover member relative the pipe wrapping member to facilitate substantial overlaying of the pipe wrapping member in the wrapped condition by the cover member.

5. A sealing device as claimed in claim 3 or 4 wherein the receiving portion is in the form of any one of the group including an elongate pin, channel, slot, aperture, groove or recess defined in the cover member which is configured to receive and retain an end region of the pipe wrapping member complementally therein so as to allow the receiving portion to be displaceable relative the pipe wrapping member.

6. A sealing device as claimed in claim 5 wherein the elongate pin, channel, slot, aperture, groove or recess extends substantially the length of the cover member.

7. A sealing device as claimed in any one or more of the preceding claims wherein the cover member is generally arcuate and/or C-shaped in cross section so as to correspond with the curvature of the pipe to be sealed.

8. A sealing device as claimed in claim 7 wherein the cover member is sized so as to allow it to overlay the pipe wrapping member in the wrapped condition.

9. A sealing device as claimed in claim 7 or 8 wherein the cover member has a width that allows a free end region of the cover member to overlay itself at least partially in the pipe sealing condition.

10. A sealing device as claimed in any one or more of the preceding claims wherein the retaining arrangement is mounted on the cover member.

11. A sealing device as claimed in any one or more of the preceding claims wherein the retaining arrangement includes a receiving formation for receiving a free end region of the cover member complementally therein.

12. A sealing device as claimed in claim 11 wherein the receiving formation is in the form of an elongate slot which is sized, shaped and/or configured to receive the free end region of the cover member therethrough.

13. A sealing device as claimed in claims 11 or 12 wherein the retaining arrangement further includes a retaining formation for retaining the free end region of the cover member in position relative the receiving formation.

14. A sealing device as claimed in claim 13 wherein the retaining formation includes a rack-and-ratchet assembly.

15. A sealing device as claimed in claim 13 or 14 wherein the rack-and-ratchet assembly is in the form of teeth which extend from the cover member and inwardly the receiving formation respectively.

16. A sealing device as claimed in any one or more of the preceding claims wherein a release mechanism is provided for allowing the cover member to be released so as to be displaceable relative the receiving formation out of the pipe sealing condition.

17. A sealing device as claimed in any one or more of the preceding claims wherein a second retaining arrangement is provided for assisting in retaining the overlaying

free end region of the cover member in abutment with an overlaid portion of the cover member in the pipe sealing condition.

18. A sealing device as claimed in any one or more of the preceding claims wherein the retaining arrangements are generally arcuate along their longitudinal and transverse axes in accordance with a curved profile defined by the pipe wrapping member in the wrapped condition.

19. A sealing device as claimed in any one or more of the preceding claims wherein the pipe wrapping member is manufactured from any one or more suitable elastic materials of the group consisting of polyurethane, natural rubber, synthetic rubber and latex

20. A sealing device as claimed in any one or more of the preceding claims wherein the cover member and retaining arrangements are manufactured from any one or more suitable plastic materials of the group including polypropylene, polycarbonate, polyethylene, silicone, nylon and polyvinyl chloride

21. A sealing device as claimed in any one or more of the preceding claims wherein a tightening means is provided for tightening the cover member around the pipe wrapping member.

22. A sealing device, according to the invention, substantially as hereinbefore described or exemplified.

23. A sealing device, as specifically described with reference to or as illustrated in any one of the accompanying drawings.

24. A sealing device, including any new or inventive integer or combination of integers, substantially as hereinbefore described.

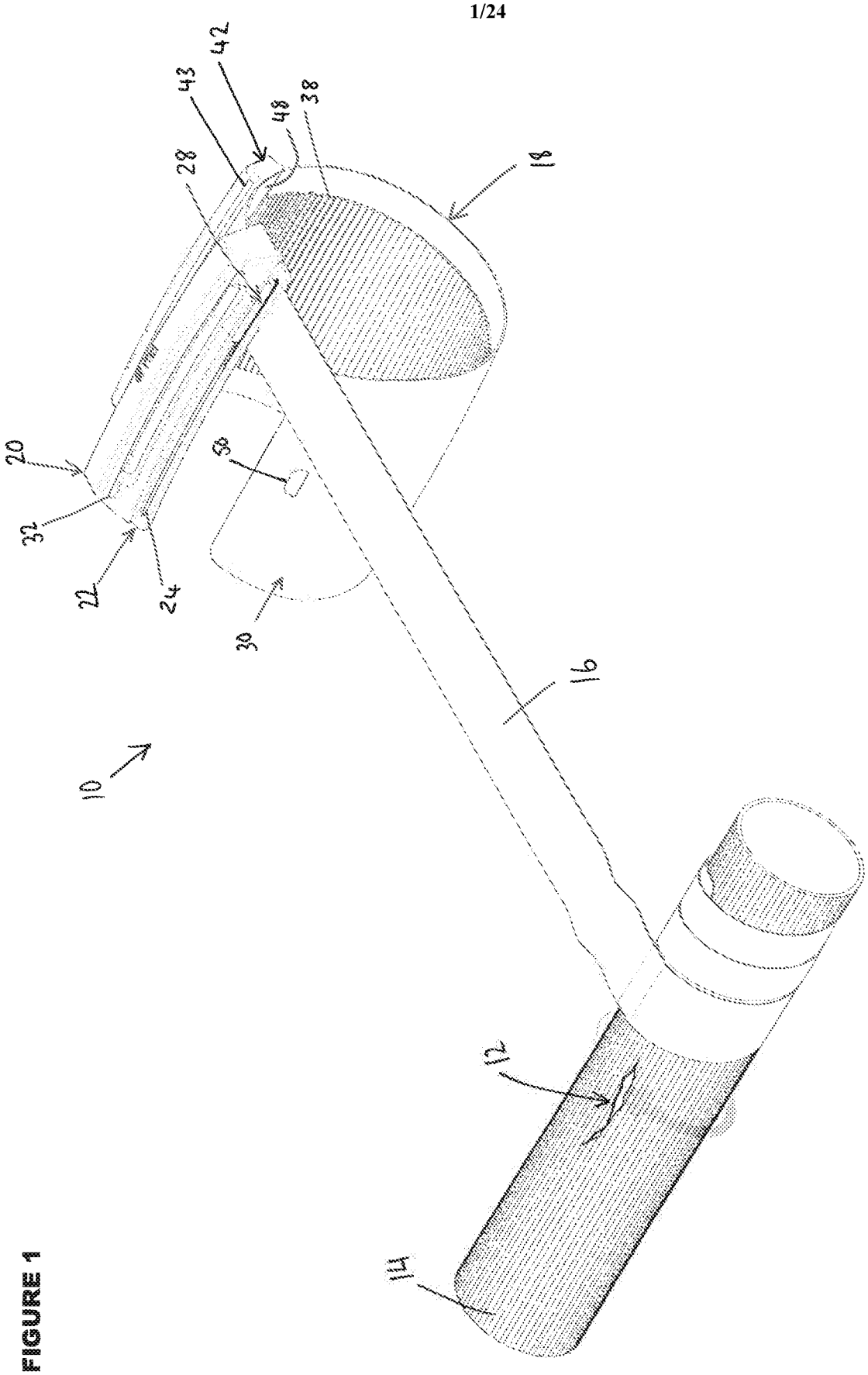

FIGURE 1

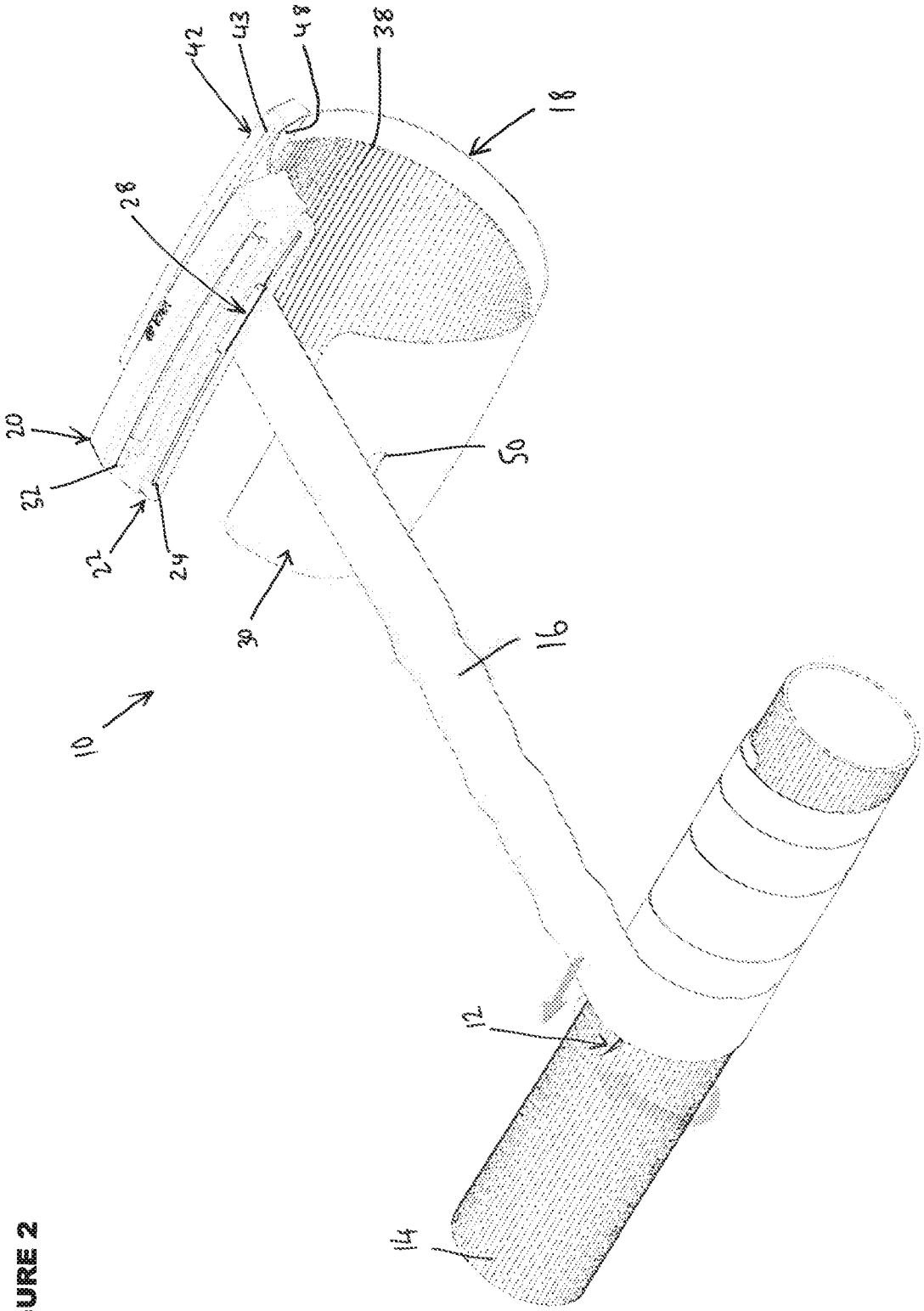

FIGURE 2

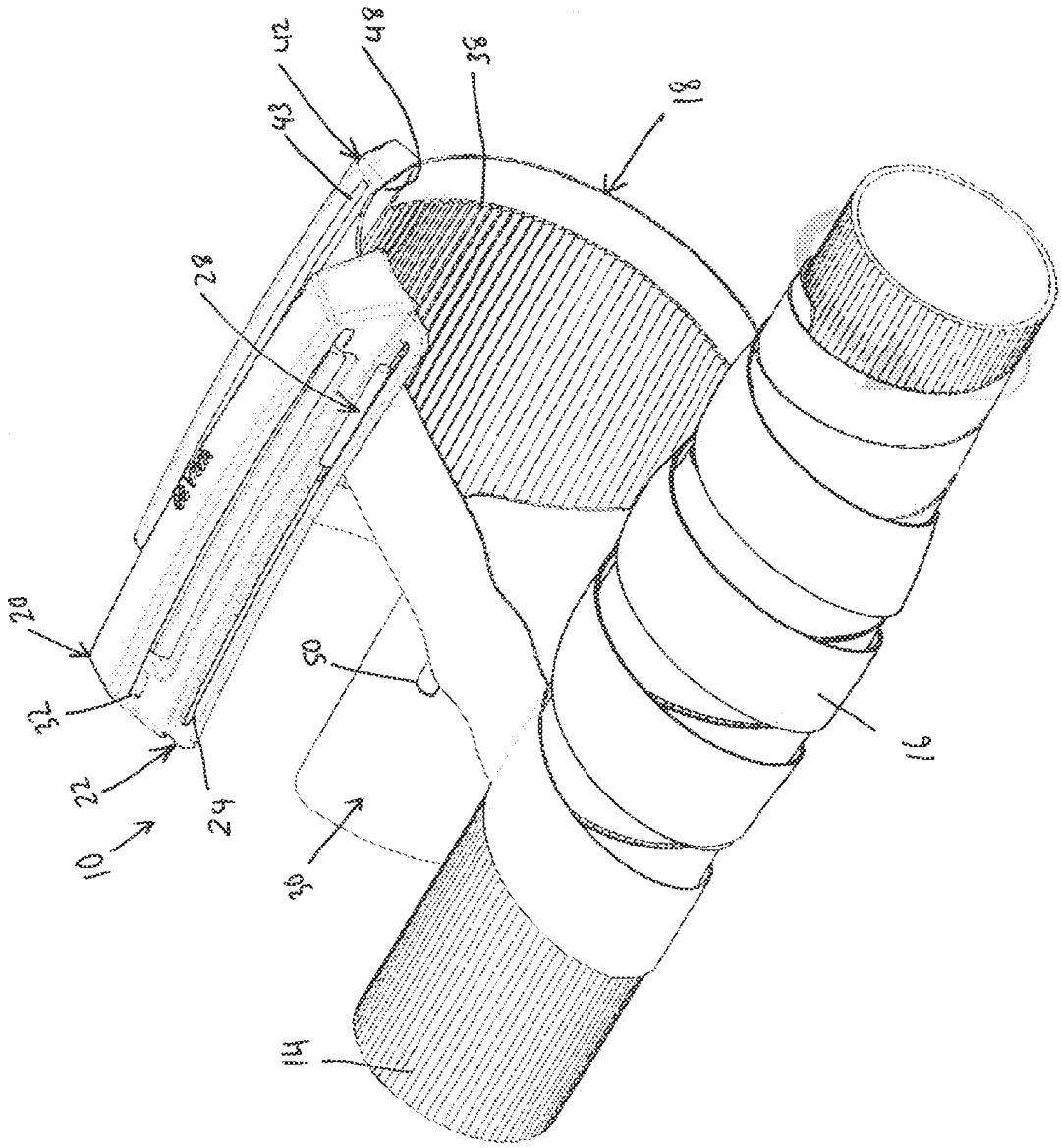

FIGURE 3

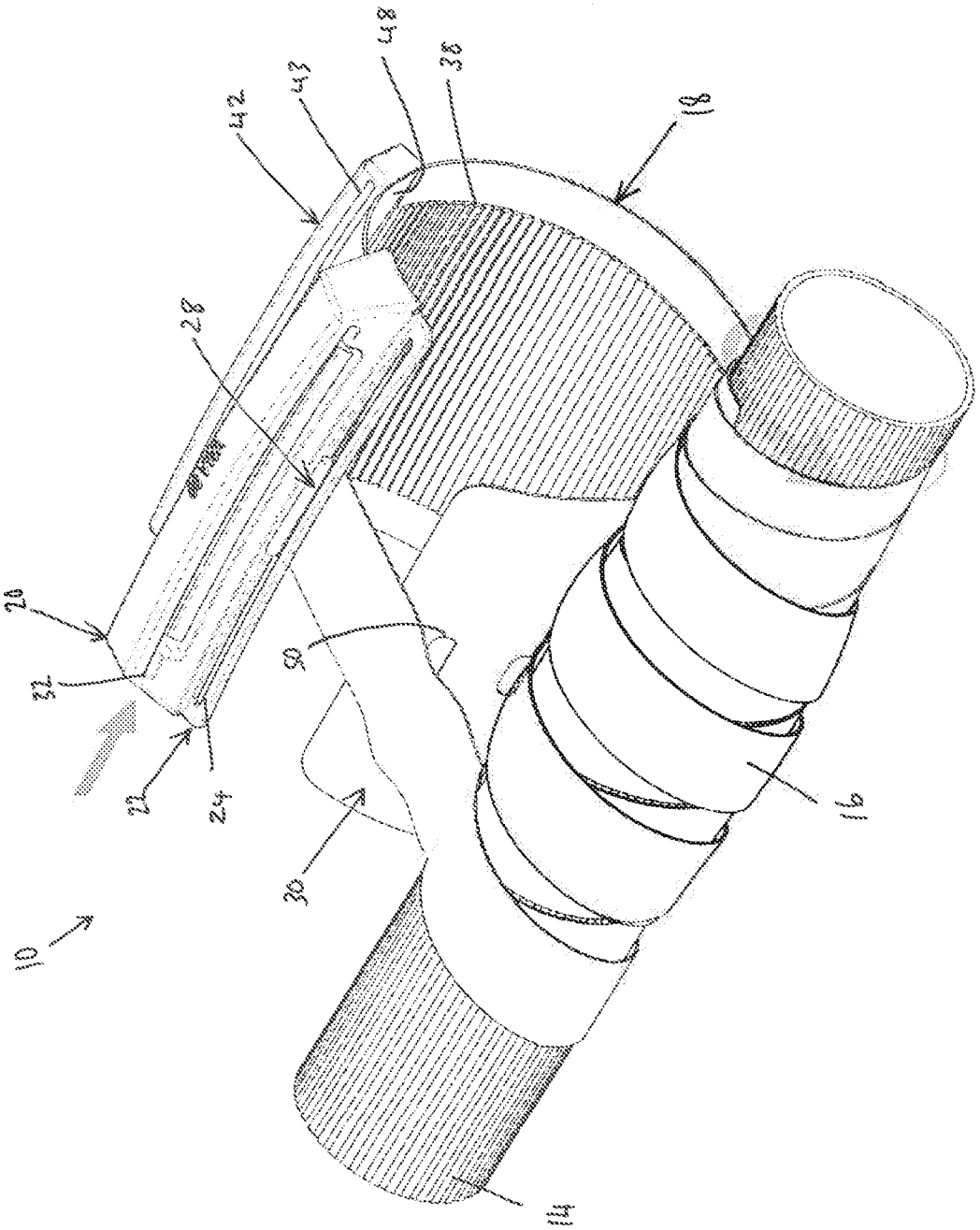

FIGURE 4

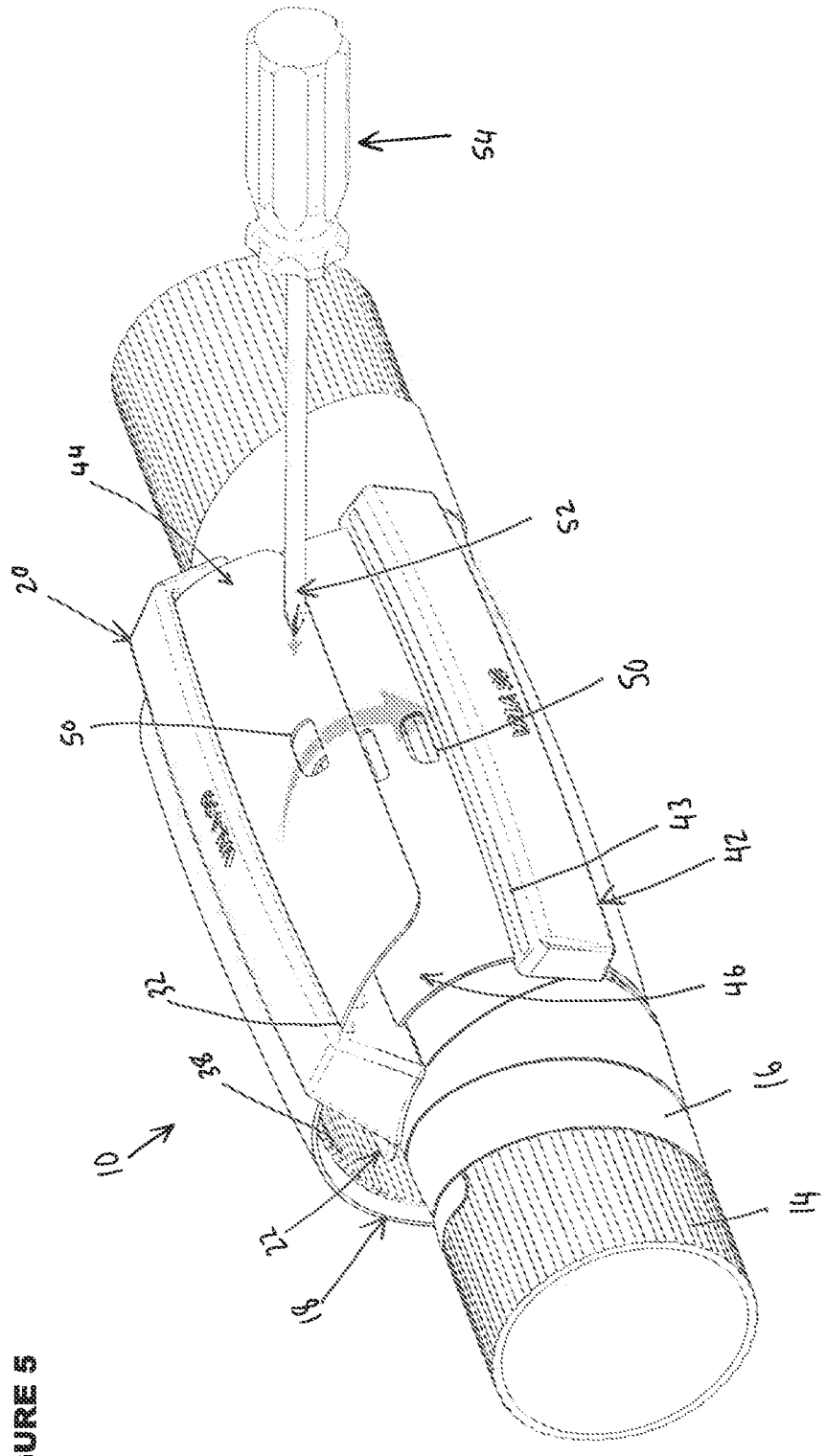

FIGURE 5

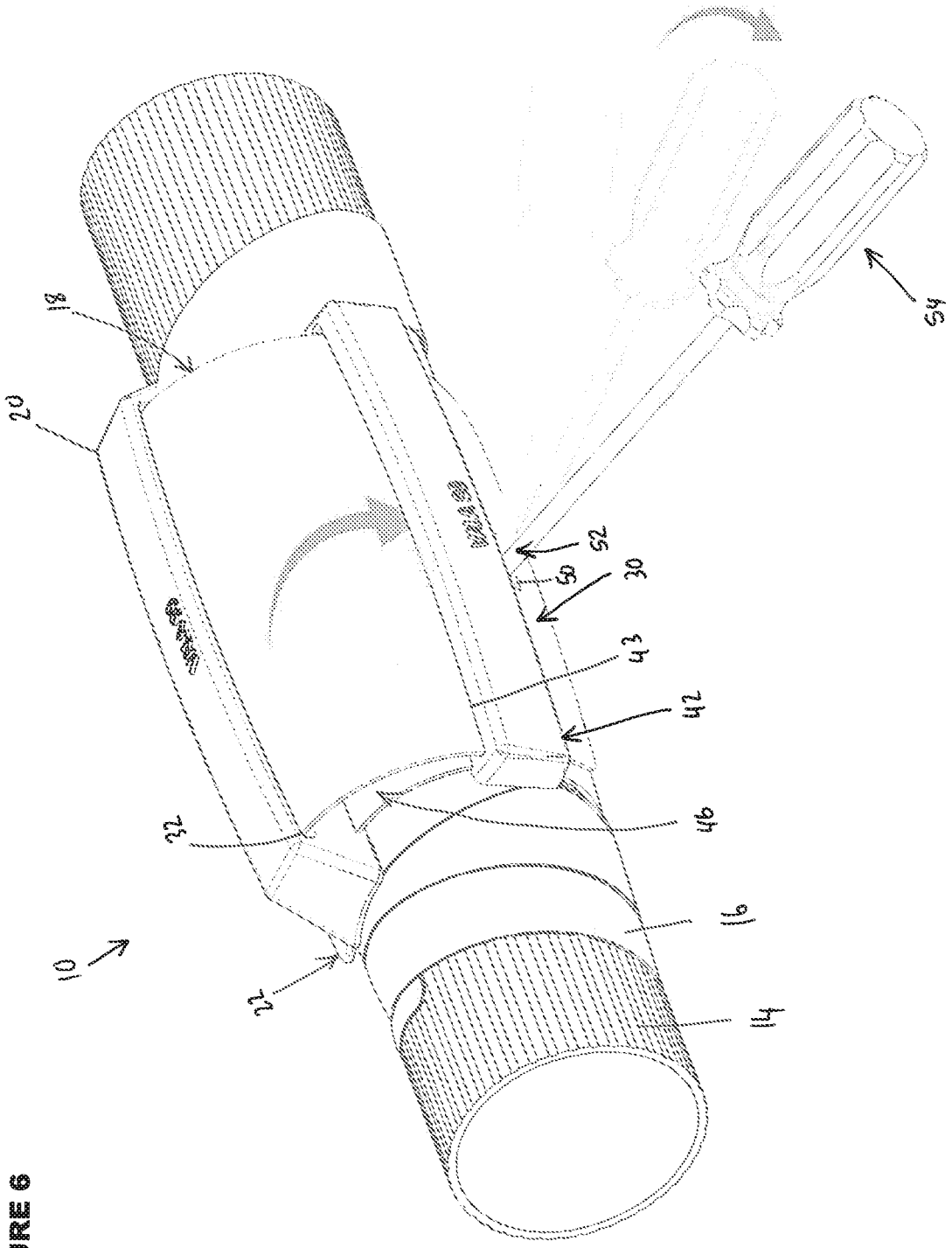

FIGURE 6

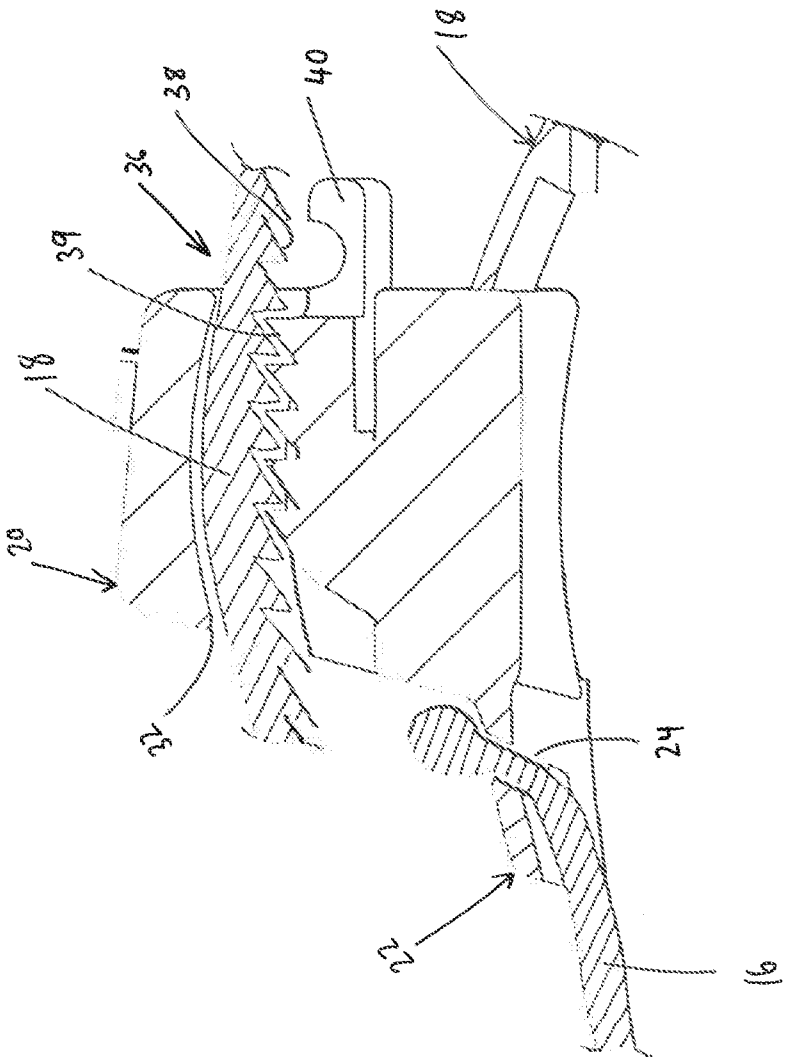

FIGURE 7

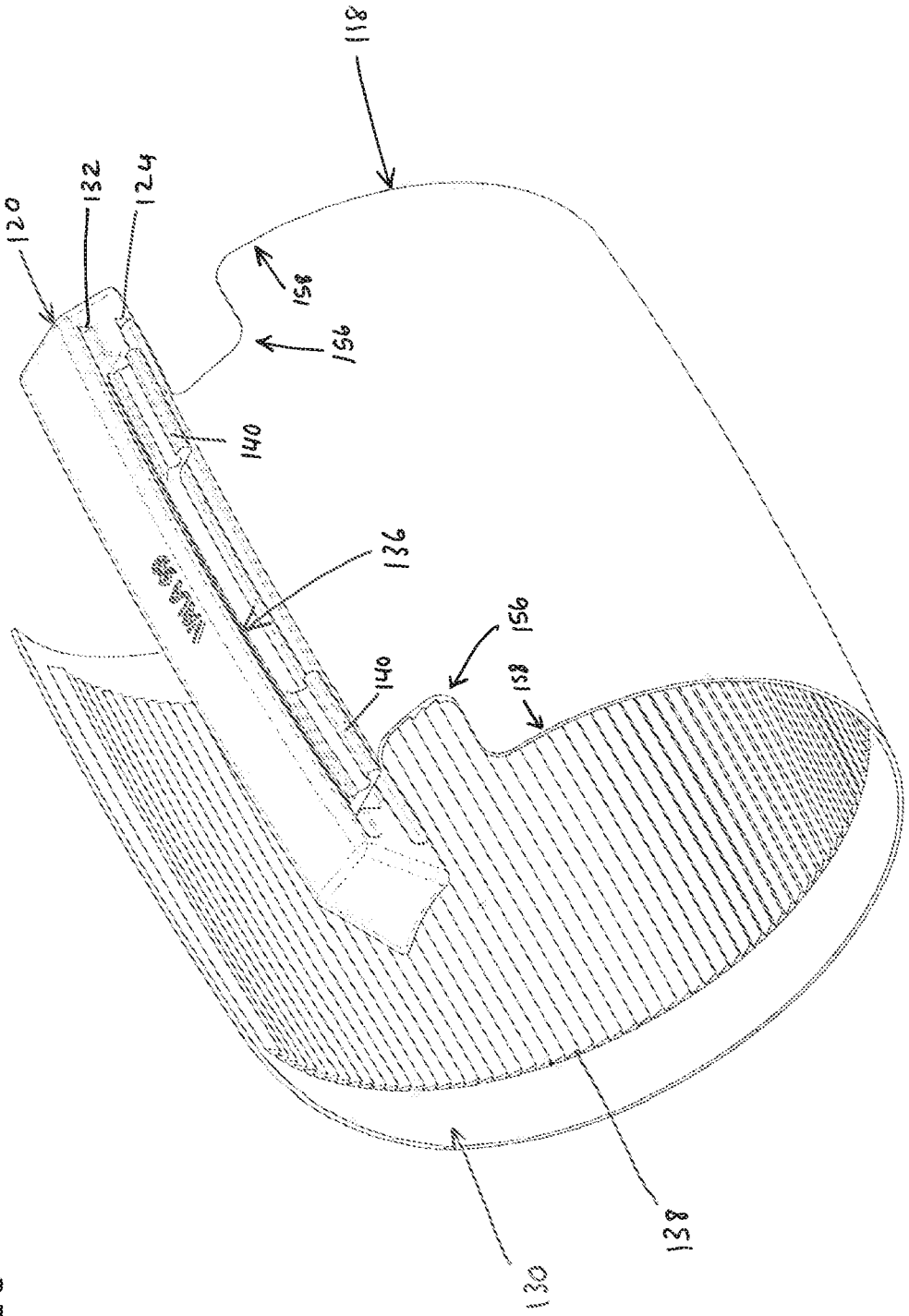

FIGURE 8

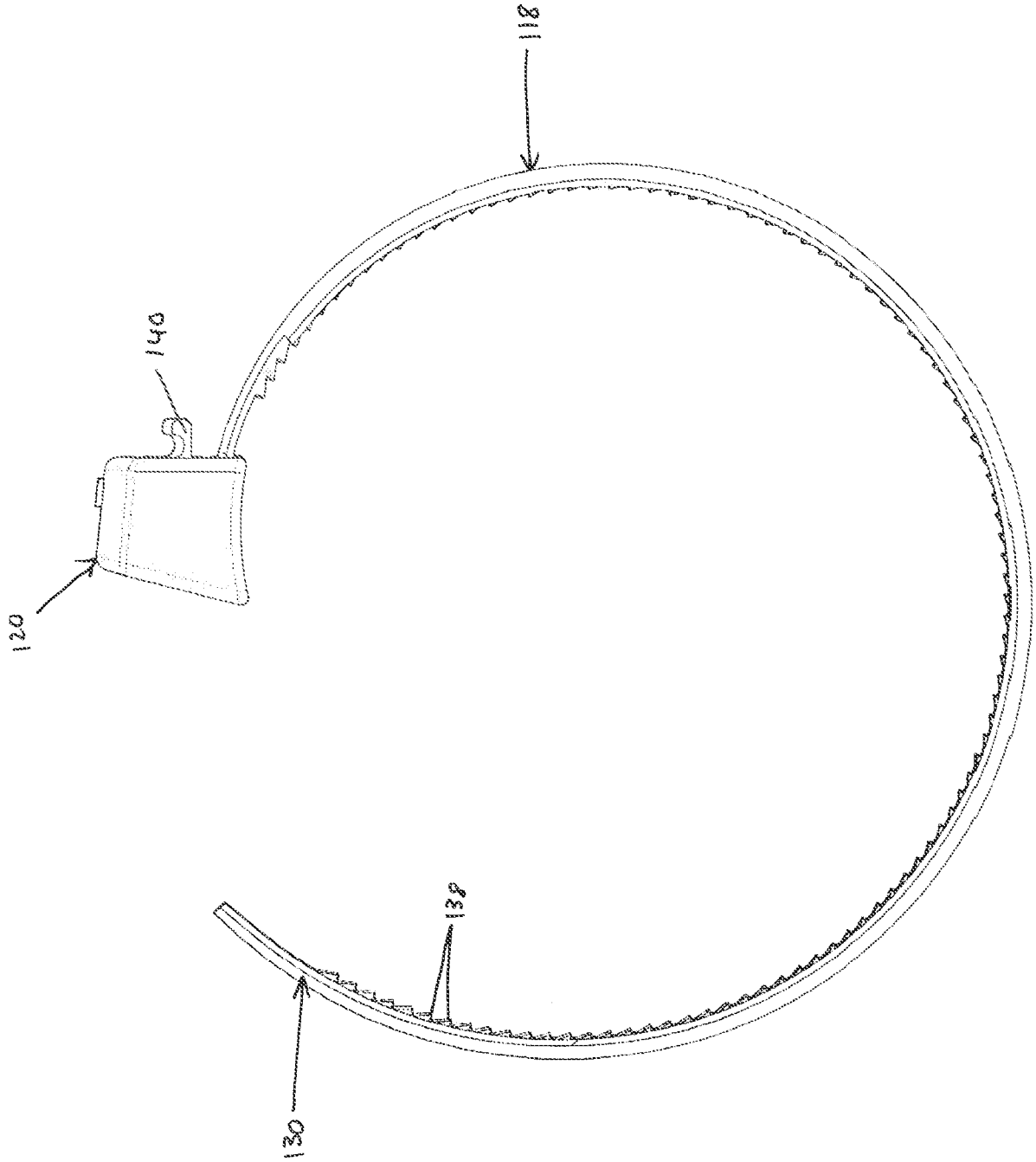

FIGURE 9

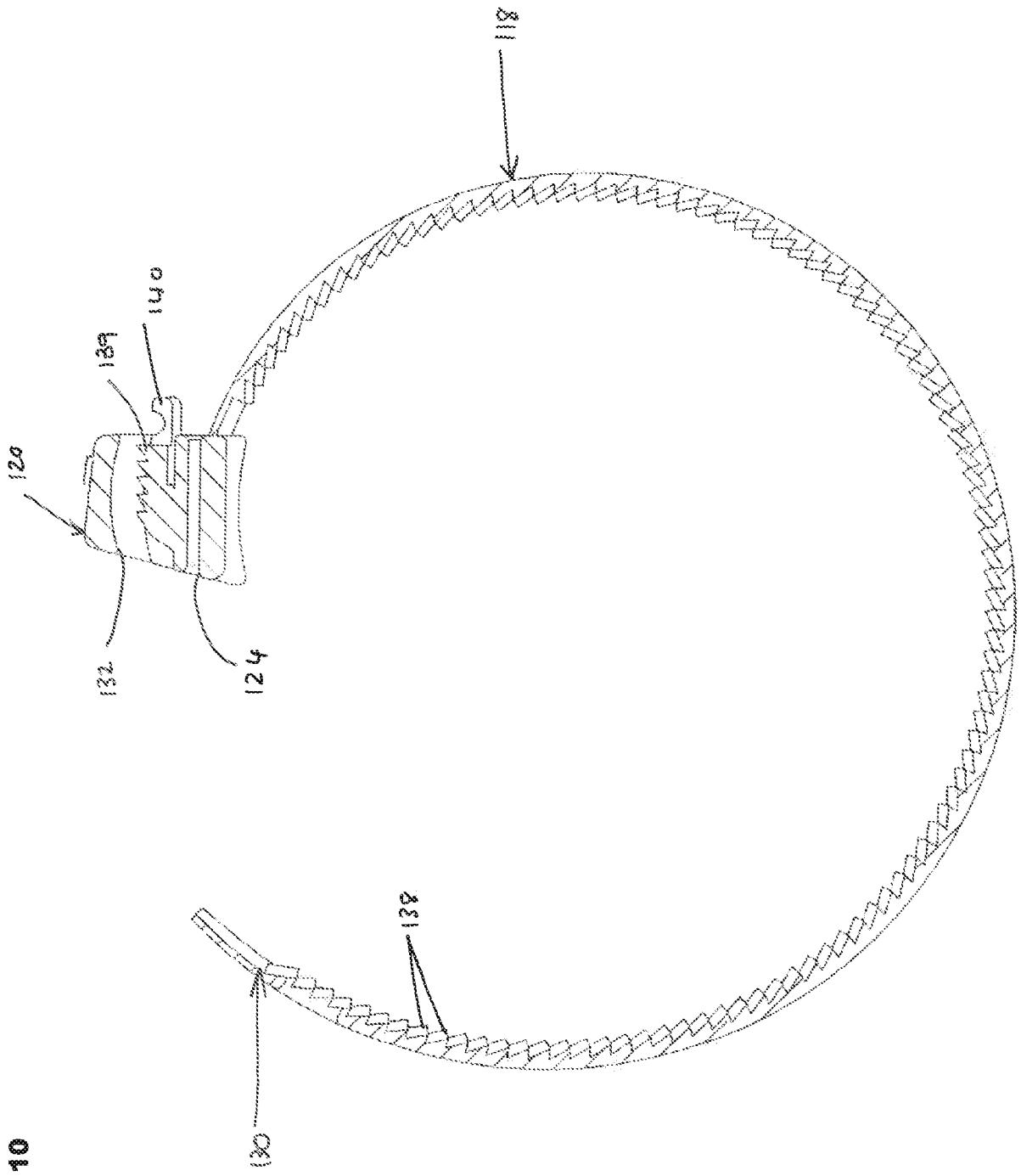

FIGURE 10

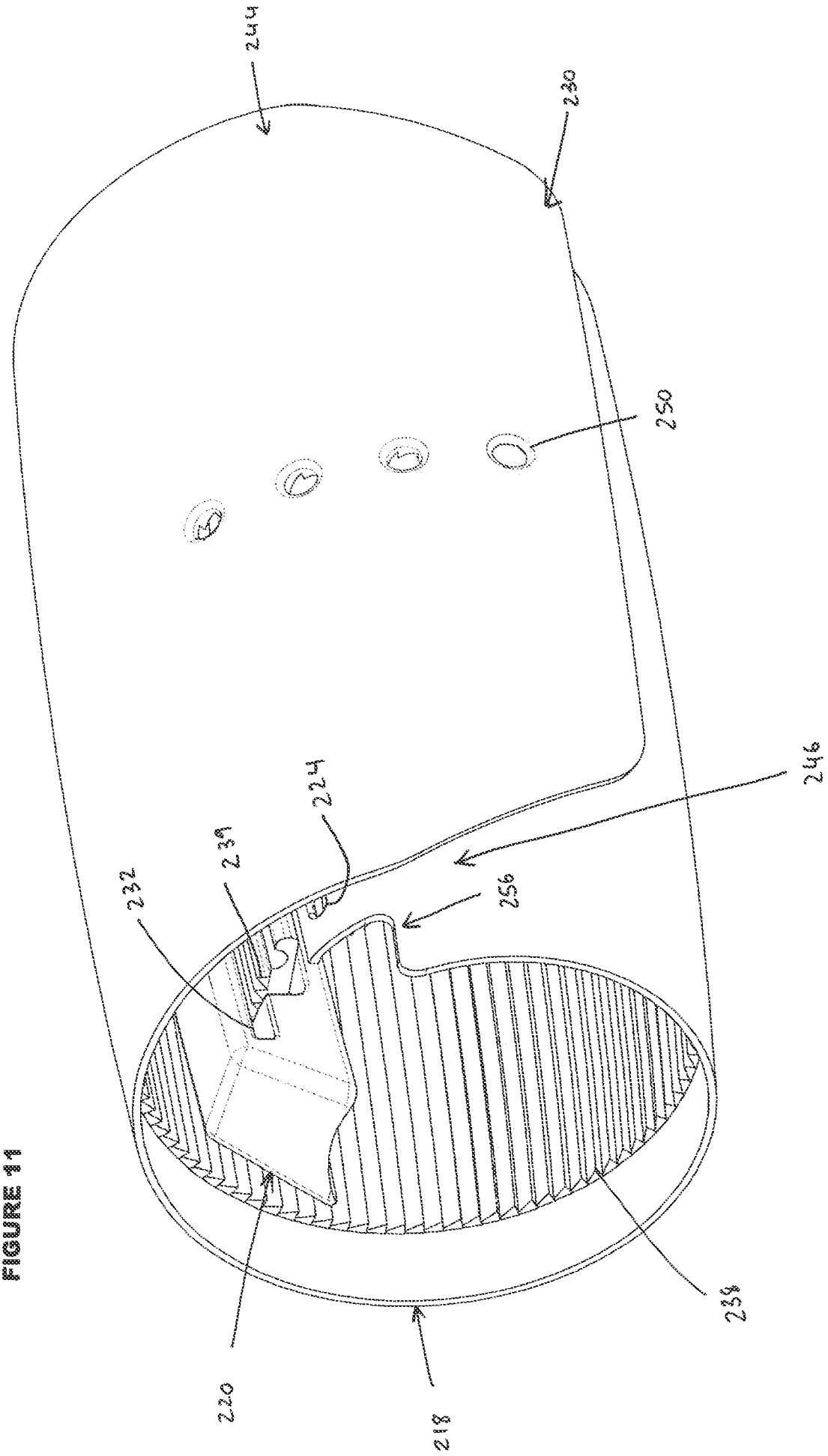

FIGURE 11

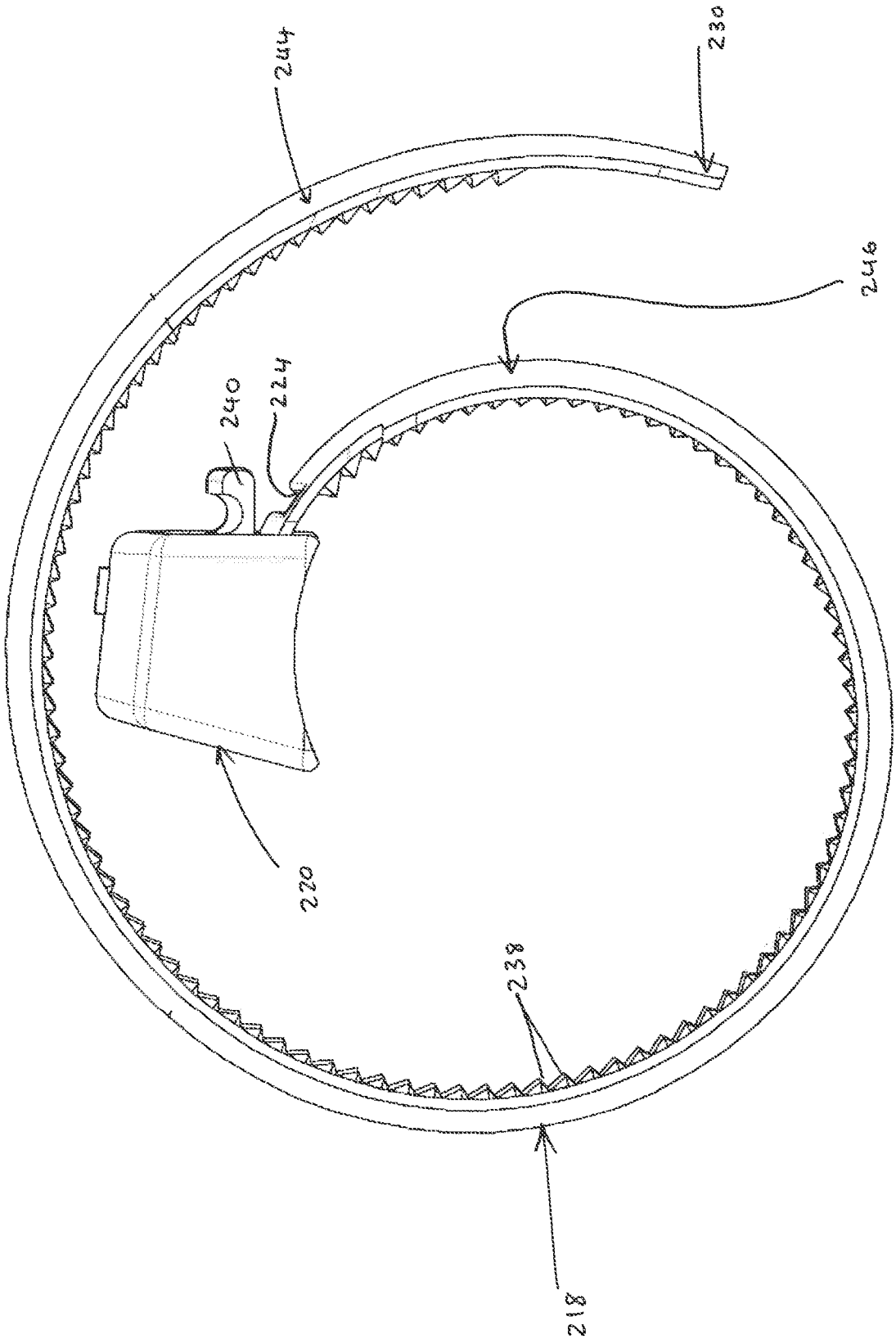

FIGURE 12

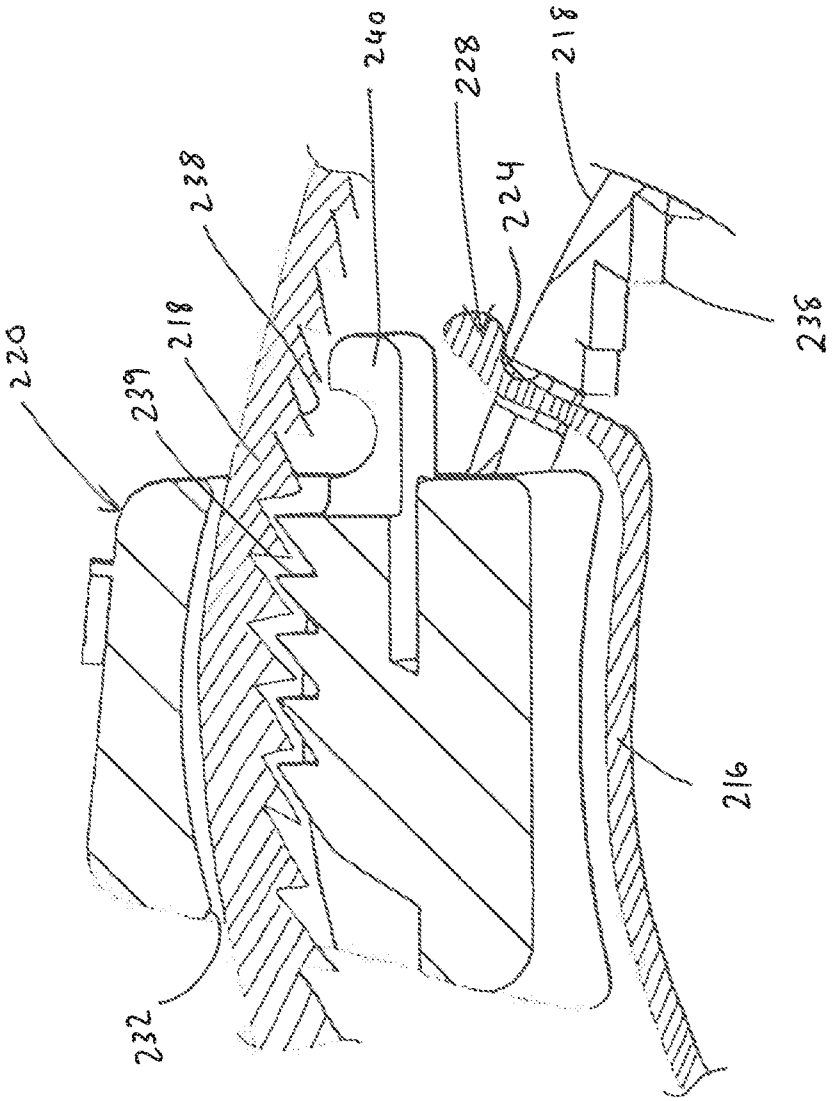

FIGURE 13

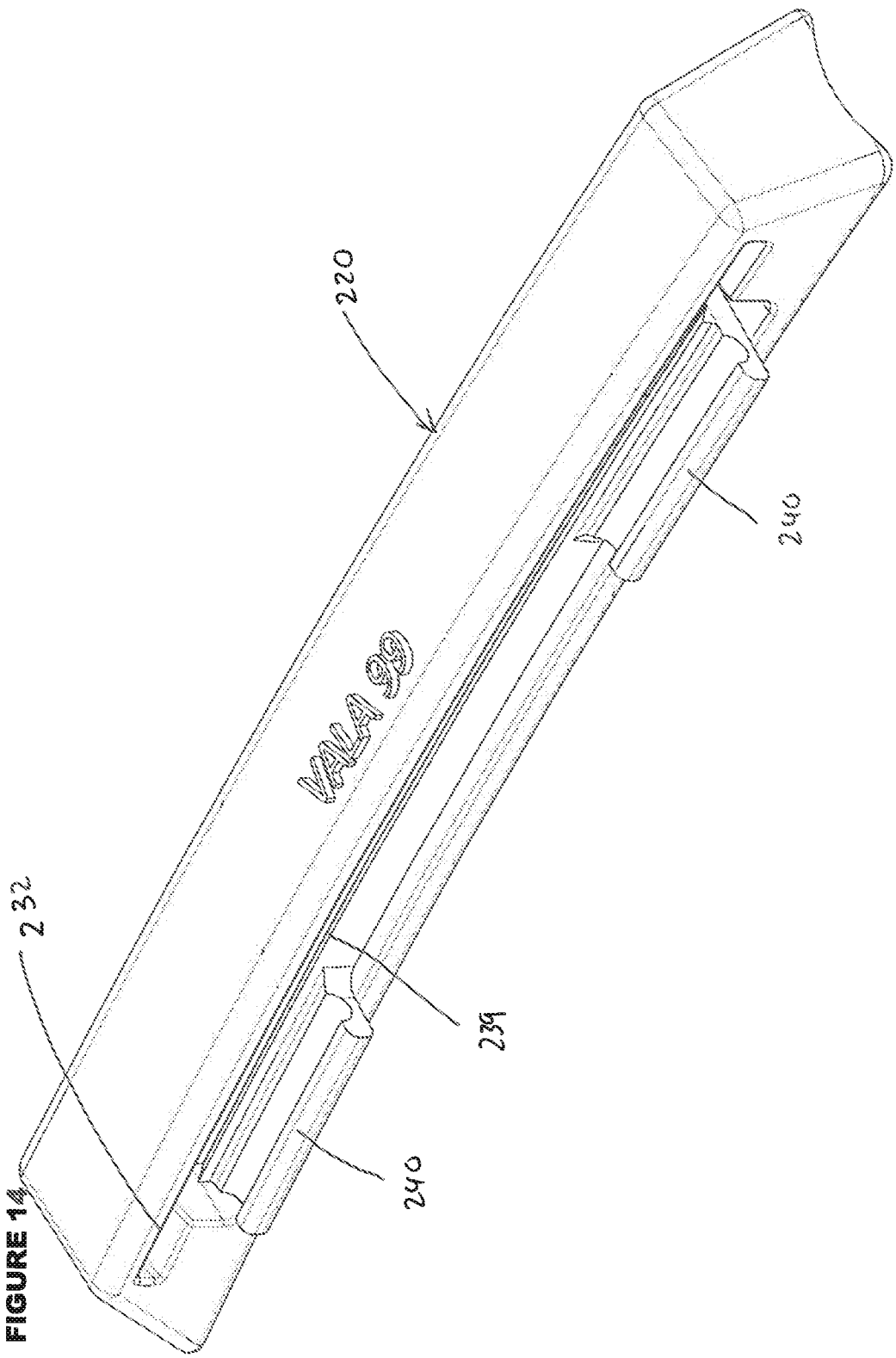

FIGURE 14

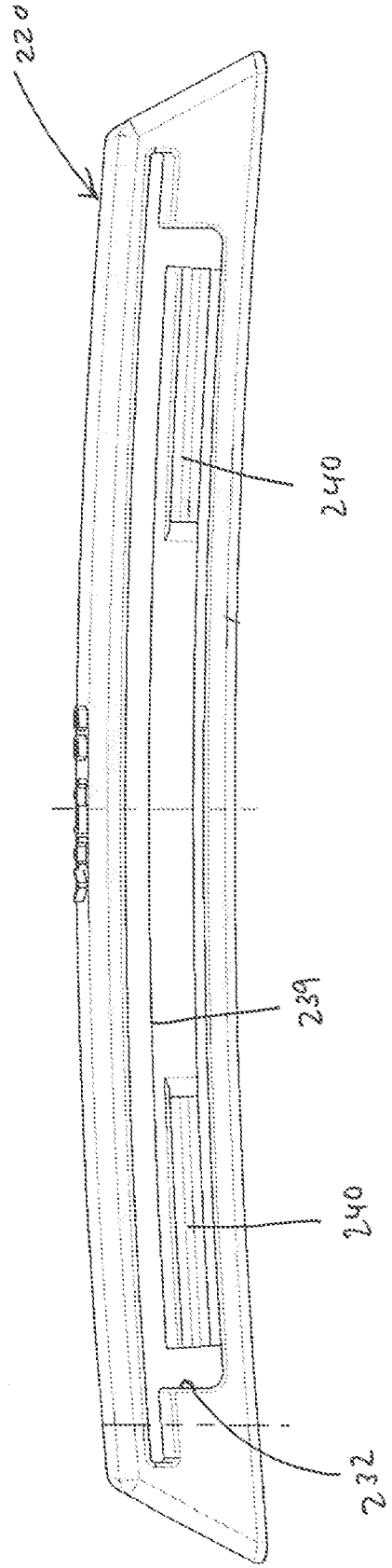

FIGURE 15

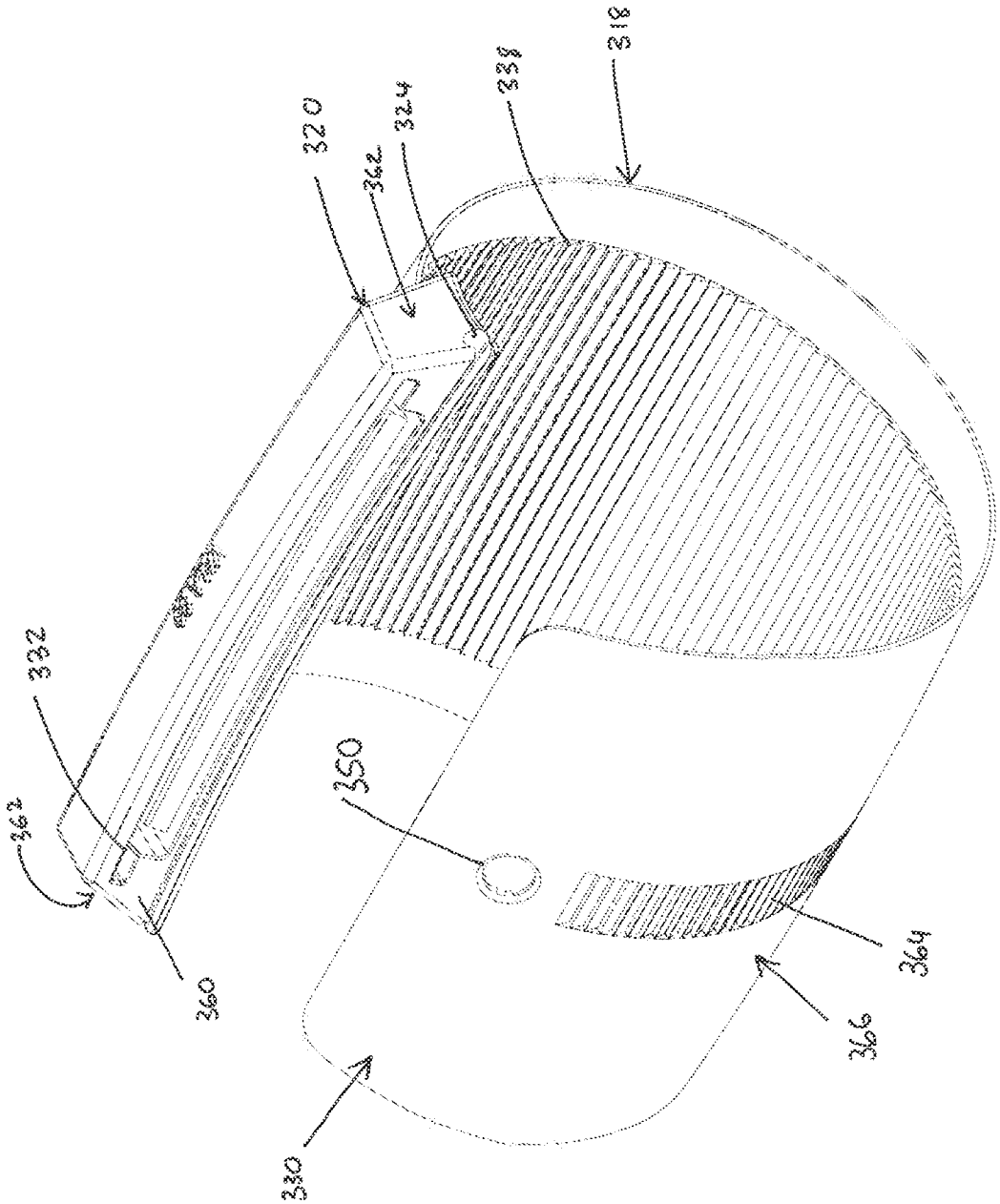

FIGURE 16

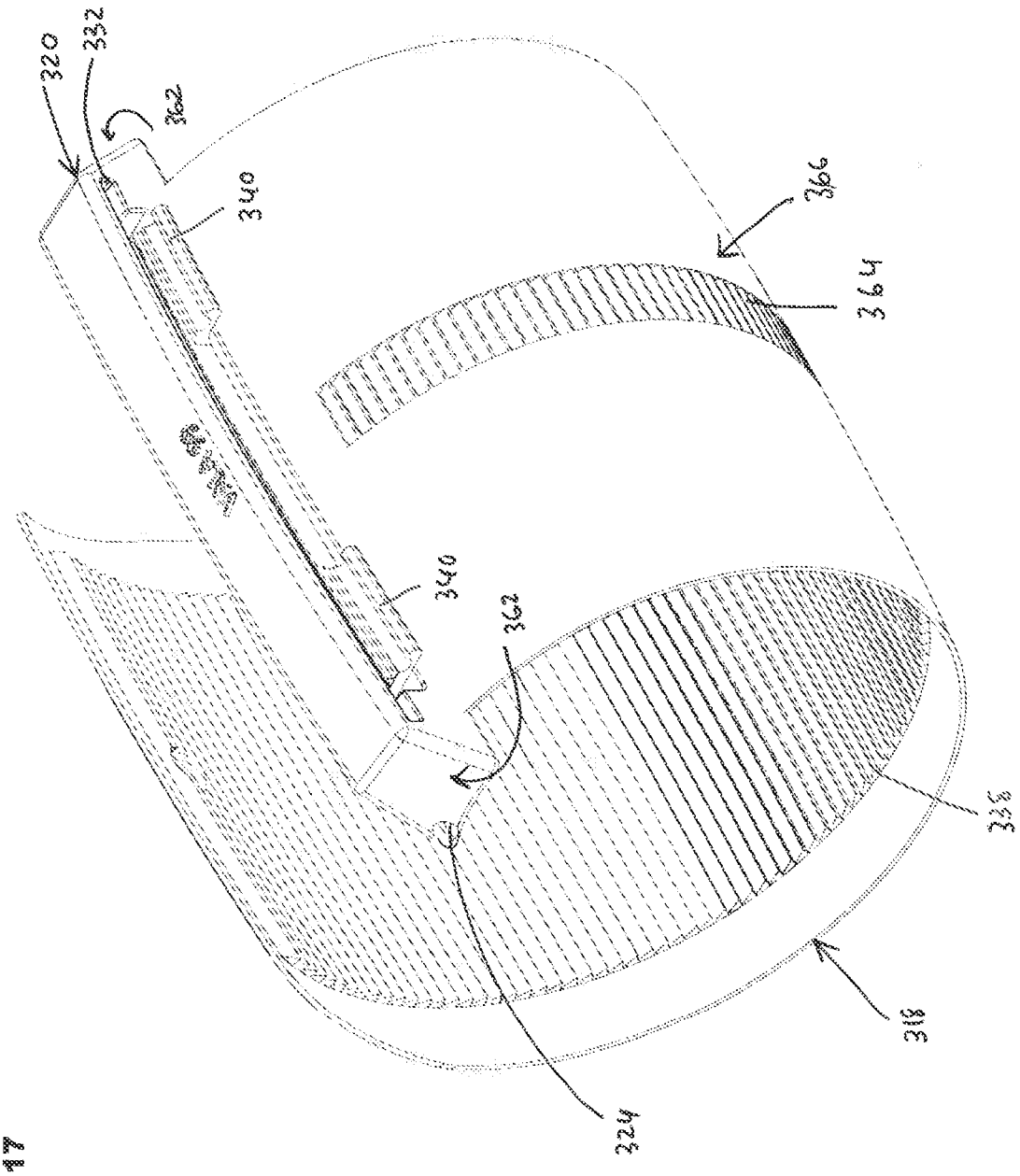

FIGURE 17

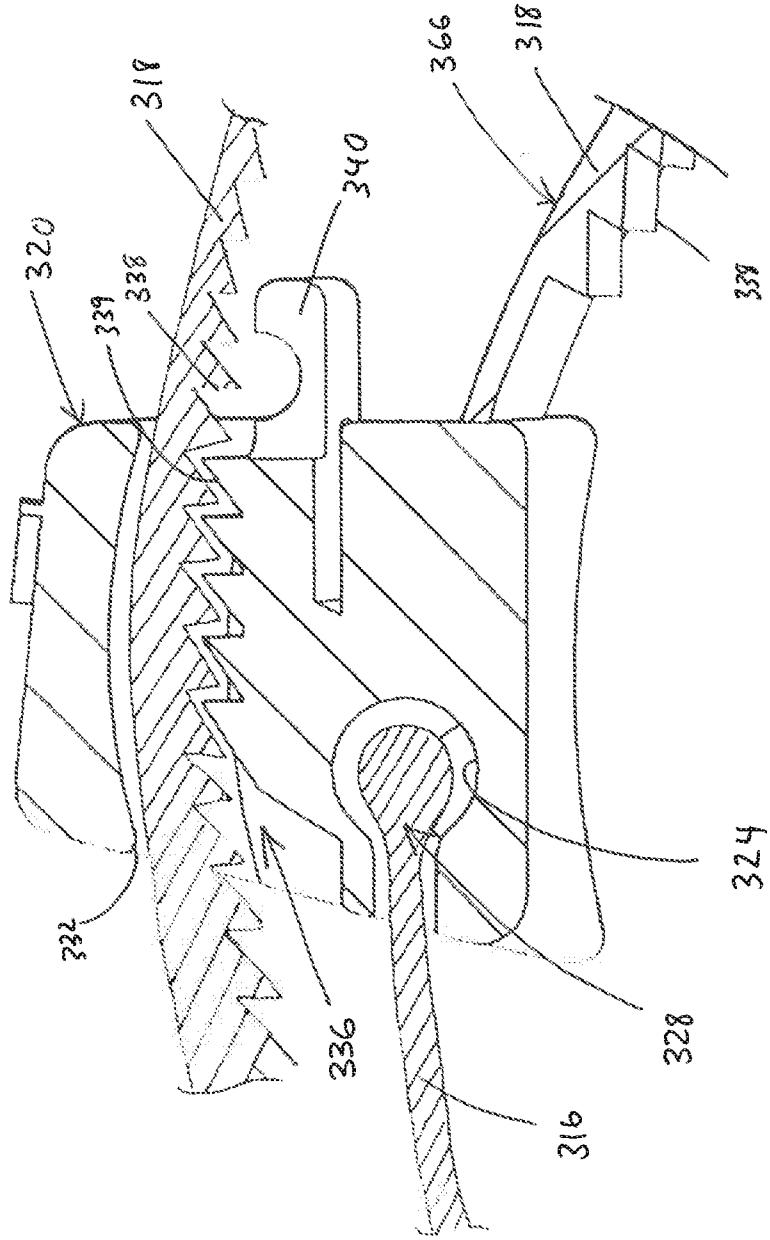

FIGURE 18

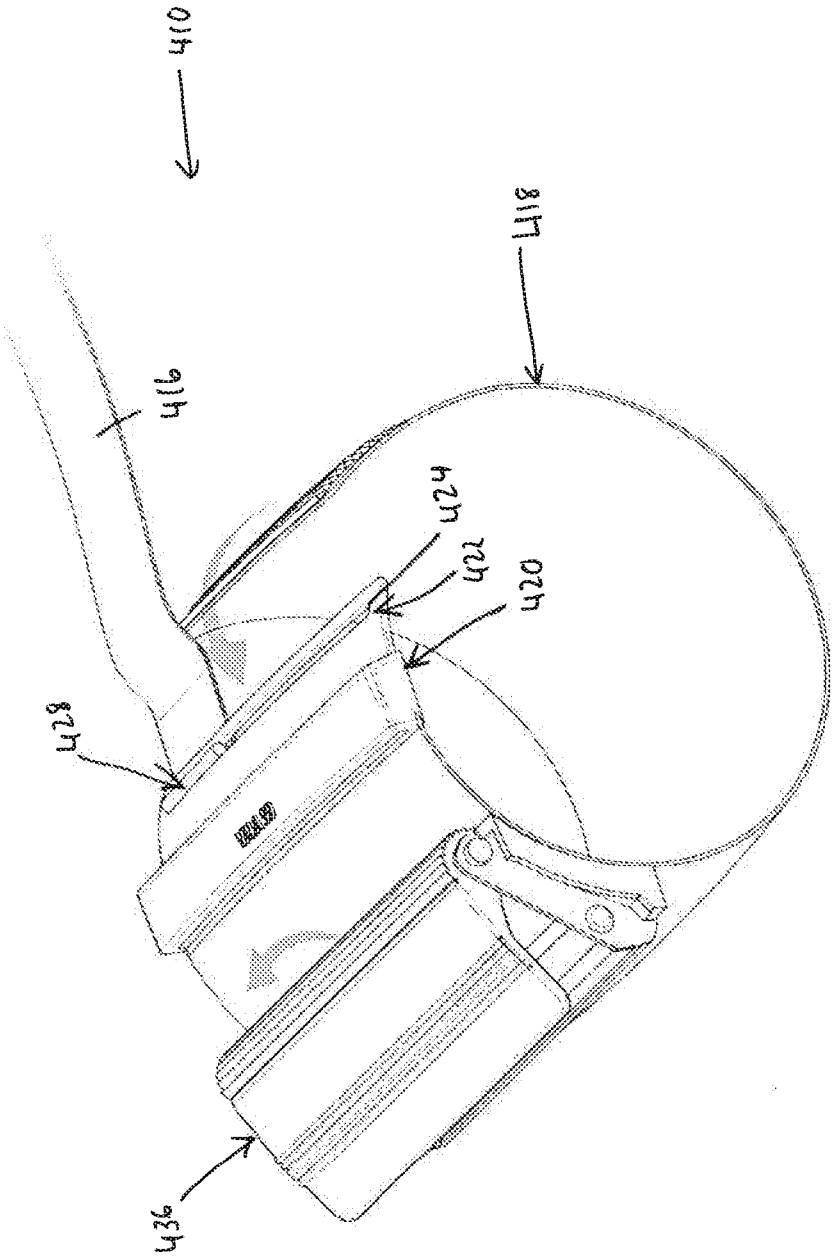

FIGURE 19

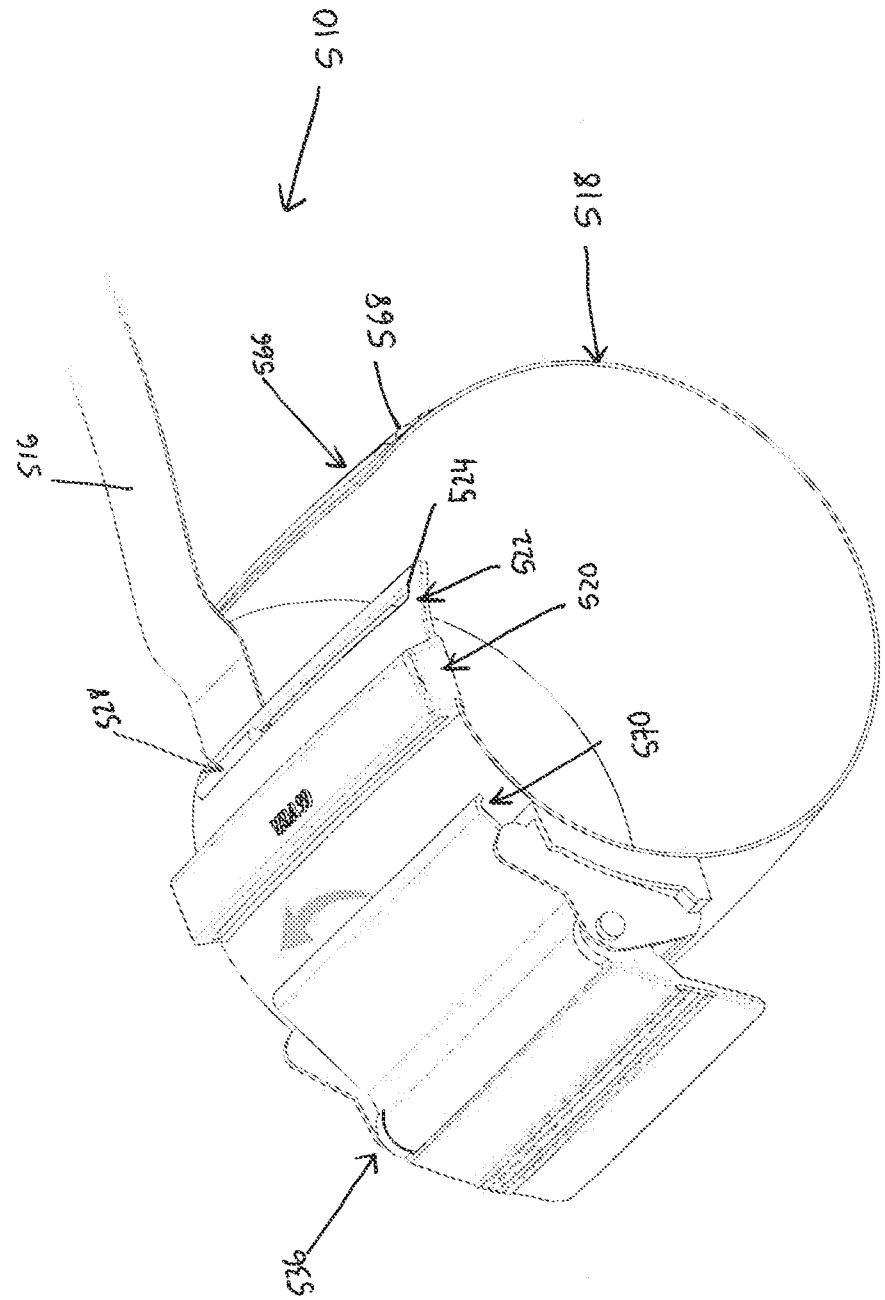

FIGURE 20

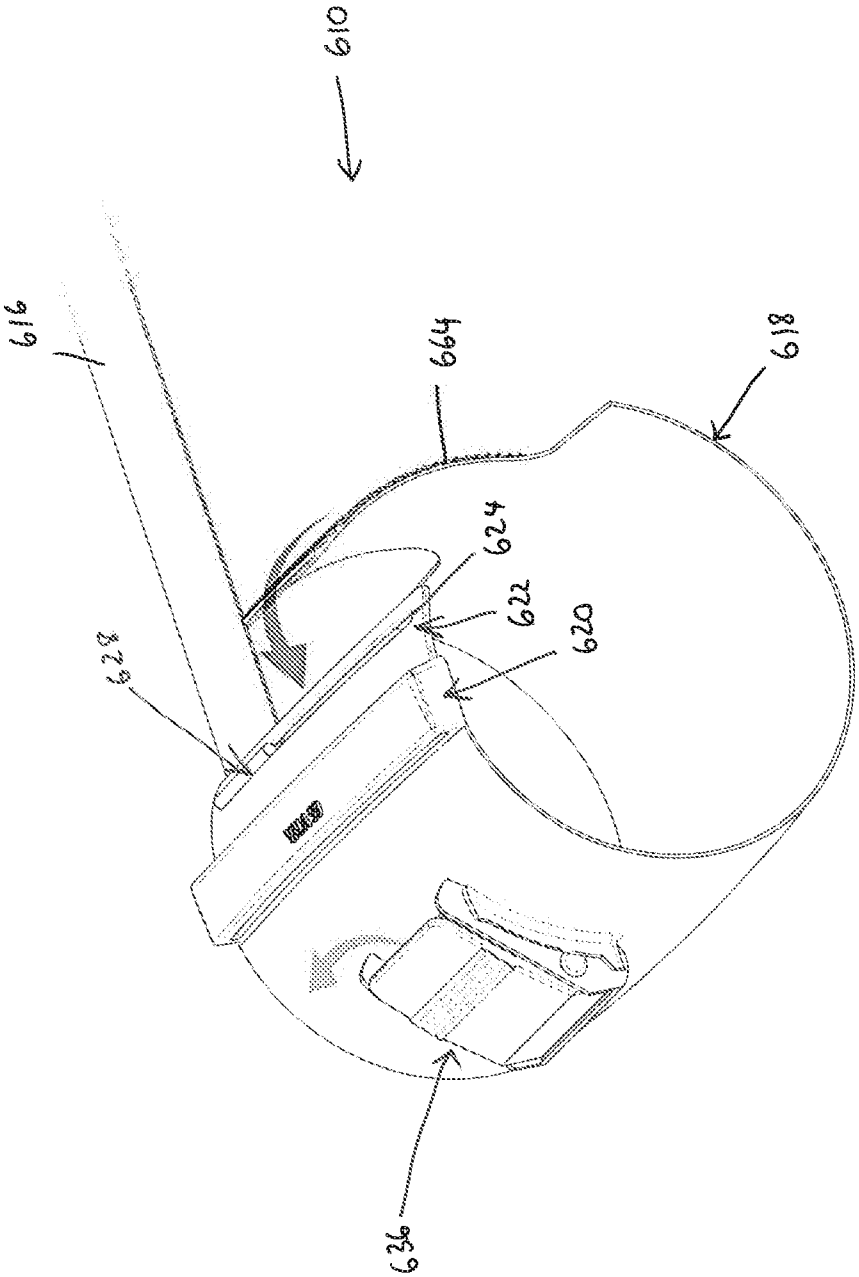

FIGURE 21

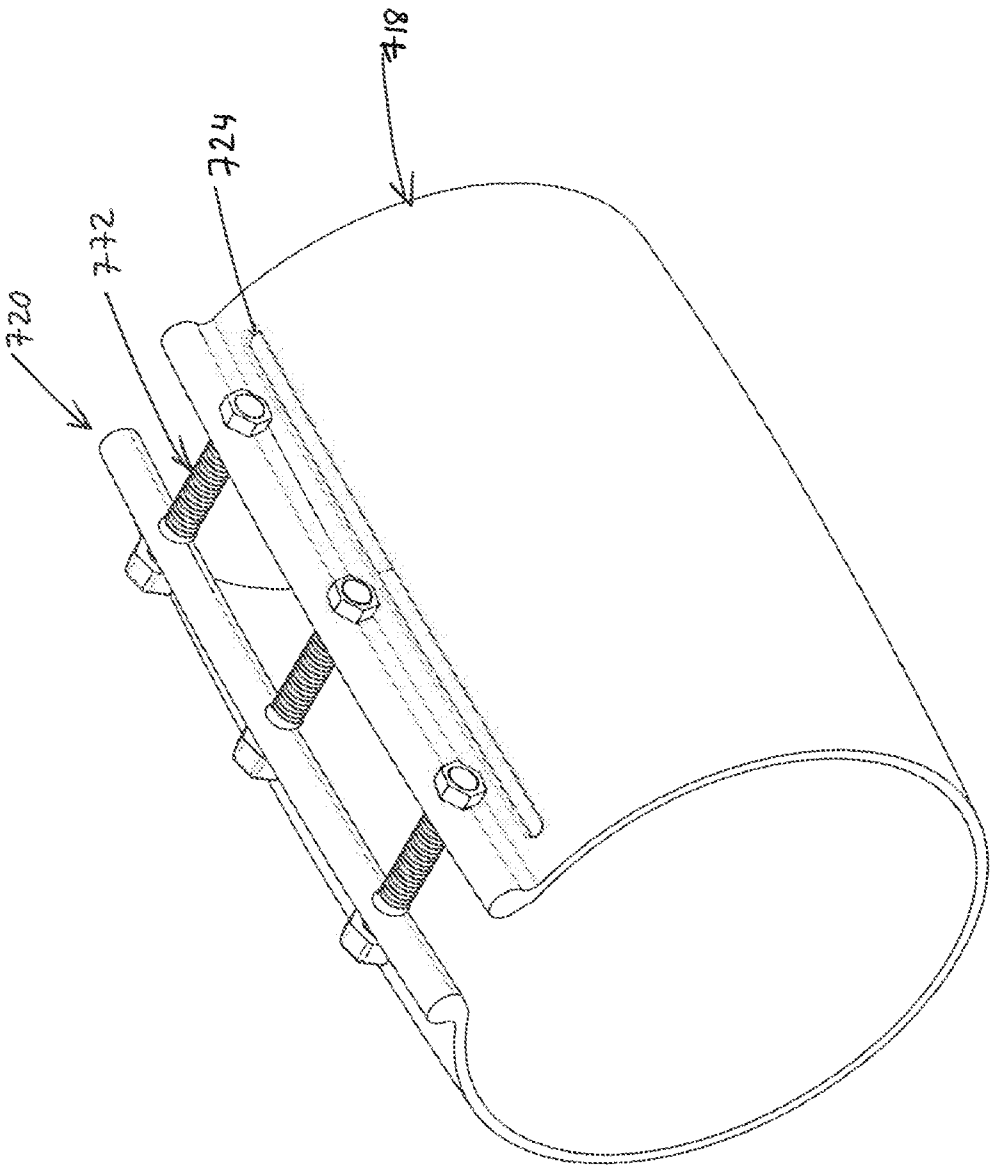

FIGURE 22

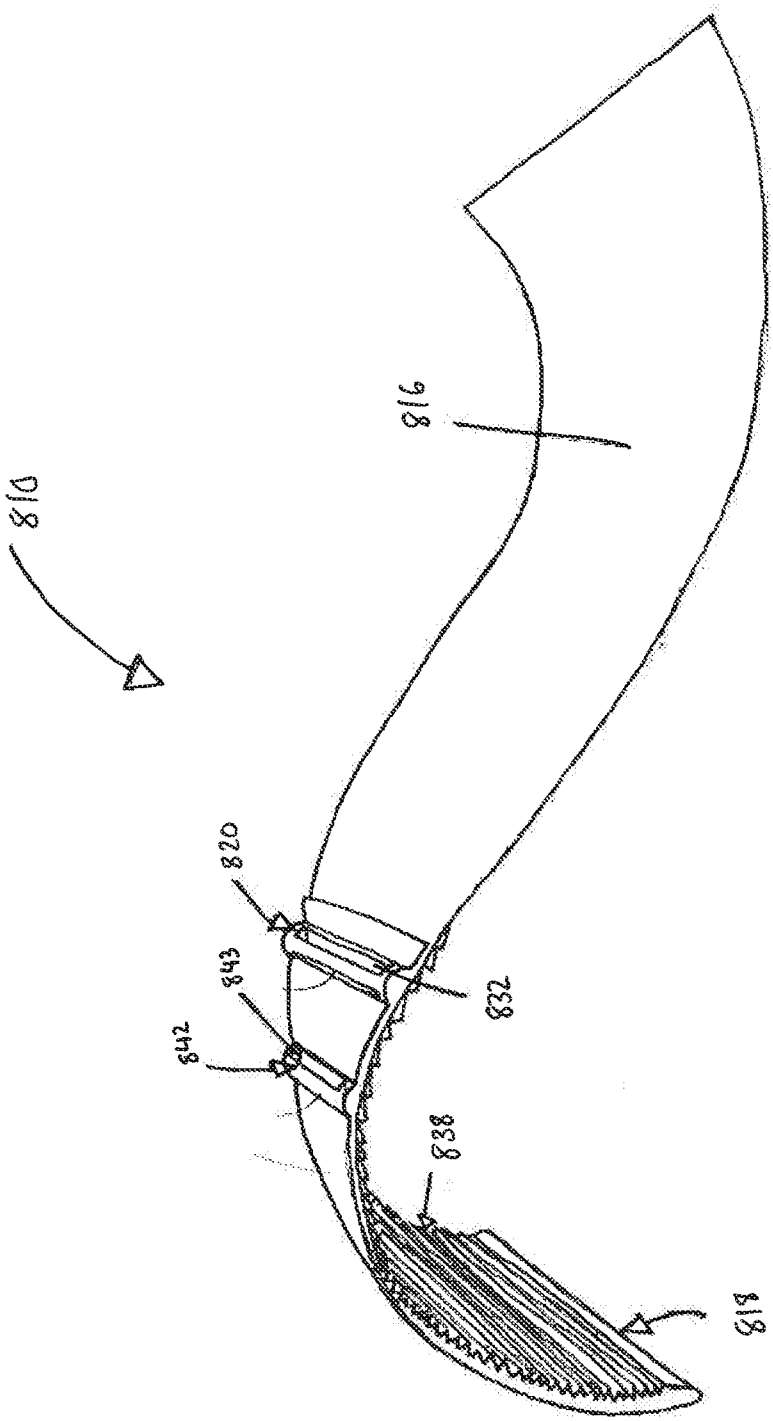

FIGURE 23

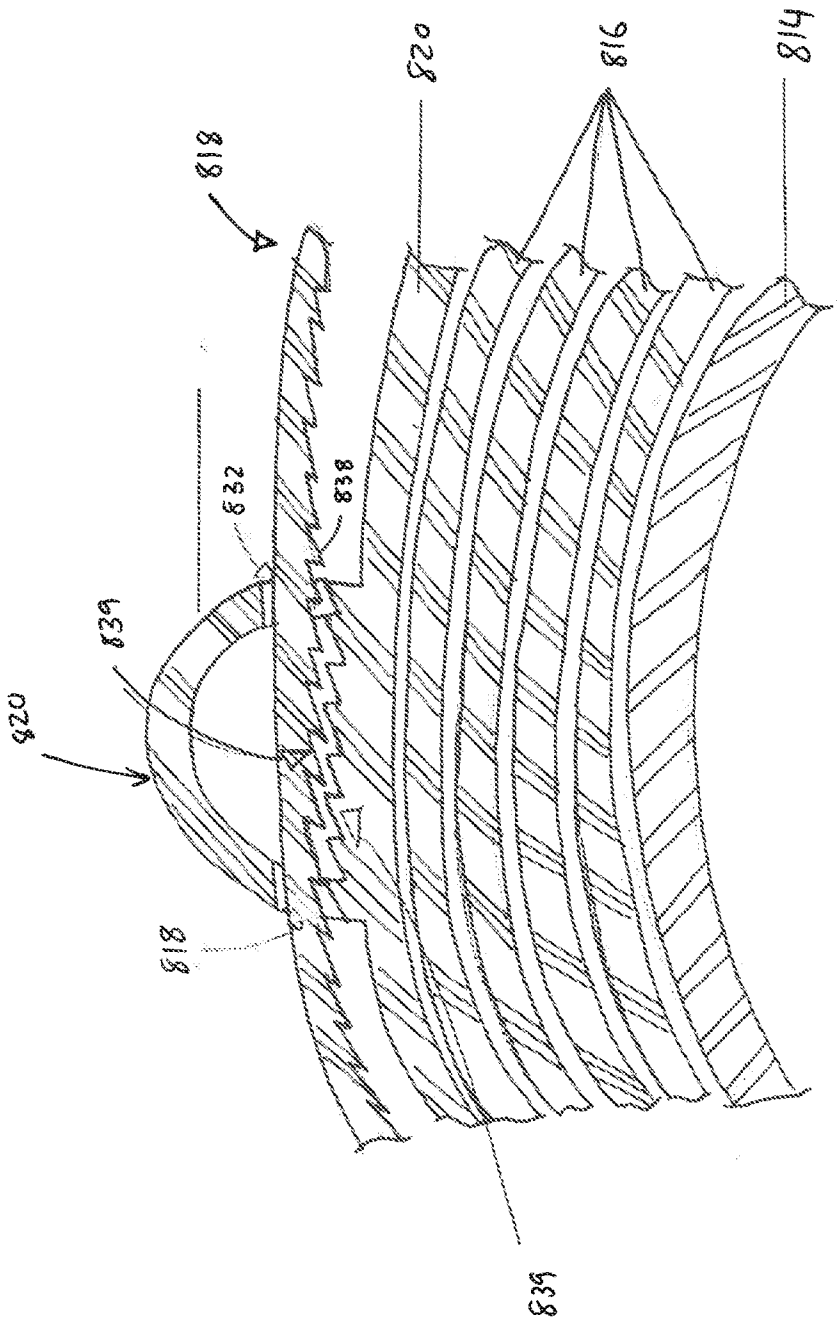

FIGURE 24

INTERNATIONAL SEARCH REPORT

International application No.

PCT / ZA 2017/050042

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***F16L 55/17*** (2006.01); ***F16L 55/172*** (2006.01); ***F16L 55/168*** (2006.01)

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)

F16L

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)

WPI; EPODOC; TXT nn

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 3006014 A1 (NEW TECH DISTRIBUTION) 28 November 2014 (28.11.2014) figures, abstract	1-4, 10-13, 16, 19-21
A	RU 2156397 C1 (GOSUDARSTVENNOE PREDPRIJATIE "PROIZVODSTVENNOE OB") 20 September 2000 (20.09.2000) figures	1-21
A	GB 2140529 A (NORMAN JOHN) 28 November 1984 (28.11.1984) figures	1-21
A	GB 2485249 A (ROGER LUCIEN BAILHACHE) 09 May 2012 (09.05.2012) figures	1-21

[X] Further documents are listed in the continuation of Box C. [X] 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	Date of mailing of the international search report
10 January 2018 (10.01.2018)	17 January 2018 (17.01.2018)
Name and mailing address of the ISA/AT Austrian Patent Office Dresdner Straße 87, A-1200 Vienna Facsimile No. +43 / 1 / 534 24-535	Authorized officer WAGNER S. Telephone No. +43 / 1 / 534 24-381

INTERNATIONAL SEARCH REPORT

International application No.

PCT / ZA 2017/050042

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 204554226 U (DAI HAILEI) 12 August 2015 (12.08.2015) figures	1-21
A	JP H0970884 A (ORIHARA SEISAKUSHO) 18 March 1997 (18.03.1997) figures	1-21

INTERNATIONAL SEARCH REPORT

International application No.

PCT / ZA 2017/050042

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

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 22-24
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

According to PCT-Rule 6.2(a) claims shall not rely on such references "as illustrated in figure … of the drawings", therefore claims 22-24 are not allowed.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT / ZA 2017/050042

Patent document cited in search report			Patent family member(s)			Publication date
FR	A1	3006014	FR	A1	3006014	2014-11-28
RU	C1	2156397	RU	C1	2156397	2000-09-20
GB	A	2140529	GB	A	2140529	1984-11-28
GB	A	2485249	GB	A	2485249	2012-05-09
CN	U	204554226	CN	U	204554226	2015-08-12
JP	A	H0970884	JP	A	H0970884	1997-03-18