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(72) Inventors:
• **Benoit-Gonin, Claude**
69460 Odenas (FR)
• **Bardet, Philippe**
69400 Gleize (FR)

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(74) Representative: **Greenwood, Matthew David et al**
K.R. Bryer & Co.
7 Gay Street
Bath BA1 2PH (GB)

(71) Applicant: **Obrist Closures Switzerland GmbH**
4153 Reinach (CH)

(54) **Perforable closure**

(57) A perforable closure (10) is provided and has a body (40) with at least one perforable opening (50, 53). The closure has an internal sealing element (60) which

extends across the interior side of the or each opening. The sealing element (60) is inseparably welded to the body (40).

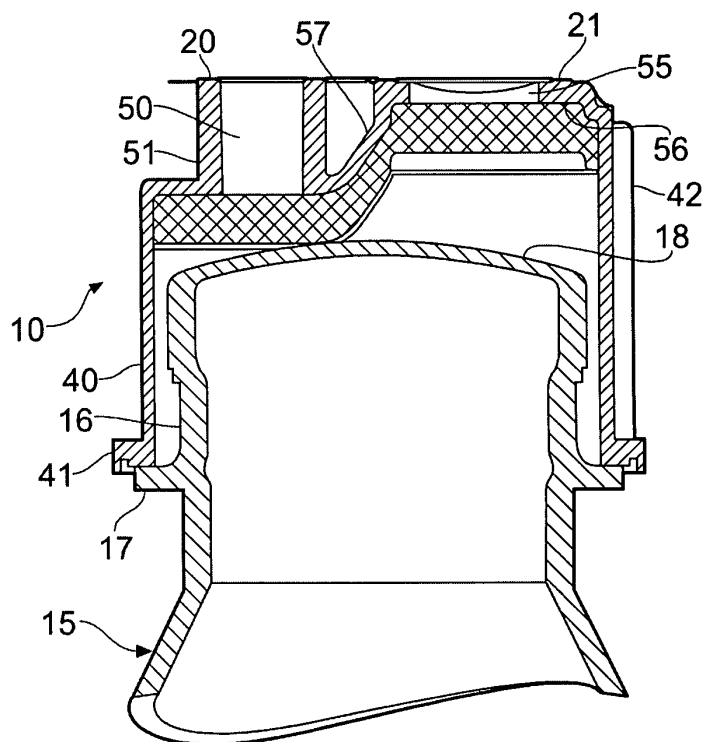


FIG. 4

Description

[0001] The present invention relates generally to a closure and particularly to a perforable closure for use in conjunction with perforating elements such as syringes, needles and the like.

[0002] Such closures are used, for example, in conjunction with containers for medicines, in which the contents must be kept sterile. Perforating elements can be introduced into the container through the Closure. The closures are self-sealing to punctures from perforating elements.

[0003] Examples of such closures include FR2598137, EP0364783. US2135386 and EP1392569.

[0004] The present invention seeks to address certain problems with known perforable closures.

[0005] The present invention provides, in one aspect, a perforable closure comprising: a body with at least one perforable opening; and an internal sealing element which extends across the interior side of the or each opening, in which the sealing element is inseparably welded to the body.

[0006] The closure body may have at least two openings. The openings may be identical to each other or may be adapted to receive different perforating elements. In an alternative aspect the present invention provides a perforable closure comprising a body with two or more perforable openings; and an internal sealing element which extends across the interior side of each opening, in which the or two of the openings are adapted to receive different perforating elements.

[0007] The sealing element may be inseparably welded to the body. For example the closure may be formed by bi-injection moulding with the sealing element being injected into a pre-formed body.

[0008] The sealing element is positioned in the body to extend across the interior side of the or each opening. In other words, the sealing element does not extend into the opening/s but rather seals around the internal periphery thereof.

[0009] One or at least one of the opening/s may comprise a chimney for limiting entry of a perforating element. The perforating element can then be optimally positioned to be able to extract container contents.

[0010] The or at least one of the opening/s may be provided with a removable cover.

[0011] The sealing element of the closure may be a different colour to the closure body. Accordingly the sealing element can be distinguished from the body to facilitate puncture.

[0012] The closure may comprise a plurality of removable covers, in which the covers include means for indicating which particular opening they cover. In this way the correct opening can easily be selected and uncovered whilst leaving other openings covered.

[0013] The closure may further comprise an outer closure member. The outer closure may comprise a perforating element. When the outer closure is applied the

perforating element may puncture the sealing element of a respective opening.

[0014] The outer closure member and the closure may include angular orientation means. Accordingly the components can be correctly positioned with respect to each other for use.

[0015] The present invention also provides the combination of a container and a perforable closure as described herein.

[0016] The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of a perforable closure and a puncture assembly formed according to the present invention;

Figure 2 is a section of the closure of Figure 1 assembled prior to use with the puncture assembly;

Figure 3 is an exploded perspective view of the perforable closure of Figure 1;

Figure 4 is a section of the closure of figure 3 shown assembled;

Figure 5 is a perspective view of the closure of Figure 1 in use with an outer closure member and a first perforating element;

Figure 6 is a section of the closure of Figure 5;

Figure 7 is a perspective view of the closure of Figure 1 in use with a second perforating element;

Figure 8 is a section of the closure of Figure 7;

Figure 9 is an exploded perspective view of a perforable closure formed according to an alternative embodiment;

Figure 10 is a perspective view of the closure of Figure 9 shown partly assembled;

Figure 11 is a perspective view of the closure of Figure 9 shown fully assembled

Figure 12 is an exploded perspective view of a perforable closure formed according to a further embodiment;

Figure 13 is a section of a closure formed according to an alternative embodiment;

Figure 14 is a perspective view of the closure of Figure 13 shown with two covers removed; and

Figure 15 is a Respective view of the closure of Figure 14 shown with the covers in place.

[0017] Referring first to Figures 1 and 2 there is shown a perforable closure generally indicated 10 and attached to a container 15. Also shown are two cover elements 20, 21 which are shown removed in Figure 1 and in position in Figure 2. Further, a puncture assembly is shown and comprises a first needle member 25 and an outer closure 30 which incorporates a second needle member 31.

[0018] Referring now also to Figures 3 and 4 the closure 10 is shown in more detail.

[0019] The closure 10 comprises a generally cylindrical body 40 having a radially outwardly extending flange

41 at one end thereof. This end of the body is adapted to receive the neck 16 of the container 15. The container neck 16 includes a radially outwardly extending transfer bead 17 against which the closure flange 41 abuts as shown in Figure 4. The closure 10 is secured to the container neck 16 by any convenient means, which in this embodiment comprise as snap bead arrangement (not shown).

[0020] The end of the body 40 opposite the flange 41 defines two openings 50, 55. The opening 50 is defined by a cylindrical chimney 51. The chimney 51 is flanked by two upstanding rectangular fins 51, 52. The opening 55 is defined in part by an extension of the body 40 from the top end of which extends a semi-circular plate 56 incorporating the ellipsoidal opening 55. The plate 56 continues with a downwardly inclined step 57 which extends to the same level as the base of the chimney 51. The exterior of the openings, 50, 55 terminate at the same level but the interior of the opening 50 commences at a level closer to the flange 41 than the opening 55.

[0021] A sealing element 60 shown best in Figure 3 is positioned within the interior of the closure body 40 as best shown in Figure 4. The sealing element is generally circular but with a step 61 separating it into a generally semi-circular lower portion 62 and a generally semi-circular upper portion 63. The portions 62, 63 are generally planar. The stepped configuration of the sealing element 60 allows it to mirror the contours of the end of the body 40 incorporating the openings 50, 55. Accordingly, as shown in Figure 4 the sealing element 60 lies across the interior sides of the openings, 50, 55, but does not protrude into them.

[0022] In this embodiment the sealing element 60 is formed into the closure body 40 by a sequential moulding process in which the body 40 is first formed and then used as part of the mould for injection of the sealing element 60. In this way the sealing element 60 becomes inseparably welded to the interior of the closure body 40. In other embodiments the sealing element 60 may be formed completely separately of the closure body 40 and secured into position by any convenient means such as adhesion or welding.

[0023] The exterior of the body 40 includes an axial rib 42 the purpose of which will be described in more detail below.

[0024] In Figure 4 the covers 20, 21 are shown in position over the exterior sides of the openings 50, 55 respectively. The covers 20, 21 are formed from aluminium foil and are heat-sealed onto the openings 50, 55. It will be noted that the opening 20 has a circular depression 22 corresponding to the circular opening 50 and the cover 21 includes an ellipsoidal depression 23 corresponding to the ellipsoidal opening 55. Accordingly, with the covers 20, 21 in position as shown in Figures 2 and 4 it is easy to distinguish between the openings 50, 55 positioned beneath the covers 20, 21.

[0025] Referring now to Figure 5 the closure 10 is shown positioned on the container 15 and with both covers

20, 21 removed. Also shown is the outer closure 30 including the needle 31. It will be noted when also referring to figures 1 and 2 that the outer closure 30 comprises a main cylindrical body 32 and a secondary cylindrical body 33 which has a main axis offset from that of the main body 32. The secondary cylindrical body 33 is open at one end and partially dosed at the other by the top plate 32a of the cylindrical body 32 with the exception of an orifice 32b through which the needle 31 passes and is held securely. The main body 32 also comprises an axial channel 34 which is sized and positioned to receive the rib 42 on the closure body 10 when the outer closure 30 is fitted on as shown in Figure 5. The rib 42 and the channel 34 co-operate to position the outer closure 30 in a particular angular orientation with respect to the closure 10 and to hold it in that position as shown in Figure 5.

[0026] With the needle 31 held firmly in place, when the outer closure 30 is applied to the closure 10 the needle 31 punctures the sealing element 60 through the opening 55 and then punctures the container neck cover 18.

[0027] Referring now to Figures 7 and 8 the operation of the opening 50 is shown. The piercing element 25 includes an elongate shaft 26 terminating in an aperture 27. The opposite end of the shaft 26 terminates with a collar 28. The collar 28 acts as a stop so that when the element 25 is inserted through the opening 50 and through the cover 18 the collar 28 abuts against the exterior end of the chimney 51. Accordingly, the aperture 27 can be precisely positioned within the interior of the container 15.

[0028] Referring now to Figures 9 and 10 there is shown a closure 110 formed according to an alternative embodiment. The closure 110 is very similar to the closure 10 shown in Figures 1 to 8. The major difference is the form of the sealing element 160, which in the embodiment is not a complete circle but rather a generally rectangular strip. The sealing element 160 is so-formed to be accommodated within the upper region of the closure body 140, which in this embodiment includes two lateral steps 170, 171. The sealing element 160 does not therefore extend over the entire interior surface of the upper end of the body 140.

[0029] Referring now to Figures 11 and 12 there is shown a closure 210 formed according to an alternative embodiment. The closure 210 is very similar to the closure 110 shown in Figures 9 and 10. In this embodiment the fins 152, 153 which flank the chimney 151 are not parallel but rather diverge towards the periphery of the closure. Accordingly, the lower part 262 of the sealing element 260 is fan-shaped to correspond with the region defined by the fins 251, 252.

[0030] Referring now to Figure 13 there is shown a closure 310 formed according to an alternative embodiment. The closure is similar to the closures shown in Figures 1 to 11. In this embodiment there is no step between the two openings 250, 255. The openings are provided at either end of a figure-of-eight chimney 265 projecting from a top deck 270, as shown best in Figures 14 and 15.

[0031] As shown in Figure 15, the openings 250, 255 are covered, by respective disc-shape foil covers 220, 221 each having a respective pull tab 220a, 221a.

[0032] The covers 220, 221 are positioned over the openings 250, 255 as shown in Figure 14 and then welded into position.

[0033] In an alternative embodiment (not shown) just the opening 250 is provided in the closure 210. In other words, only one perforable opening is provided. Embodiments with three, four and more openings may also be provided.

11. A closure as claimed in Claim 9 or Claim 10, in which the outer closure member and the closure include angular orientation means.

12. In combination, a container and a perforable closure according to any preceding claim.

Claims

- 1.** A perforable closure comprising: a body with at least one perforable opening; and an internal sealing element which extends across the interior side of the or each opening, in which the sealing element is inseparably welded to the body.
- 2.** A closure as claimed in Claim 1, in which the body has at least two openings.
- 3.** A perforable closure comprising: a body with two or more perforable openings; and of internal sealing element which extends across the interior side of each opening, in which the or two of the openings are adapted to receive different perforating elements.
- 4.** A closure as Claimed in Claim 3, in which the sealing element is inseparably welded to the body.
- 5.** A closure as claimed in any proceeding claim, in which one or at least one of the opening/s comprise a chimney for limiting entry of a perforating element.
- 6.** A closure as claimed in any preceding claim, in which the or at least one of the openings is provided with a removable cover.
- 7.** A closure as claimed in any preceding claim, in which the sealing element is a different colour to the closure body.
- 8.** A closure as claimed in any preceding claim, the closure comprising a plurality of openings provided with a plurality of removable covers, in which the covers include means for indicating which particular opening they cover.
- 9.** A closure as claimed in any preceding claim, further comprising an outer closure member.
- 10.** A closure as claimed in Claim 9, in which the outer closure comprises a perforating element.

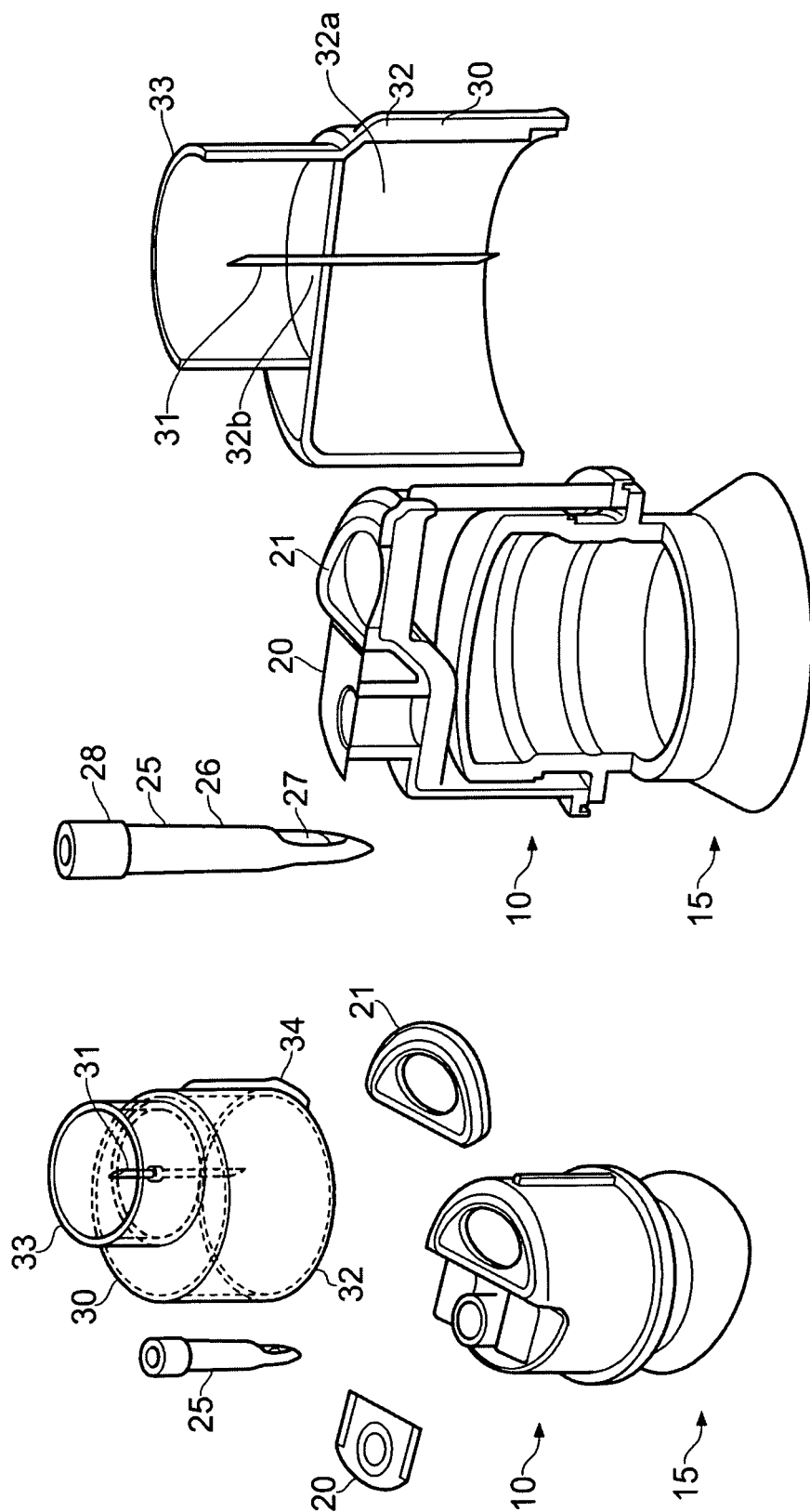


FIG. 2

FIG. 1

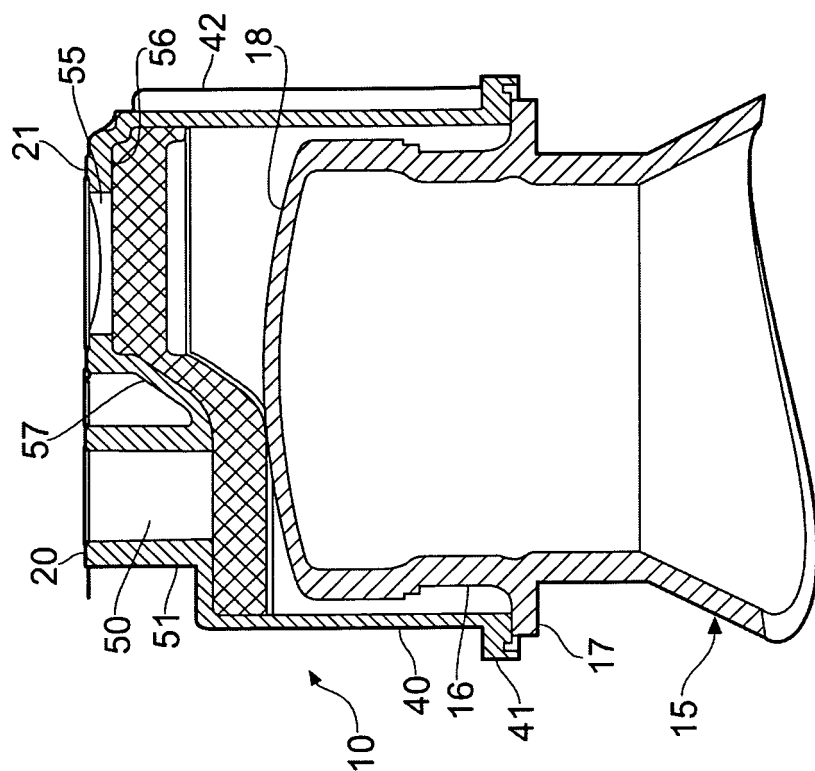


FIG. 4

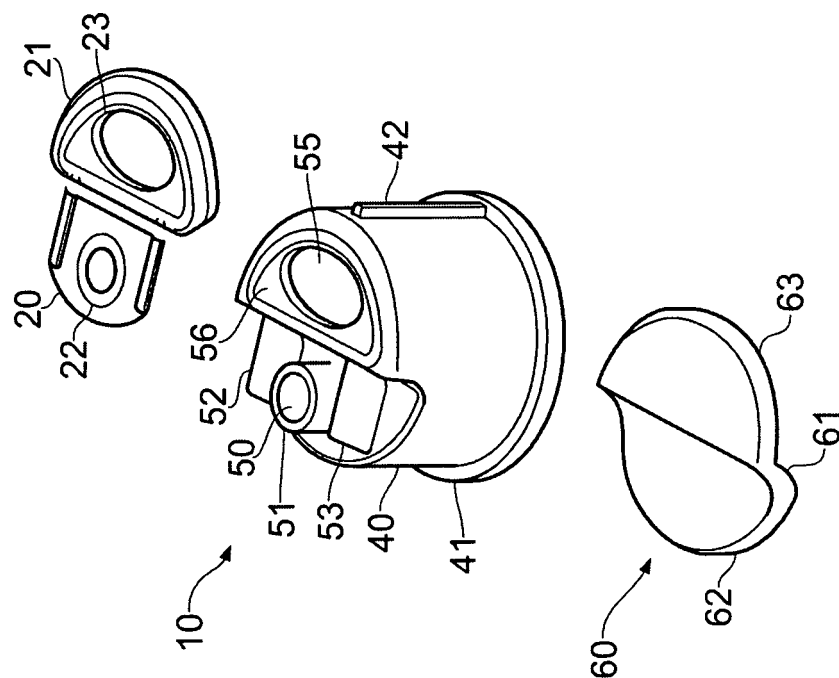


FIG. 3

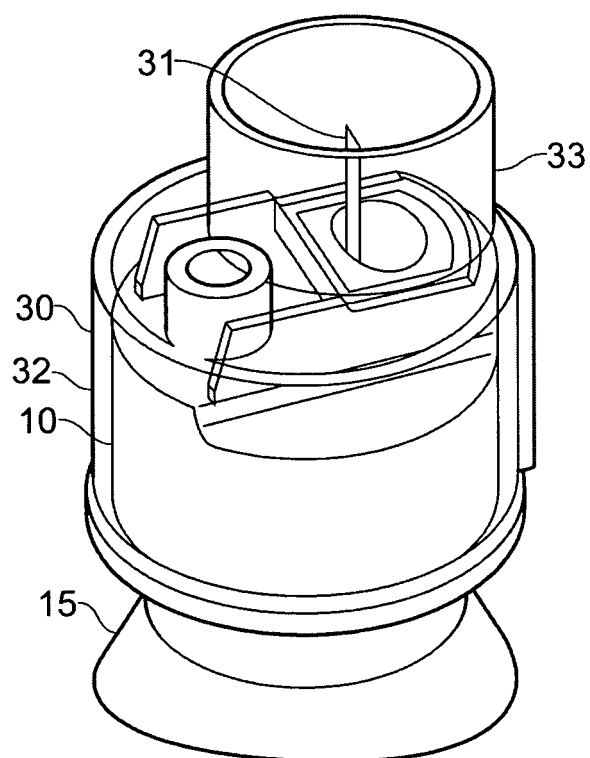


FIG. 5

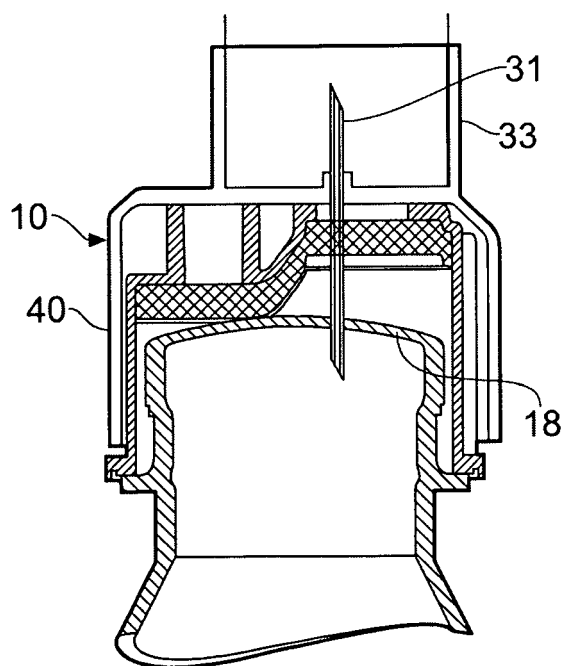


FIG. 6

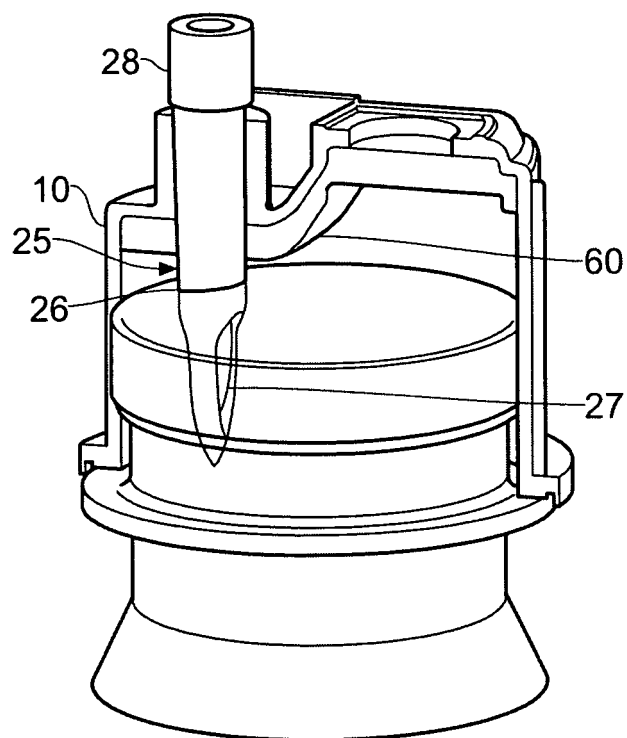


FIG. 7

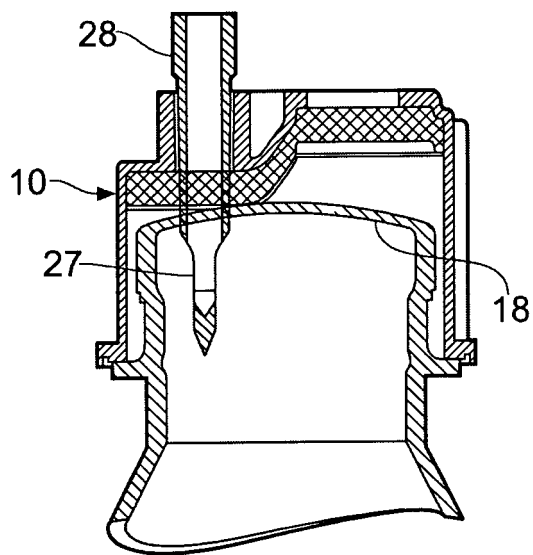


FIG. 8

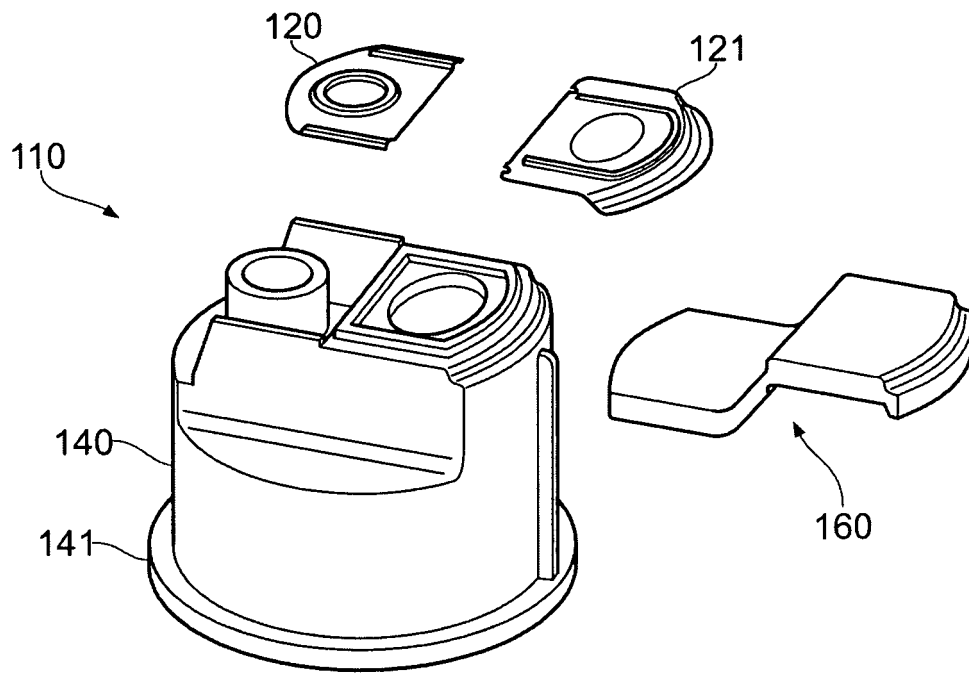


FIG. 9

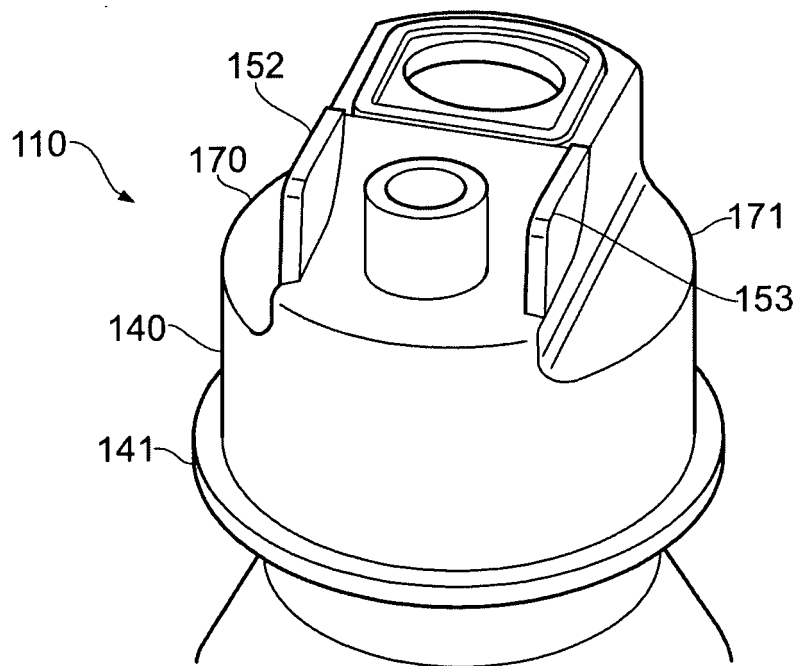


FIG. 10

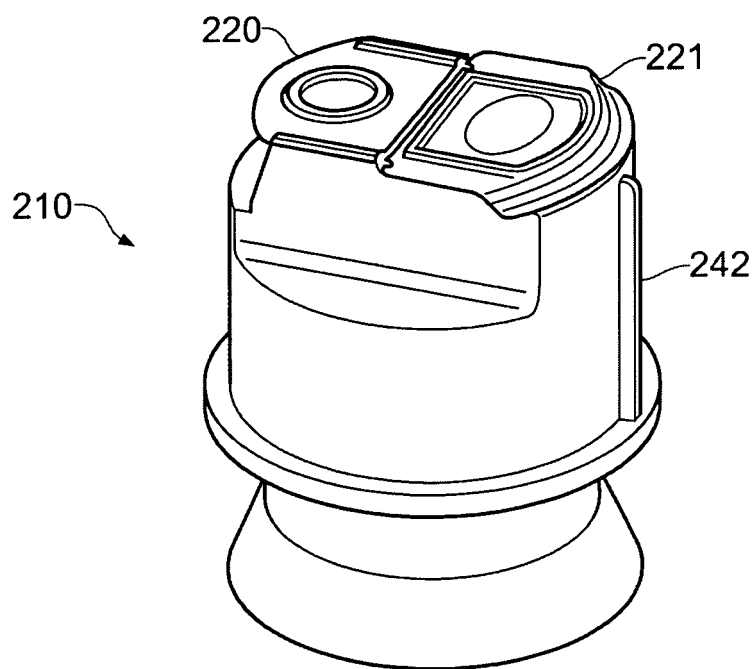


FIG. 11

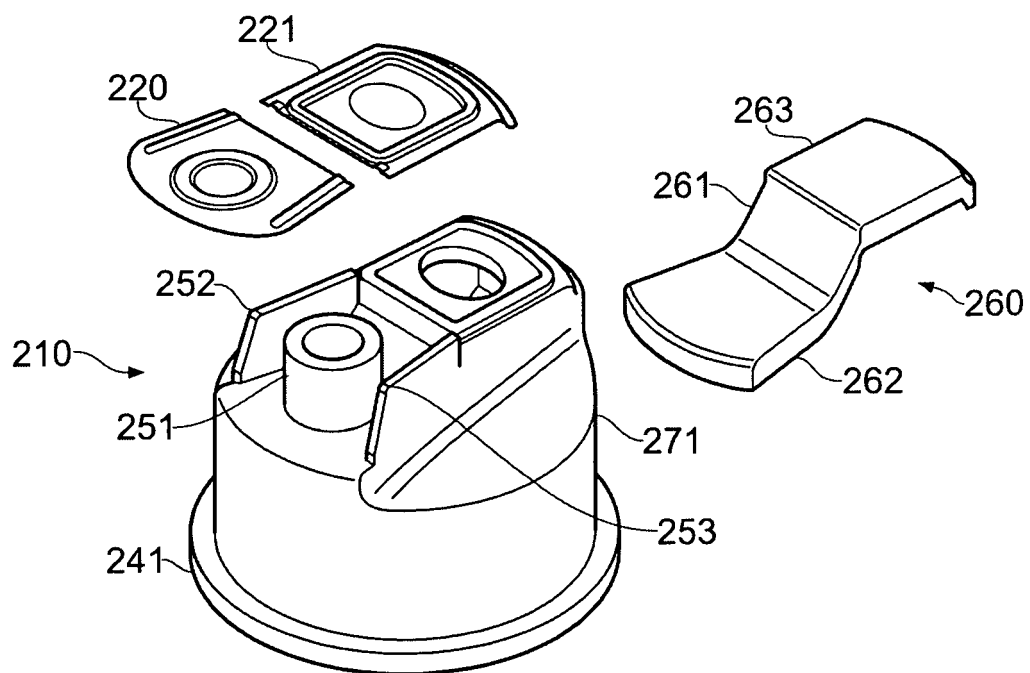


FIG. 12

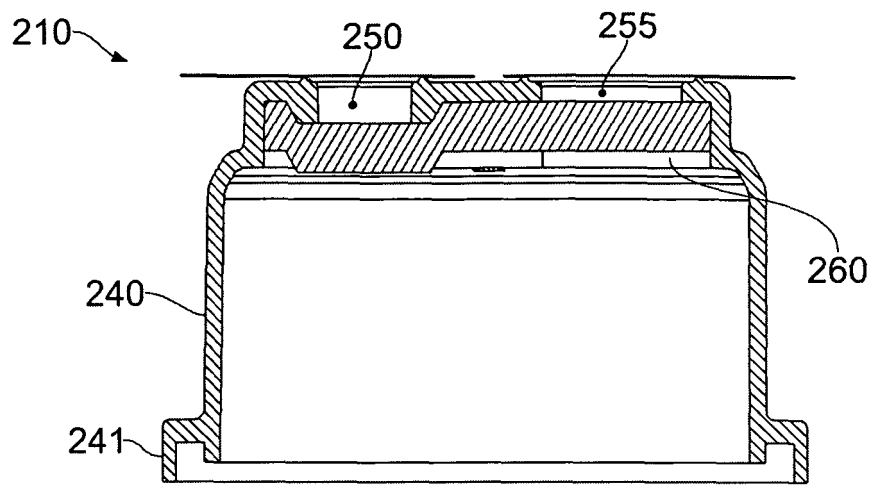


FIG. 13

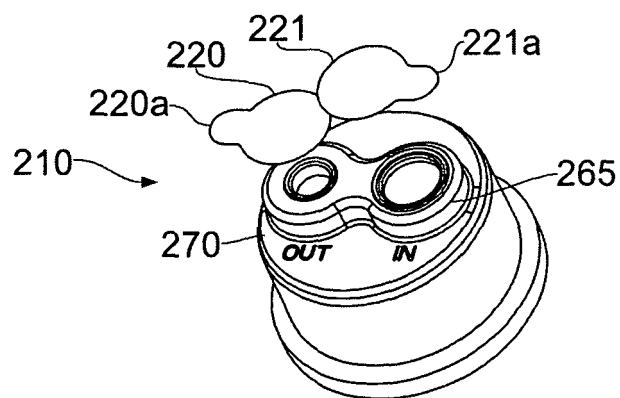


FIG. 14

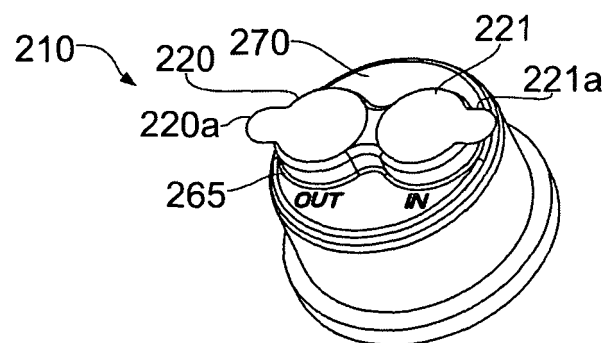


FIG. 15



European Patent
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Application Number
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Place of search The Hague		Date of completion of the search 3 July 2008	Examiner Leijten, René
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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