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[Continued on next page]

(54) Title: PIERCING CAP ASSEMBLY

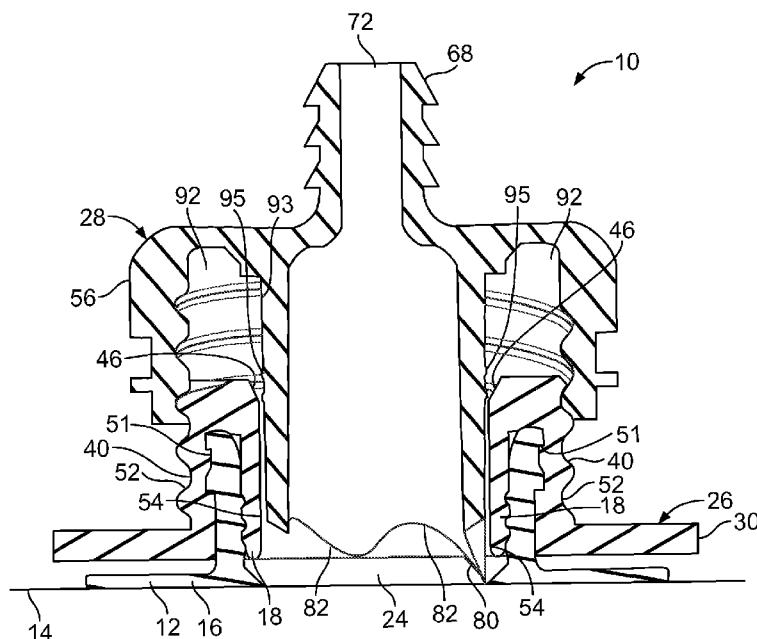


FIG. 6

(57) Abstract: An assembly (10) is configured to be secured to a spout (12) of a bag (14) in order to pierce the bag to allow fluid to flow therethrough. The assembly includes an adaptor (26) configured to secure to the spout (12). The adaptor (26) includes an annular base (30) connected to a cap - connection tube (38). The assembly also includes a cap (38) that is rotatably secured to the cap - connection tube. The cap is configured to rotate about the adaptor (26) in order to slice a fluid opening through the bag (14).



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PIERCING CAP ASSEMBLY

RELATED APPLICATIONS

[0001] This application relates to and claims priority benefits from U.S. Provisional Patent Application No. 61/422,945 entitled “Piercing Cap Assembly,” filed December 14, 2010, which is hereby incorporated by reference in its entirety.

FIELD OF EMBODIMENTS

[0002] Embodiments generally relate to a cap assembly, and, more particularly, to a cap assembly configured to provide a flow opening through a plastic bag, or other such enclosure, containing a liquid or flowing material.

BACKGROUND

[0003] Various liquids may be contained within plastic bags or enclosures. Certain liquids that are used in the food industry, for example, and purchased in bulk are often contained within large, flexible plastic bags or sacks. Typically, a fitting is secured to a bag that is configured to allow liquid to flow out of the bag. During manufacture, the bag is enclosed to ensure that the liquid does not escape during transport. An end user pierces or otherwise opens the bag at the fitting so that the liquid flows therethrough.

[0004] A conventional piercing assembly includes a spike that penetrates the bag as the cap is snapped onto a spout connection. Another type of piercing assembly includes an exterior push button that linearly actuates a tooth into the bag, and punctures the film of the bag. However, these types of assemblies are generally susceptible to liquid spillage and leakage. Further, in puncturing a hole within the bag, a cut piece of plastic of the bag may be ejected into contents of the bag itself, thereby compromising the integrity of the liquid within the bag.

[0005] In general, conventional assemblies puncture a bag or sack in a linear, axial direction. Such movement may be awkward or difficult with non-rigid bags or sacks. Further, the force required to pierce the bag or sack in the linear, axial direction

may be great enough to prove difficult for some users. Additionally, conventional piercing cap assemblies are susceptible to spillage during installation.

SUMMARY OF EMBODIMENTS

[0006] Certain embodiments provide an assembly configured to secure to a spout of a bag in order to pierce the bag to allow fluid to flow therethrough. The assembly includes an adaptor configured to secure to the spout and a cap. The adaptor includes an annular base connected to a cap-connection tube. The cap is rotatably secured to the cap-connection tube. The cap is configured to rotate about the adaptor in order to slice a fluid opening through the bag.

[0007] The adaptor may include a cavity formed through the cap-connection tube. A portion of the spout is received and securely retained within the cavity. The adaptor may be configured to snapably secure to the spout. The cap-connection tube may include a chamfered opening configured to align the cap into the adaptor. The chamfered opening may also sealingly engage a portion of the cap as the cap is mated with the adaptor.

[0008] The adaptor and the cap may each include one or more tactile members.

[0009] The cap may include a piercing member having a cutting tooth followed by at least one smooth fin. The smooth fin(s) is configured to push a cut flap of the bag out of a cutting envelope of the cutting tooth so that the cut flap remains connected to the bag.

[0010] The cap may include a nozzle or another fluid opening. Alternatively, the cap may be close-ended and configured to act as a fluid-stopper.

[0011] Certain embodiments provide a fluid delivery system that may include a flexible plastic bag configured to retain a fluid, a spout secured over a portion of the flexible plastic bag, an adaptor configured to secure to the spout, and a cap that is rotatably secured to the cap-connection tube. The adaptor may include an annular base

connected to a cap-connection tube. The cap is configured to rotate about the adaptor in order to slice a fluid opening through the flexible bag.

[0012] Certain embodiments provide an assembly configured to secure to a spout of a bag in order to pierce the bag to allow fluid to flow therethrough. The assembly may include an adaptor configured to secure to the spout, and a cap that is rotatably secured to the cap-connection tube.

[0013] The adaptor may include an annular base, first tactile members around the annular base, a cap-connection tube extending from the annular base, and a cavity formed through the cap-connection tube. The tactile members are configured to allow a user to securely grasp and hold the annular base in a steady, fixed orientation. The cap connection tube may have a chamfered opening. A portion of the spout is received and securely retained within the cavity.

[0014] The cap may include a main body, a piercing member extending from the main body, and second tactile members located on an outer surface of the main body. The piercing member may include a cutting tooth followed by at least one smooth fin. The smooth fin(s) is configured to push a cut flap of the bag out of a cutting envelope of the cutting tooth so that the cut flap remains connected to the bag. The second tactile members are configured to allow the user to grasp the main body in order to rotate the cap into piercing engagement with the bag. The cap is configured to rotate about the adaptor in order to slice a fluid opening through the bag.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0015] Figure 1 illustrates an isometric exploded view of a piercing cap assembly aligned with a spout of a liquid-containing bag, according to an embodiment.

[0016] Figure 2 illustrates an isometric view of an adaptor, according to an embodiment.

[0017] Figure 3 illustrates an axial cross-sectional view of an adaptor, according to an embodiment.

[0018] Figure 4 illustrates an isometric view of a cap, according to an embodiment of the present invention.

[0019] Figure 5 illustrates an isometric view of a piercing cap assembly secured to a spout of a pierced liquid-containing bag, according to an embodiment.

[0020] Figure 6 illustrates an axial cross-sectional view of a piercing cap assembly secured to a spout of a liquid-containing bag in a pre-piercing state, according to an embodiment.

[0021] Figure 7 illustrates an axial cross-sectional view of a piercing cap assembly secured to a spout of a pierced liquid-containing bag, according to an embodiment.

[0022] Figure 8 illustrates an isometric exploded view of a piercing cap assembly aligned with a spout of a liquid-containing bag, according to an embodiment.

[0023] Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of "including" and "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof.

DETAILED DESCRIPTION OF EMBODIMENTS

[0024] Figure 1 illustrates an isometric exploded view of a piercing cap assembly 10 aligned with a spout 12 of a liquid-containing bag 14 or sack, according to an embodiment. The spout 12 may be pre-assembled to the bag 14. For example, the spout 12 may be welded or molded directly to the bag 14. The spout 12 includes an annular base 16 that is integrally formed with a cylindrical, open-ended tube 18 having at

least one circumferential notch 20, ridge, or detent formed around a distal end 22. The base 16 is secured directly to the bag 14, while an open area 24 of the bag 14 abutting a lower portion of the tube 18 is configured to be opened by the piercing cap assembly 10 to allow fluid to flow out of the bag 14.

[0025] The piercing cap assembly 10 includes an adaptor 26 that is configured to threadably engage a cap 28. During manufacture, the adaptor 26 and cap 28 may be assembled together. Thus, the assembly 10 including the adaptor 26 and the cap 28 is then secured to the spout 12. For example, the circumferential notch 20, ridge, or detent of the tube 18 may snapably engage a reciprocal structure of the adaptor 26. Optionally, the adaptor 26 may threadably, latchably, or otherwise securely engage the spout 12. Also, alternatively, the adaptor 26 may first be secured to the spout 12, and then the cap 28 may threadably secure to the adaptor 26.

[0026] Figure 2 illustrates an isometric view of the adaptor 26, according to an embodiment. Referring to Figures 1 and 2, the adaptor 26 includes a planar, annular, circumferential base 30 that is configured to overlay the base 16 of the spout 12. An outer circumferential collar edge 32 of the base 30 includes tactile ribs 34, embossments, or the like separated by grooves 36, recessed areas, or the like. The ribs 34 provide a tactile interface for a user to securely grasp.

[0027] A cap-connection tube 38 extends outwardly from the base planar base 30. The outer surface 40 of the tube 38 includes spaced threads 42 that are configured to threadably engage an interior portion of the cap 28. The tube 38 includes a distal outer ledge 44 that is distally located from the base 30. However, the ledge 44 is generally perpendicular with the planar surface of the base 30. The ledge 44 includes an inwardly-chamfered or angled interior diameter edge 46 that leads into a central channel 48 that passes through the connection tube 38 and the base 30.

[0028] Figure 3 illustrates an axial cross-sectional view of the adaptor 26, according to an embodiment. As shown in Figure 3, the cap-connection tube 38 includes a circumferential cavity 50 defined between an outer wall 52 and an inner wall 54. The

cavity 50 passes through the base 30. The walls 52 and 54 are flexible and configured to receive and sealingly retain the tube 18 of the spout 12 (shown in Figure 1). An annular ridge 51 may extend into the cavity 50 and snapably engage the notch 20 of the spout 12 (alternatively, the spout 12 may include the ridge, while a notch is formed in the tube 38 receives and retains the ridge). In this manner, the cap-connection tube 38 may snapably secure to the spout 12. Optionally, the cap-connection tube 38 may secure to the spout 12 through an interference or press-fit.

[0029] Figure 4 illustrates an isometric view of the cap 28, according to an embodiment of the present invention. Referring to Figures 1 and 4, the cap 28 includes a circumferential main body 56 having spaced apart grasping collars 58 and 60. Each collar 58 and 60 may include tactile ribs 62, similar to those discussed above with respect to the base 30 of the adaptor 26. A series of evenly-spaced grip blocks 66 also extend from the main body 56. The ribs 62 and blocks 66 provide tactile features that a user may grasp and grip in order to rotate the cap 28 into a secure relationship with the adaptor 26. Alternatively, the main body 56 may include only the blocks 66, and not the ribs 62, or only the ribs 62 and not the blocks 66. Also, alternatively, the main body 56 may not include any of the blocks 66 or ribs 62.

[0030] A nozzle 68 outwardly extends about a central axis of the main body 56. The nozzle 68 may include a plurality of ramped barbs 70 that are configured to sealingly engage a hose, flexible conduit, or the like. Optionally, the nozzle 68 may not include the barbs 70, or may include more or less barbs than shown. A fluid channel 72 is formed through the nozzle 68 and extends through the main body 56 into a tube channel (hidden from view) to an opening (hidden from view) formed at an end 74 of the main body 56 that is opposite the nozzle 68. The fluid channel 72 extends into a circumferential piercing member 76.

[0031] The circumferential piercing member 76 is formed around the opening formed at the end 74 of the main body 56. The piercing member 76 may be a tube that is formed on an underside of the main body 56 and extends into a central cavity of the main body 56. The piercing member 76 includes a circumferential wall 78 defining an open

area around the opening. The wall 78 includes a sharp-edged cutting tooth 80 that is integrally connected to a rounded, smooth tab 82, fin, or other such protuberance that is a radial distance from the cutting tooth 80. The tab 82 is connected to another tab 82 a circumferential distance away therefrom, which may be connected to another tab 82 a circumferential distance away therefrom. More or less tabs 82 may be used. For example, the wall 78 may include the cutting tooth 80 and only one tab 82.

[0032] Each tab 82 may include a curved base 84 that integrally connects to a steep extension 86 that integrally connects to a smooth, rounded top 88, which, in turn, integrally connects to an elongated descent 90. In this manner, the smooth edges of the tab 82 are configured to not cut into the material of the bag 14 (shown in Figure 1). Instead, as discussed below, the cutting tooth 80 pierces the bag 14, while the smooth tabs 82 push the cut flap of material out of a fluid path. Further, the smooth tabs 82 are also configured to keep the film of the bag 14 stretched tight, in order to allow the cutting tooth 80 to efficiently and predictably cut through the film of the bag 14.

[0033] Figure 5 illustrates an isometric view of the piercing cap assembly 10 secured to the spout 12 of the pierced liquid-containing bag 14, according to an embodiment. Referring to Figures 1-5, the adaptor 26 is sealingly secured to the spout 12, while the cap 28 is threadably and sealingly secured to the adaptor 26. A fluid path is defined through the nozzle 68 and into the bag 14.

[0034] In order to pierce the plastic of the bag 14 to provide an opening for fluid to pass, the cap 28 is threadably rotated in the direction of arc A (shown in Figures 1, 4, and 5) with respect to the adaptor 26 until a lower portion of the main body 56 of the cap 28 abuts an upper surface of the annular base 30 of the adaptor 26. A user may grasp the tactile ribs 34 of the adaptor 26 and hold the adaptor 26 steady. The user may also use another hand to grasp the main body 56 of the cap 28, such as through the tactile ribs 62 and/or blocks 66. Again, the ribs 34 and 62, and the blocks 66 provide tactile features that allow the user to easily grasp and manipulate the assembly 10. In this manner, the user may grasp the intuitive collar edge 32 with increased grip by way of the ribs 34 and hold the adaptor 26 steady, rigid, and firm. The user then user grasps the main body 56

of the cap 28 with increased grip by way of the ribs 62 and/or blocks 66 and rotates the cap 28 with respect to the adaptor 26. Therefore, when the user rotates the cap 28, the spout 12 does not rotate along therewith. As such, any potential for the spout 12 constricting or twisting the bag 14 is diminished.

[0035] As the cap 28 rotates in the direction of arc A, the cutting tooth 80 moves closer to the plastic material of the bag 14. With continued rotation in the direction of arrow A, the cutting tooth 80 contacts the bag 14. Because the cutting tooth 80 is sharp, the cutting tooth 80 pierces the bag 14 as the cap 28 continues to move toward the bag 14 with increased rotation in the direction of arrow A. The cut bag 14 forms a flap of material hanging therefrom. With increased rotation in the direction of arc A, the cutting tooth 80 moves away from that portion of the flap, while the smooth tab 82 encounters the flap. The steep extension 86 follows the cutting tooth 80 and contacts the flap, thereby providing an immediate barrier that pushes the flap away from the interior channel formed through the assembly 10, and toward the interior of the bag 14. The smooth top 88 ensures that the flap is not further cut, and the elongated descent keeps the flap out of the opening, until the flap is contacted by another tab 82, which repeats the process. Because the rounded tabs 82 push the flap of material out of the way, even with continued rotational movement in the direction of arc A, the cutting tooth 80 will not be able to cut the flap material, because the flap material is pushed out of the way of the range of the cutting tooth 80.

[0036] Figure 6 illustrates an axial cross-sectional view of the piercing cap assembly 10 secured to the spout of the liquid-containing bag 14 in a pre-piercing state, according to an embodiment. As shown in Figure 6, the tube 18 of the spout 12 is received and retained within the cavity 51 of the cap-connection tube 38 of the adaptor 26. In this manner, the cap-connection tube 38 sealingly engages the spout 12.

[0037] The main body 56 of the cap 28 is positioned on the cap-connection tube 38, such that the cap-connection tube 38 is positioned within threaded cavities 92 of the main body 56. In this position, the cutting tooth 80 has yet to contact the plastic film of the bag 14.

[0038] The chamfered opening 46 of the cap-connection tube 38 helps to align the cap 28 with the adaptor 26. That is, the chamfered opening 46 provides a lead-in that automatically centers the piercing member 76 and axially aligns it within the cap-connection tube 38 of the adaptor 26. Moreover, the decreasing diameter (from top to bottom, as shown in Figure 6) of the chamfered opening 46 provides a wiper seal that provides a sealing engagement between the cap-connection tube 38 and the fluid tube 93 of the cap 28. Additionally, the fluid tube 93 (which includes the piercing member 76 at its distal end) may include one or more circumferential sealing rings 95 that are also configured to sealingly engage the inner wall of the cap-connection tube 38.

[0039] Figure 7 illustrates an axial cross-sectional view of the piercing cap assembly 10 secured to the spout 12 of a pierced liquid-containing bag 14, according to an embodiment. As the cap 28 is rotated with respect to the adaptor 26 in the direction of arc A, the cutting tooth 80 pierces into the bag 14, thereby providing a flap 94 of material that provides an opening through the bag for liquid to flow. As the cap 28 continues to rotate in the direction of arc A, the smooth tabs 82 push the flap 94 out of the way so that the flap 94 is outside of the piercing member 76, and outside of the cutting envelope of the cutting tooth 80. Thus, the cap assembly 10 pierces the bag 14 to provide a fluid opening therethrough, but ensures that no portion of the bag 14 is dislodged into the interior of the bag 14 or the cap assembly 10.

[0040] Figure 8 illustrates an isometric exploded view of a piercing cap assembly 100 aligned with a spout of a liquid-containing bag, according to an embodiment. The assembly 100 is similar to the assembly 10, except that the cap 102 does not include a nozzle or opening that passes completely therethrough. Instead, the cap 102 acts as a stopper that prevents liquid from passing therethrough. Thus, the cap 102 may be used to slice an opening through the bag 14, as discussed above, and then prevent liquid from flowing out of the cap 102. When a user desires to pour liquid out of the bag 14, the user would simply unthread the cap 102 and remove the cap 102 from the adaptor 26.

[0041] Alternatively, the cap 28 or 102 may include various other nozzles and openings to allow liquid to selectively pass therethrough. For example, instead of the nozzle, the cap 28 or 102 may include a central opening and a plug.

[0042] Embodiments provide a piercing cap assembly that is configured to provide an opening through a fluid-containing bag having a high flow rate. The piercing cap assembly prevents release of the cut flap of material into the contents of the bag. That is, the piercing cap assembly does not simply cut a circular opening into the bag. Instead, the piercing cap assembly cuts one or more flaps that are pushed out of the way of the cutting envelope.

[0043] Embodiments provide an easy way to attach a hose or the like to a form-fill-seal bag. For example, the nozzle having barbs is configured to sealingly connected to a hose. Moreover, the piercing cap assembly provides convenient and intuitive grasping areas.

[0044] While various spatial and directional terms, such as top, bottom, lower, mid, lateral, horizontal, vertical, front and the like may be used to describe embodiments of the present invention, it is understood that such terms are merely used with respect to the orientations shown in the drawings. The orientations may be inverted, rotated, or otherwise changed, such that an upper portion is a lower portion, and vice versa, horizontal becomes vertical, and the like.

[0045] Variations and modifications of the foregoing are within the scope of the present invention. It is understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present invention. The embodiments described herein explain the best modes known for practicing the invention and will enable others skilled in the art to utilize the invention. The claims are to be construed to include alternative embodiments to the extent permitted by the prior art.

[0046] Various features of the invention are set forth in the following claims.

CLAIMS

1. An assembly configured to secure to a spout of a bag in order to pierce the bag to allow fluid to flow therethrough, the assembly comprising:

an adaptor configured to secure to the spout, the adaptor including an annular base connected to a cap-connection tube; and

a cap that is rotatably secured to the cap-connection tube, wherein the cap is configured to rotate about the adaptor in order to slice a fluid opening through the bag.

2. The assembly of claim 1, wherein the adaptor includes a cavity formed through the cap-connection tube, and wherein a portion of the spout is received and securely retained within the cavity.

3. The assembly of claim 1, wherein the adaptor is configured to snapably secure to the spout.

4. The assembly of claim 1, wherein the cap-connection tube includes a chamfered opening configured to align the cap into the adaptor.

5. The assembly of claim 4, wherein the chamfered opening also sealingly engages a portion of the cap as the cap is mated with the adaptor.

6. The assembly of claim 1, wherein the annular base includes a plurality of tactile members.

7. The assembly of claim 1, wherein the cap includes a piercing member having a cutting tooth followed by at least one smooth fin.

8. The assembly of claim 7, wherein the at least one smooth fin is configured to push a cut flap of the bag out of a cutting envelope of the cutting tooth so that the cut flap remains connected to the bag.

9. The assembly of claim 1, wherein the cap includes a nozzle.

10. The assembly of claim 1, wherein the cap is close-ended and configured to act as a fluid-stopper.

11. A fluid delivery system, comprising:
a flexible plastic bag configured to retain a fluid;
a spout secured over a portion of the flexible plastic bag;
an adaptor configured to secure to the spout, the adaptor including an annular base connected to a cap-connection tube; and

a cap that is rotatably secured to the cap-connection tube, wherein the cap is configured to rotate about the adaptor in order to slice a fluid opening through the flexible bag.

12. The fluid delivery system of claim 11, wherein the adaptor includes a cavity formed through the cap-connection tube, and wherein a portion of the spout is received and securely retained within the cavity.

13. The fluid delivery system of claim 11, wherein the cap-connection tube includes a chamfered opening configured to align the cap into the adaptor, and wherein the chamfered opening also sealingly engages a portion of the cap as the cap is mated with the adaptor.

14. The fluid delivery system of claim 11, wherein the annular base includes a plurality of tactile members.

15. The fluid delivery system of claim 11, wherein the cap includes a piercing member having a cutting tooth followed by at least one smooth fin.

16. The fluid delivery system of claim 15, wherein the at least one smooth fin is configured to push a cut flap of the bag out of a cutting envelope of the cutting tooth so that the cut flap remains connected to the bag.

17. The fluid delivery system of claim 11, wherein the cap includes a nozzle.

18. The fluid delivery system of claim 11, wherein the cap is close-ended and configured to act as a fluid-stopper.

19. An assembly configured to secure to a spout of a bag in order to pierce the bag to allow fluid to flow therethrough, the assembly comprising:

an adaptor configured to secure to the spout, the adaptor including:

an annular base;

first tactile members around the annular base, the tactile members configured to allow a user to securely grasp and hold the annular base in a steady, fixed orientation;

a cap-connection tube extending from the annular base, the cap connection tube having a chamfered opening;

a cavity formed through the cap-connection tube, wherein a portion of the spout is received and securely retained within the cavity;

and

a cap that is rotatably secured to the cap-connection tube, the cap including

a main body;

a piercing member extending from the main body, the piercing member having a cutting tooth followed by at least one smooth fin, wherein the at least

one smooth fin is configured to push a cut flap of the bag out of a cutting envelope of the cutting tooth so that the cut flap remains connected to the bag; and

second tactile members located on an outer surface of the main body, wherein the second tactile members are configured to allow the user to grasp the main body in order to rotate the cap into piercing engagement with the bag,

wherein the cap is configured to rotate about the adaptor in order to slice a fluid opening through the bag,

20. The assembly of claim 1, wherein the cap includes one of a nozzle or a close-ended stopper.

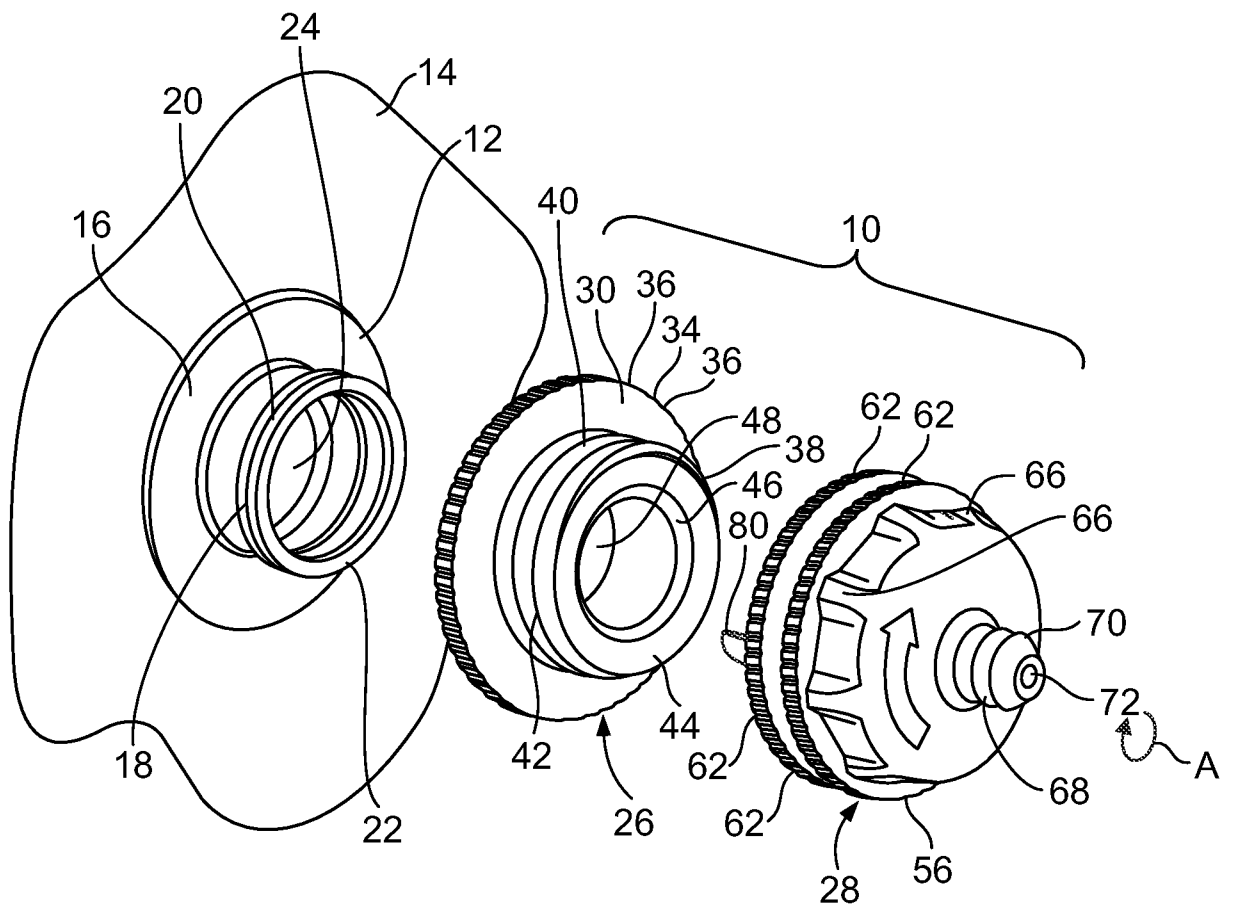


FIG.1

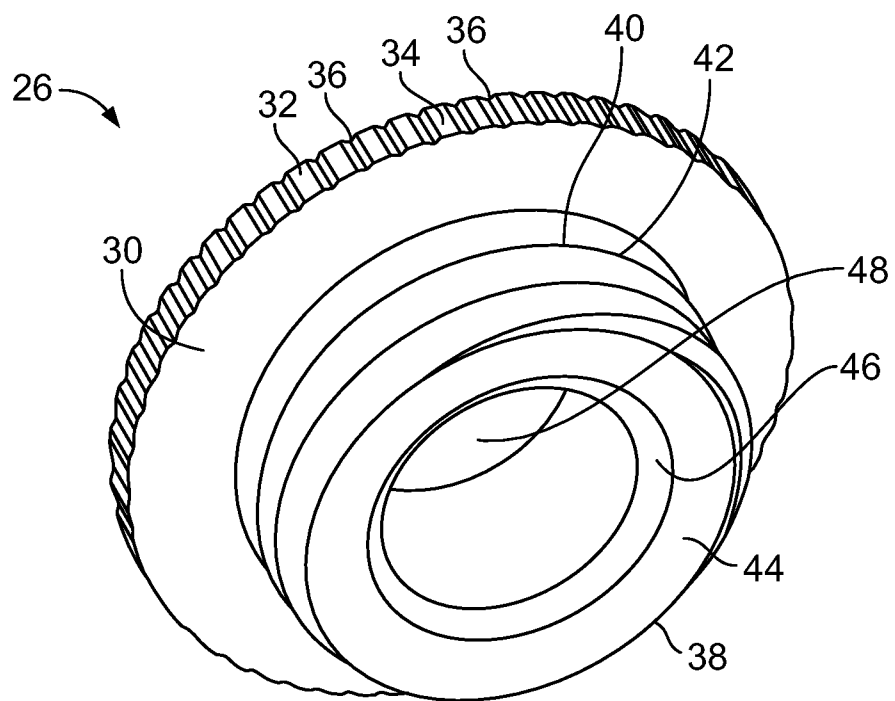


FIG. 2

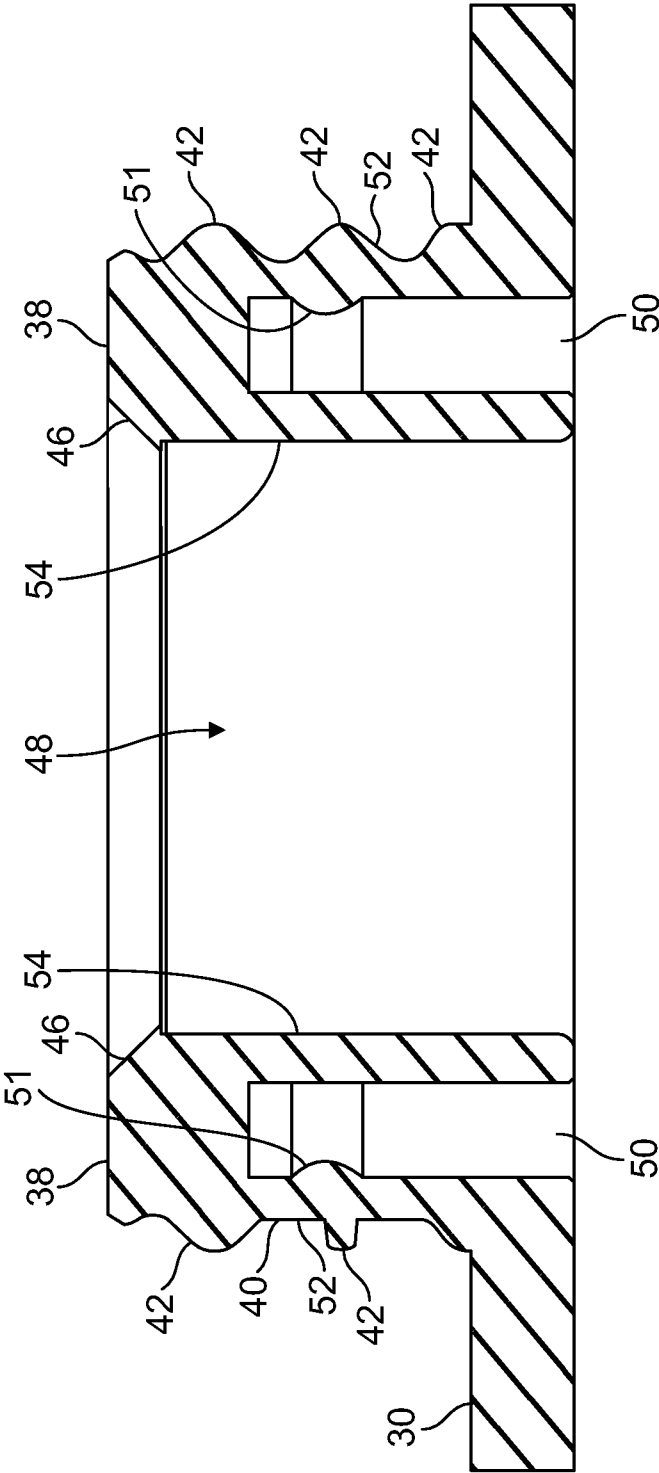


FIG. 3

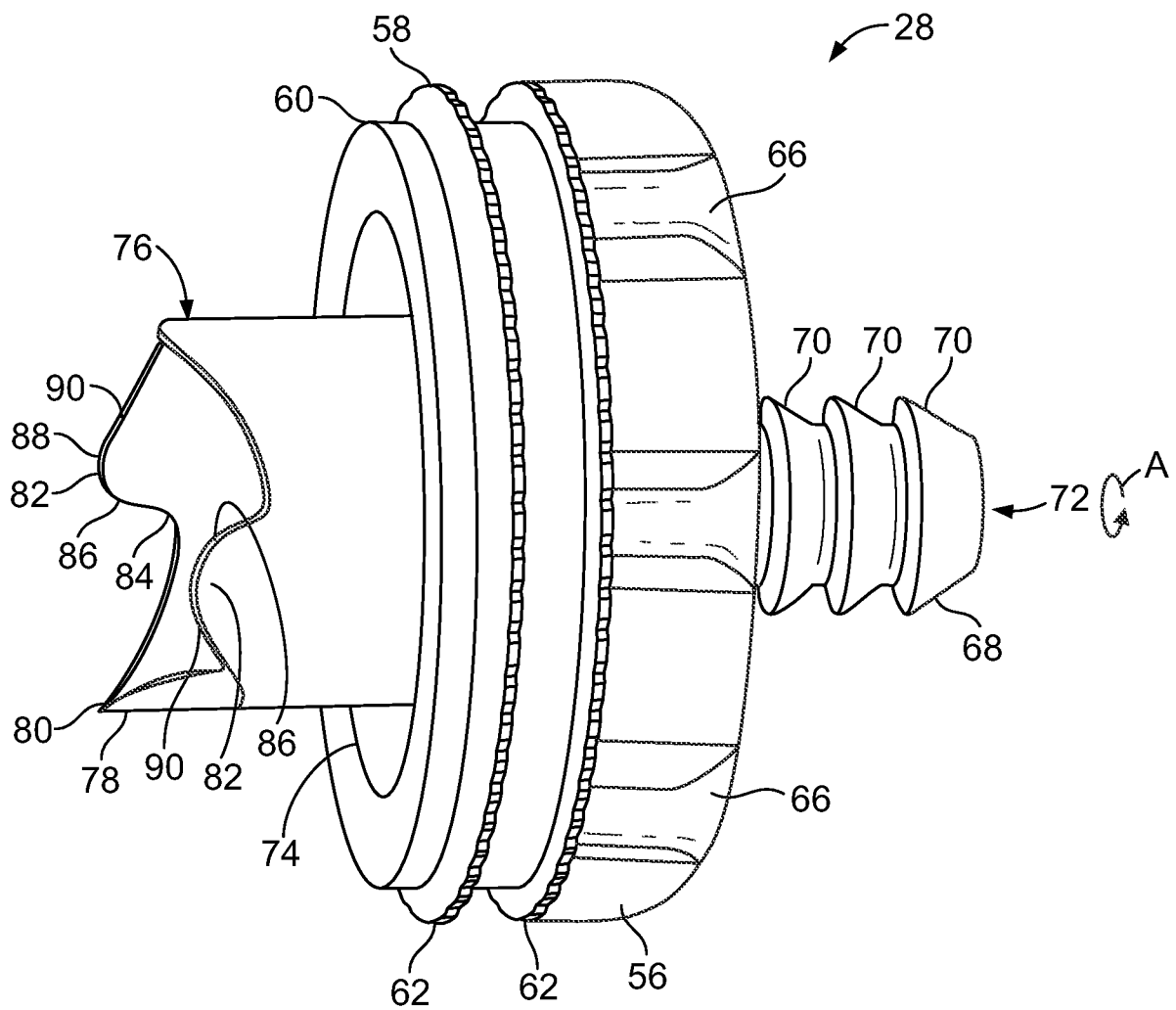


FIG. 4

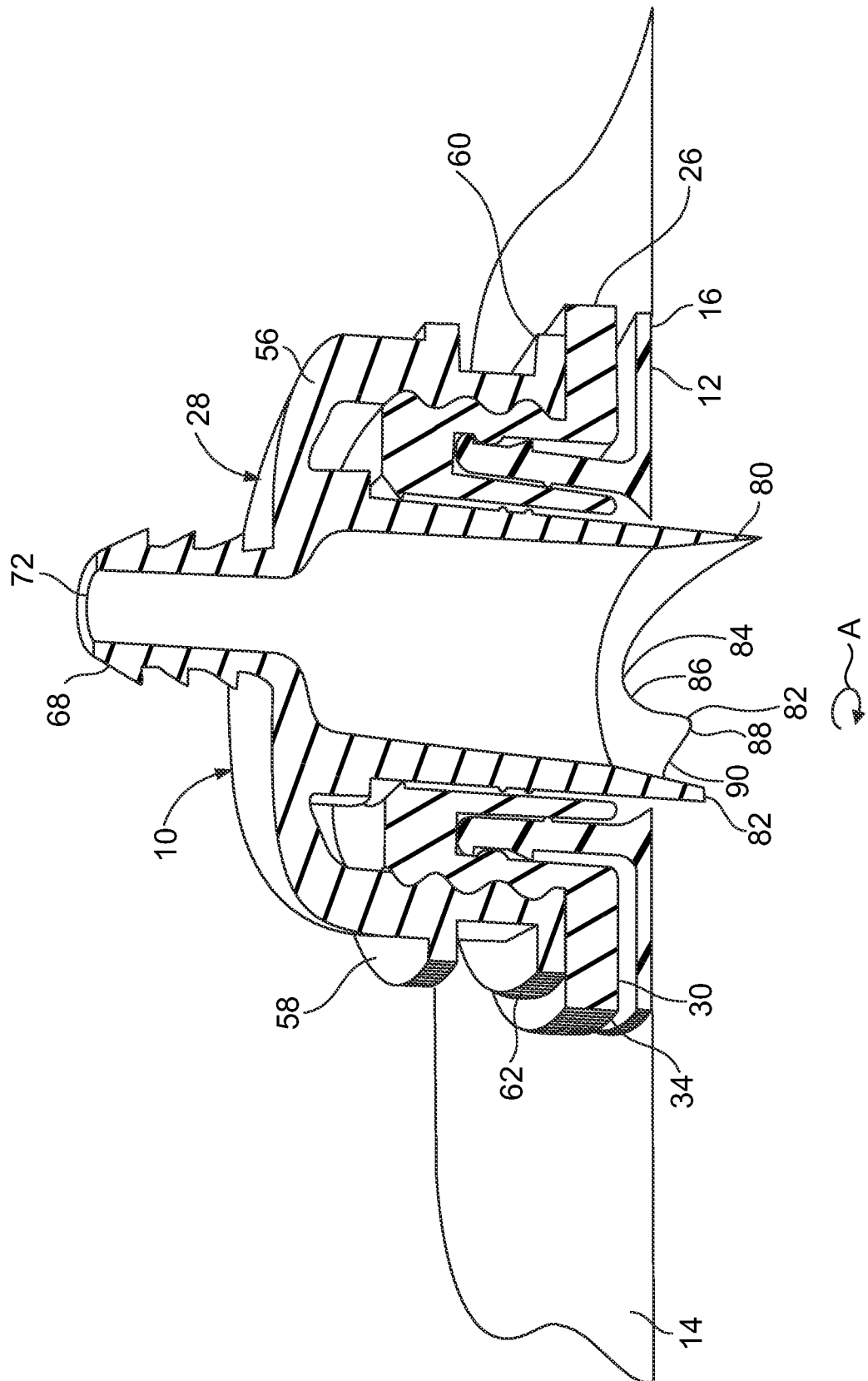


FIG. 5

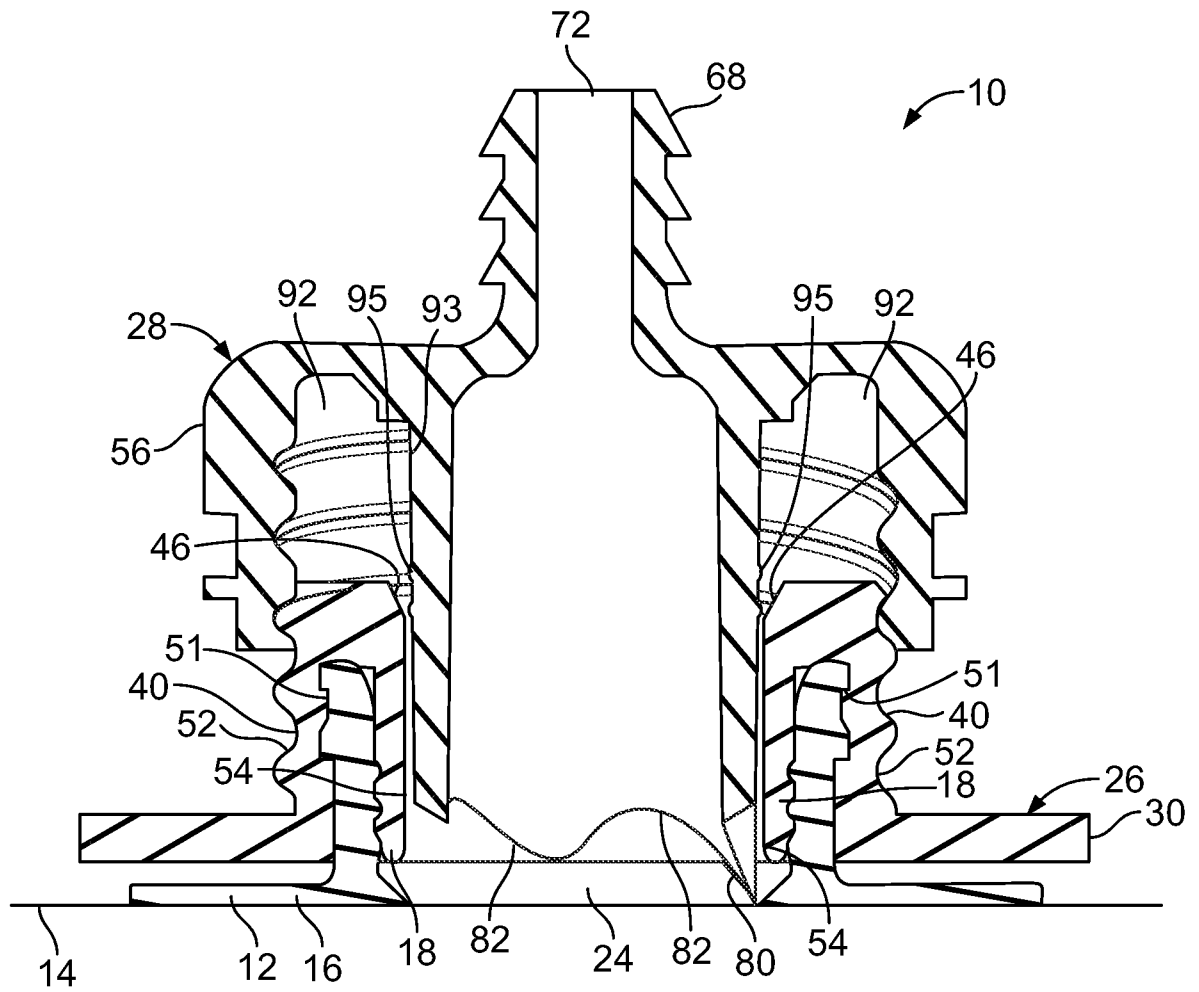


FIG. 6

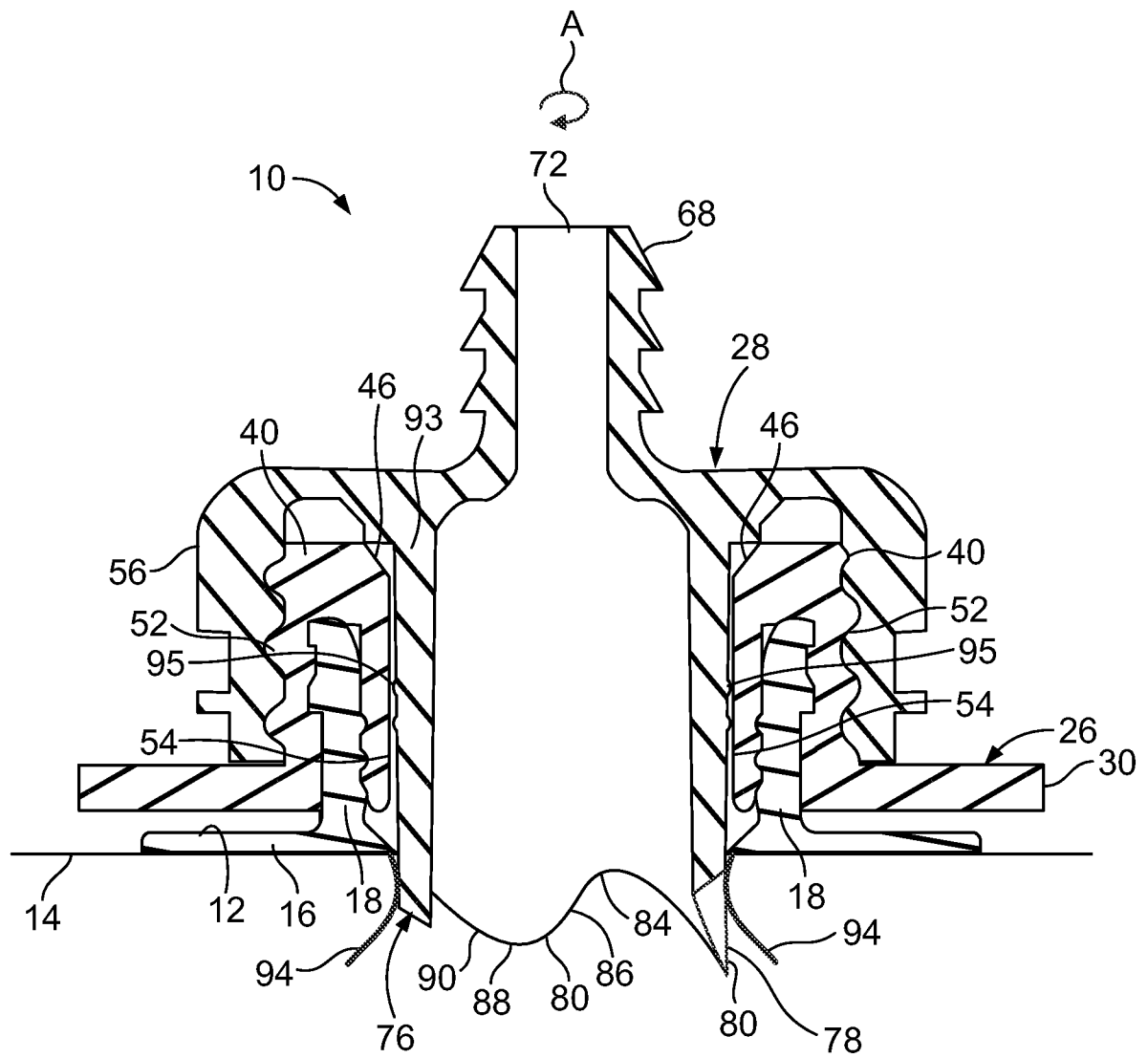


FIG. 7

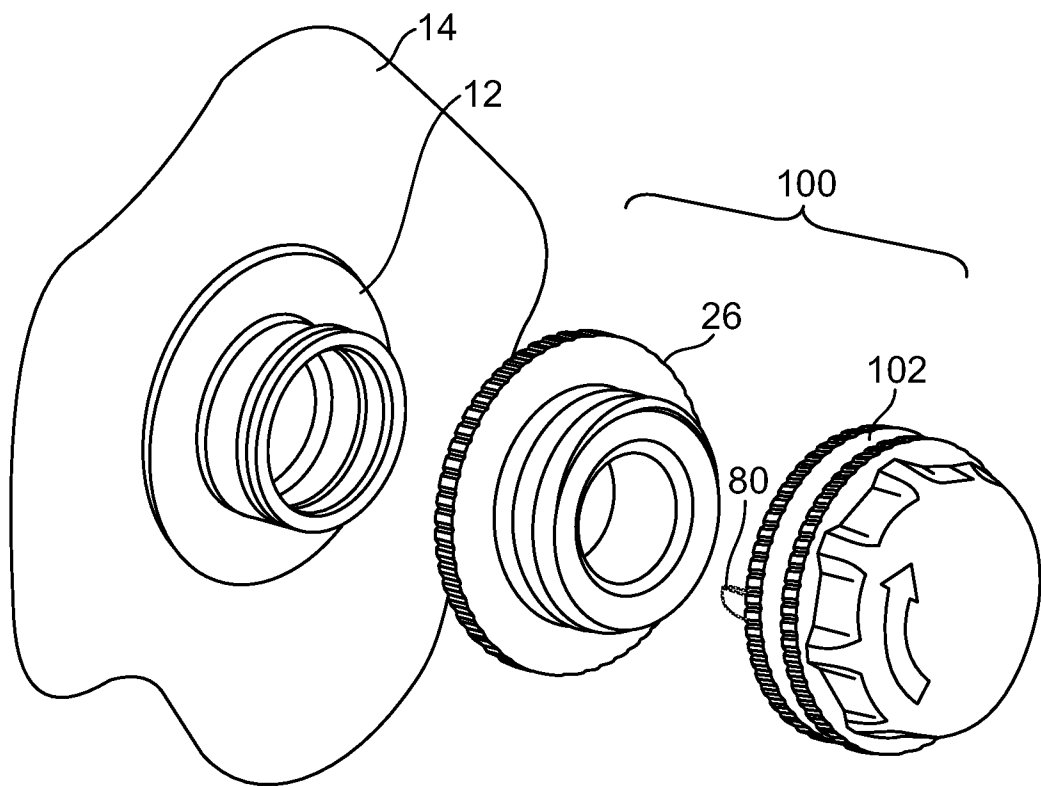


FIG.8

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/064395

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D5/74 B65D51/22 B65D75/58 B65D77/06
ADD.

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)
B65D

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 practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 33 39 257 A1 (STRICKER HEINZ) 9 May 1985 (1985-05-09)	1,3-6,9, 11,13, 14,17,20
Y	the whole document	2,7,8, 12,15,16
A		19
X	US 2003/102333 A1 (WRIGHT RICHARD [AU]) 5 June 2003 (2003-06-05)	1-5, 9-13,17, 18,20
A	the whole document	19
X	EP 0 543 119 A1 (TOPPAN PRINTING CO LTD [JP]) 26 May 1993 (1993-05-26) the whole document	1
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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

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International application No
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