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(71) Applicant: **Bausch & Lomb Incorporated  
Rochester, NY 14604-2701 (US)**

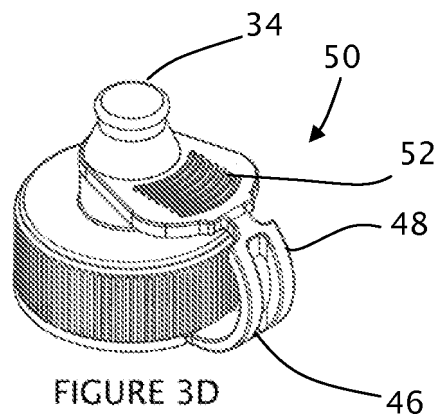
(72) Inventor: **Dressel, Mark W.  
Webster, NY 14580 (US)**

(74) Representative: **Glas, Holger  
Maiwald Patentanwalts GmbH  
Elisenhof  
Elisenstrasse 3  
80335 München (DE)**

(54) **Closure assembly with a levered lid opening mechanism**

(57) A closure assembly (30) for a container. The closure assembly (30) includes a lid (34) that sealingly engages a dispensing outlet (62) in a closed position and is spaced a distance from the dispensing outlet in an open position. The closure assembly also includes a tab

(36) extending from a bottom portion of the lid (34) and having a surface (38) of sufficient dimension to engage a finger or thumb such that pressure on the surface of the tab with the finger or thumb transmits an upward force to the lid to disengage the lid from the closed position.



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## Description

### Field of the Invention

**[0001]** The present invention relates to a closure assembly that provides for sanitary dispensing of a liquid from a container.

### Background of the Invention

**[0002]** Sterile solutions are useful for certain medicinal and ophthalmic applications in which it is desirable to expel a portion of the sterile solution from a multi-dose container for treatment purposes while maintaining the integrity of the remaining sterile solution. In such applications, it is necessary either to provide a bacteriostatic agent in the solution itself or to remove microorganisms and other contaminants from the flow of replacement air into the container. It is also advantageous to provide that the fluid dispensing path minimize the intrusion of contaminations into the container after dispensing a portion of the sterile solution.

**[0003]** US patent 5,588,546 discloses a closure with a stay-open lid, wherein the stay-open feature is attained in part by the use of a nib on the lid of the closure which engages a void on the base of the closure. A frictional fit between the nib and the sides of the void keep the lid up until the user chooses to close the lid on top of the base.

**[0004]** Figures 1A, 1B, 1C, 1D, and 1E are views of a prior art closure assembly 10 that is used to dispense commercial contact lens solutions. The prior art closure 10 includes a lid 12 attached to the cap 14 by strap 16. The strap 16 is formed by separate ribbons 18 and 19. The lid 12 is displaced from the dispensing outlet by exerting upward pressure on area 22 of the lid. Essentially, one lifts the lid 12 off the cap 14 with their fingers and thumb by grasping underneath area 22 and pulling upward. Upon opening the lid 12 will extend a distance from the displacement outlet.

**[0005]** There is a need for a closure assembly that provides for easy removal of a lid from a dispensing cap, and one that is designed to reduce inadvertent contact between the fingers or thumb of a user and the outlet or lid of the container.

### Brief Summary of the Invention

**[0006]** The invention is directed to a closure assembly for a container. The closure assembly includes a lid that sealingly engages a dispensing outlet in a closed position and is spaced a distance from the dispensing outlet in an open position. The closure assembly also includes a tab extending from a bottom portion of the lid and having a surface of sufficient dimension to engage a finger or thumb such that pressure on the surface of the tab with the finger or thumb transmits an upward force to the lid to disengage the lid from the closed position.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

**[0007]** Figures 1A, 1B, 1C, 1D, and 1E are views of a prior art construction.

**[0008]** Figures 2A, 2B and 2C are side, front, and end views, respectively, of a closure assembly in accordance with an exemplary embodiment of the present disclosure.

**[0009]** Figures 2D and 2E are perspective views of the closure assembly of Figure 2A.

**[0010]** Figures 3A, 3B and 3C are side, front, and end views, respectively, of a closure assembly in accordance with an exemplary embodiment of the present disclosure. 3D, and 3E are perspective views of the closure assembly of Figure 3A.

**[0011]** Figures 4A and 4C, are views of another embodiment of the closure assembly.

**[0012]** Figure 4B is a cross-sectional view of the closure assembly of Figure 4A.

**[0013]** Figures 5A and 5B are top and cross-sectional views of a closure assembly with the tab offset from the ribbon.

**[0014]** Figure 6 is a side view of a closure assembly showing the ribbon attached at the bottom of the tab.

### Detailed description of the invention

**[0015]** The invention is directed to a closure assembly for a container. The closure assembly comprises a cap having a dispensing outlet. The closure includes a lid that sealingly engages the dispensing outlet in a closed position and is spaced a distance from the dispensing outlet in an open position. The closure assembly also includes a tab extending from a bottom portion of the lid and having an upper surface of sufficient dimension to engage a finger or thumb such that downward pressure on the upper surface of the tab with the finger or thumb transmits an upward force to the lid to disengage the lid from the closed position.

**[0016]** In one embodiment, the closure assembly also includes a strap that connects the tab to the cap and is of sufficient dimension and stiffness to displace the lid from the dispensing outlet in the open position. Preferably, the lid, the tab, the strap and the cap are integrally formed, e.g., by injecting molding of an appropriate plastic material. Alternatively, one can envision the strap, tab and lid as integrally formed, which is then positioned about the dispensing outlet area much like the cap of a water bottle.

**[0017]** Figures 2A, 2B, and 2C, are side and top end views of a closure assembly 30 in accordance with one embodiment. Figures 2D and 2E are perspective views of the same closure assembly 30.

**[0018]** The closure assembly 60 depicted in Figures 4A to 4C includes a cap 32, a lid 34 and an integral interconnecting strap 44. The cap 32 includes internal features such as threads, detents, annular ribs or ridges for engaging a correspondingly configured neck of a con-

tainer (not shown). The peripheral surface of the cap 32 is shown with a knurled edge 76.

**[0019]** The cap 60 includes a dispensing outlet 62. See, Figures 4A and 4B. Although the dispensing outlet 62 can have any of a variety of configurations, a suitable exemplary embodiment has a generally nozzle shape with an outer or exposed shoulder 74 and protruding lip 75. The dispensing outlet 62 lies on a longitudinal axis LA. Typically, the longitudinal axis LA is collinear with a longitudinal axis of the container.

**[0020]** The lid 34 is configured to releasably and sealingly engage the cap 32 to preclude fluid flow through the dispensing outlet 62 when the lid is in a closed position. The lid 34 is provided with an annular bead that fastens beneath lip 75 and onto shoulder 74 for a liquid tight fit of the lid. The lid 34 is provided with an integral tab 36.

**[0021]** The tab 36 projects radially away from the lid 34. In one embodiment, the tab 36 defines a contact area 38 for engaging a finger or thumb of a user. The tab 36 is sized to space the contact area 38 from the engagement of the lid 34 and the cap 32, by a sufficient distance to allow the tab 36 to function as a lever. The tab 36, which functions as a lever, is relatively inflexible with respect to the strap 44. That is, the tab 36 transmits torque or force to the lid 34, rather than flexing or bending to absorb an applied force. Accordingly, the tab 36 can include stiffening features such as ribs or struts. Alternatively, or additionally, the portions of the tab 36 can be formed with an increased thickness, thereby increasing the rigidity of the tab. Essentially, the tab 36 transmits sufficient torque to remove lid 34 from the dispensing outlet 62 with little or no flexing of the tab.

**[0022]** It is understood that the contact area 38 can include any of a variety of surface features or indicia. As seen in Figures 3B, 3D and 3E, the contact area 38 includes a plurality of ridges. The ridges can be parallel or intersecting. Further, the ridges can be curvilinear, faceted or straight. It is also noted that the contact area 38 can include indicia to direct the user on how to operate the closure assembly. The indicia can be either words, symbols, or a combination thereof. See, Figure 2B.

**[0023]** In one embodiment, the contact area 38 of the tab 36 is spaced from the longitudinal axis LA of the dispensing outlet 62 by a distance that is at least substantially equal to one half the cap diameter (or equal to the cap radius). Thus, for a concentrically located dispensing outlet 62 in the cap 32, the contact area of the tab 36 has a radial dimension of approximately 1 to 1.5x the radial dimension of the cap. In a further exemplary embodiment, the contact area 38 of the tab 36 is radially intermediate the periphery of the cap 32 and a periphery of the container. The contact area 38 is spaced from the longitudinal axis LA to allow the application of force on the tab 36 at approximately the radius of the cap 32. In a further exemplary embodiment, the tab 36 is sized to locate at least a portion of the contact area 38 beyond the radius of the cap 32 yet within the footprint of the

container.

**[0024]** As depicted in the Figures, the strap 44 integrally interconnects the tab 36 to the cap 32 and thus provides for displacement of the lid 34 between a closed position, i.e., sealing the dispensing outlet 62, and an open, operable position of the lid distanced from the dispensing outlet and permitting free unobstructed flow of the liquid from the dispensing outlet, i.e., the container. The strap 44 extends from the lid 34 to the cap 32. The transition from the cap 32 to the strap 44 is located at a lower or bottom portion of the cap 32, thereby maximizing the distance along the longitudinal axis LA between connection of the strap to the lid and the connection of the strap to the cap. Maximizing distance between these connections increases the radius of curvature experienced by the strap 44 in the closed position of the lid 34. The increased radius of curvature allows the strap to be thicker. Movement of the lid 34 onto the cap 32 into the closed position produces a bias in the strap 44 that will be released when the lid is removed and will carry the lid away from the dispensing outlet 62.

**[0025]** The lid 34 will be held away from the dispensing outlet 62 by the strap 44. The strap 44 can be formed of separate ribbon elements 46 and 48. Alternatively, the strap 44 can be formed of a single ribbon. The strap 44 formed of separate ribbons 46 and 48 can effectively provide greater support to the lid 34. The strap 44 is configured such that the lid 34 does not twist when being brought back onto the dispensing outlet 62. Accordingly, the strap 44 presents the lid 34 to the dispensing outlet 62 in substantially collinear alignment.

**[0026]** Figure 4A is a top view of an alternate closure assembly 60. Figure 4B is a cross-sectional view of the closure 60. Figure 4C is a side view of the closure assembly 60 in a closed position. In Figure 4A and 4B, the closure 60 is shown in an after molded configuration showing a one piece closure assembly.

**[0027]** The cap 32 is designed for a press fit onto a container, or alternatively, it is well within the skill of the art to utilize a screw fitting. The closure assembly is adapted to be applied to a container. For example, the container can include an annular bead that engages shoulders 66, 68 and 70 of the closure assembly to seal the closure assembly to the container. The cap 32 is shown to have a generally circular periphery defined by a cap diameter.

**[0028]** As shown in Figure 4B, the tab 36 is thicker than the strap 44. The tab 36 may have a higher resistance to bending than the strap 44 such that the resistance is sufficient to allow pushing down on the tab 36 to loosen the lid 34. Alternatively, the tab 36 can subtend a larger angle to exhibit greater resistance to bending with respect to a strap 44 of the same thickness. In the alternative, the tab 36 can be provided with ribs in order to increase its beam strength such that the tab 36 sufficiently resists bending to disengage the lid 34, in response to a downward force on the contact area 38.

**[0029]** Figures 5A and 5B are views of a closure as-

sembly 80. In closure assembly 80, the tab 36 projects at a generally right angle to the strap 44. The tab 36 can be pushed up or down to open the lid 34 (move the lid from the closed position to the open position). Even if pushed up, the thumb or finger of the user would not tend to be drawn toward the dispensing outlet 62 as the lid movement would be to the side. If the tab 36 were pressed down to open, the finger is not lead toward to the dispensing outlet 62.

**[0030]** The tab 36 when separated, or spaced, from the strap 44, as in Figure 5A, can be in any location that does not tend to lead the finger toward the dispensing outlet 62 when opening the closure assembly. A location less than 120° from the attachment point with the strap 44 is suitable. A preferred location is 75° to 90° from the center of the area of attachment of the strap 44 to the lid 34. The tab 36, when offset from the strap attachment point, can contain words such as "push" or other indicia to indicate that downward motion is preferred to open the lid 34.

**[0031]** One use of the closure assembly in is combination with plastic squeeze containers that are used to hold ophthalmic compositions such as eye drops or contact lens cleaning solutions. For such uses, the consumer could both hold and open the present closure with one hand. Other suitable use is with medical solutions and other ophthalmic solutions.

**[0032]** Figure 6 illustrates a closure assembly 90 with a different attachment point for the strap 44 onto the tab 36. In this instance the strap 44 extends from the underside of the tab 36 rather than as a continuation of the tab. This embodiment will provide additional bending resistance to the tab 36 as the tab is made is thicker at the point 92 of strap attachment to the tab. This embodiment also provides a more acute curve in the strap 44 which causes the lid 34 to spring further from the dispensing outlet 62 when the lid 34 is opened.

**[0033]** Any suitable material can be utilized in the formation of the closure assembly. Typical of such materials are polystyrene and other olefin polymers. A preferred material has been found to be a low-density polyethylene as it is low in cost, easy to mold and provides good flexibility properties for use in the ribbon while also providing the strength needed for the tab.

**[0034]** The present closure assembly facilitates one-handed operation in a manner where the finger opening the closure assembly is not led towards an orifice or outlet where sanitary material is expelled. Preferably, the cap and the lid are integral with the strap to form the closure assembly thereby providing low cost of manufacture. Further, the operation of the opening of the lid is simple and intuitive to the user.

**[0035]** While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, the present invention is intended to embrace all such alternatives, modifications,

and variations as fall within the spirit and broad scope of the appended claims.

## 5 Claims

1. A closure assembly for a container, the closure assembly comprising:

10 a cap having a dispensing outlet, wherein the cap sealingly engages the container;  
a lid sealingly engaged with the dispensing outlet in a closed position and movable to an open position spaced from the dispensing outlet; and  
15 a tab extending from a bottom portion of the lid and having an upper surface of sufficient dimension to engage a finger or thumb such that downward pressure on the upper surface of the tab with a finger or thumb transmits an upward force to the lid to disengage the lid from the closed position.

2. The closure of claim 1, further comprising a strap that connects the tab to the cap and is of sufficient dimension and stiffness to displace the lid from the dispensing outlet in the open position.

3. The closure of claim 2, wherein the lid, the tab, the strap and the cap are integrally formed.

4. The closure of any one of claims 2 and 3, wherein the lid has a circular periphery and the tab is attached to the lid at a point separate from the point of connection of the strap.

5. The closure of any one of claims 1 to 4, wherein the dispensing outlet includes a lip and a shoulder and the lid comprises an inner annular ring adapted to fit under the shoulder to sealingly engage the dispensing outlet in the closed position.

6. The closure of any one of claims 1 to 5, wherein the tab comprises features that stiffen the tab to facilitate the transmission of the upward force on the lid as the downward force is applied to the upper surface of the tab.

7. The closure of claim 6, wherein the features that stiffen the tabs are rib members or struts disposed on a lower surface of the tab.

8. The closure of any one of claims 1 to 7, wherein the tab is of sufficient thickness to provide a tab of sufficient stiffness to facilitate the transmission of the upward force on the lid as the downward force is applied to the upper surface of the tab.

9. The closure of any one of claims 1 to 8, wherein the

upper surface of the tab includes indicia on an upper surface of the tab.

10. The closure of any one of claims 1 to 9, wherein the upper surface of the tab includes a contact area to provide friction to a finger or thumb contacting the tab. 5
11. The closure of claim 2, wherein the lid, the tab and the strap are integrally formed. 10

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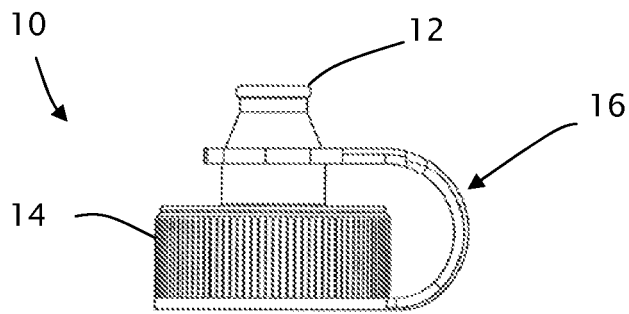


FIGURE 1A  
Prior Art

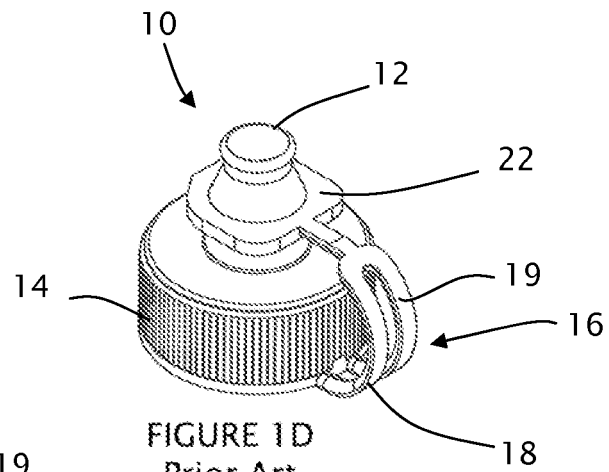


FIGURE 1D  
Prior Art

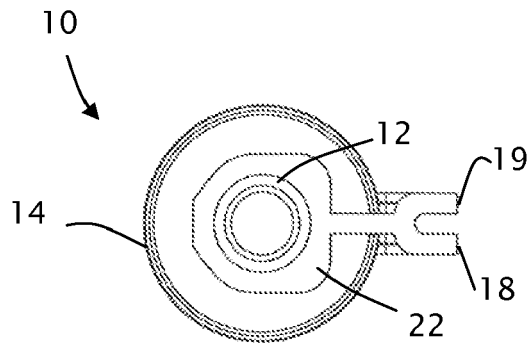


FIGURE 1B  
Prior Art

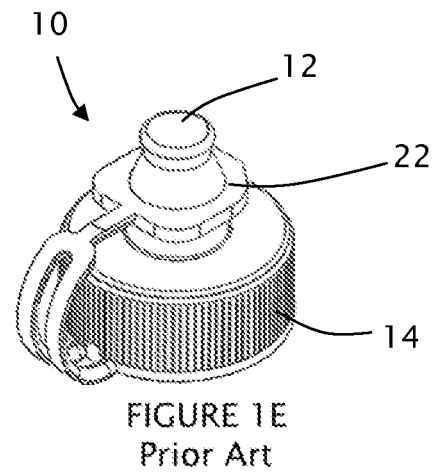


FIGURE 1E  
Prior Art

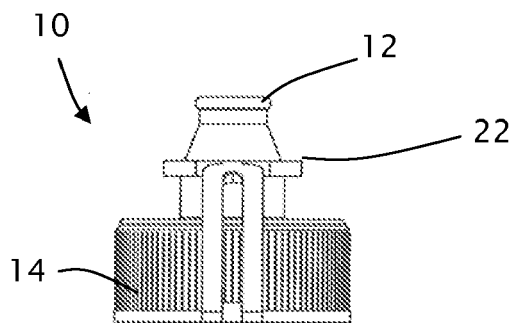
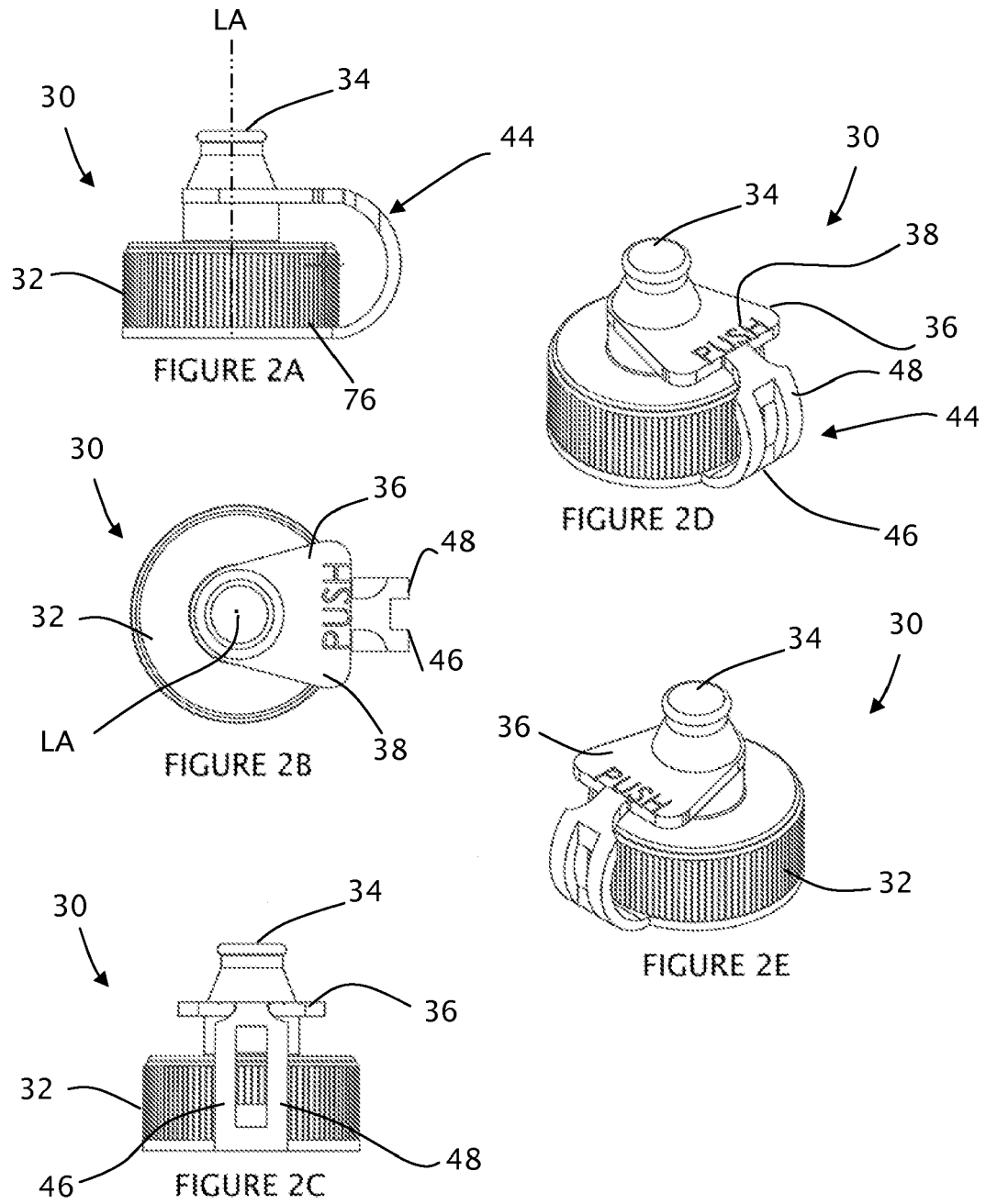
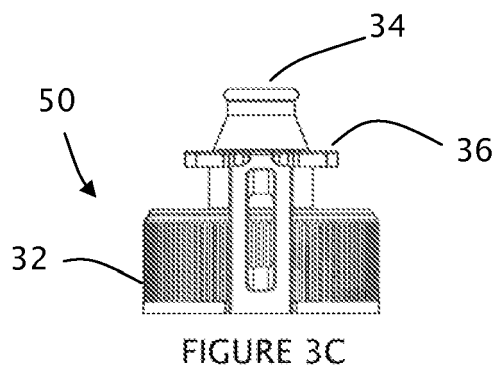
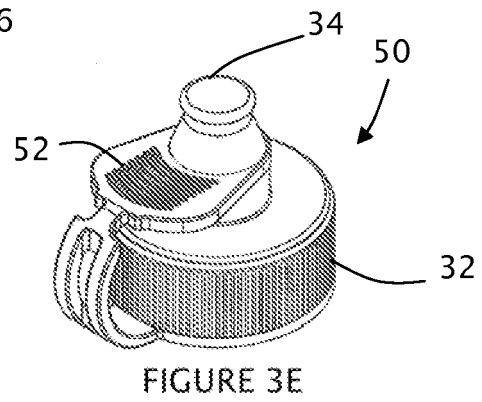
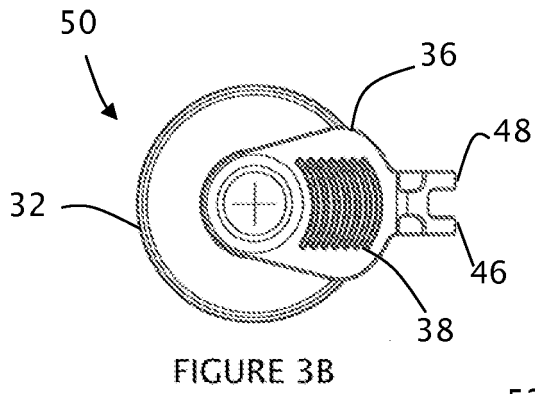
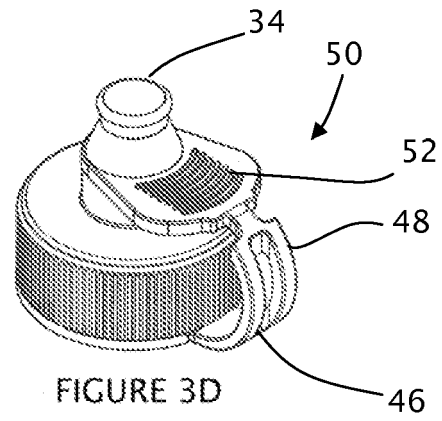
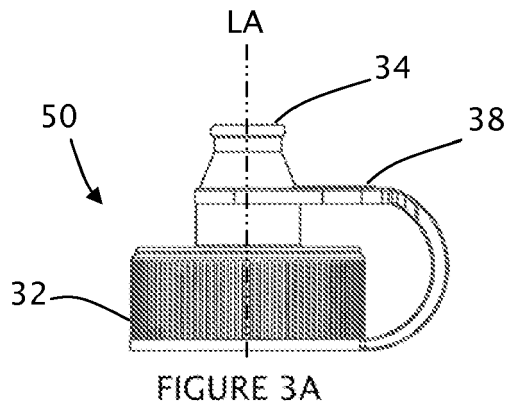


FIGURE 1C  
Prior Art







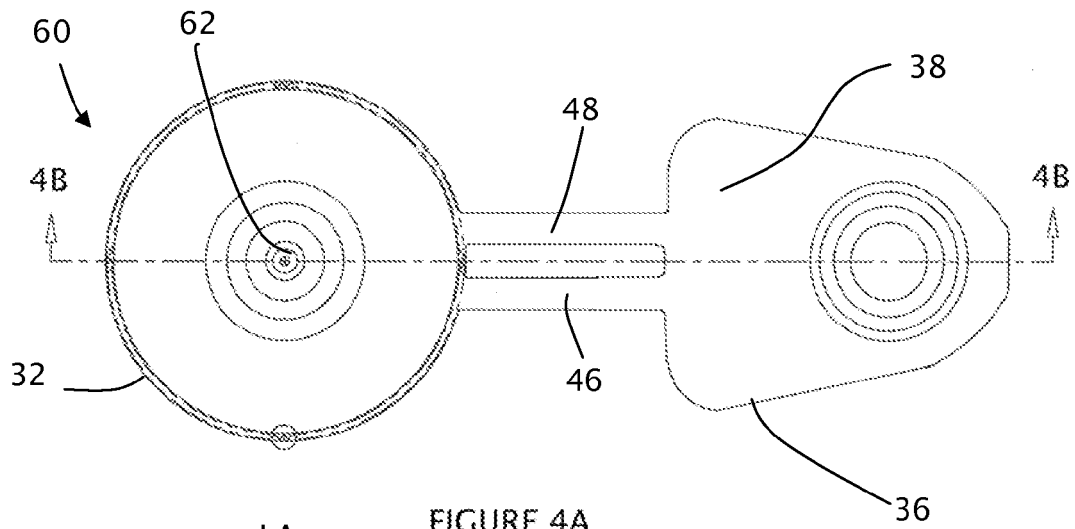


FIGURE 4A

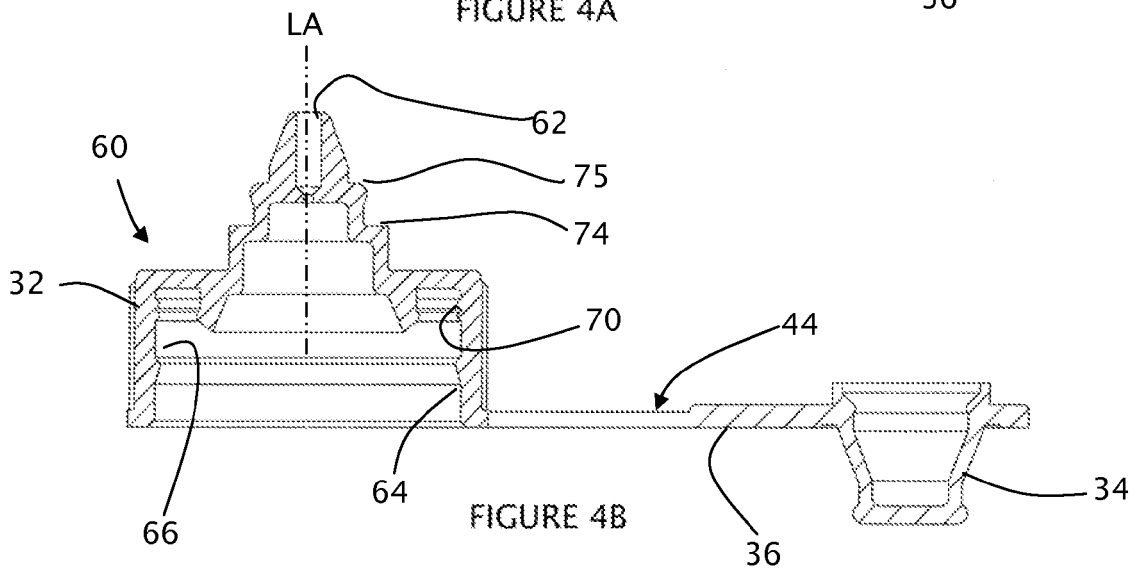


FIGURE 4B

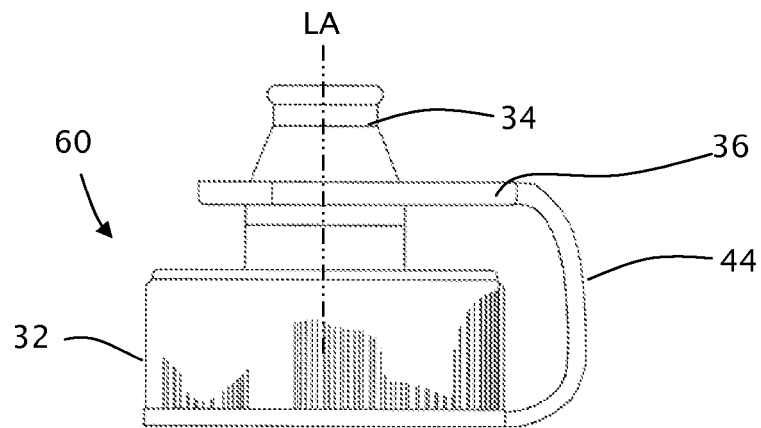
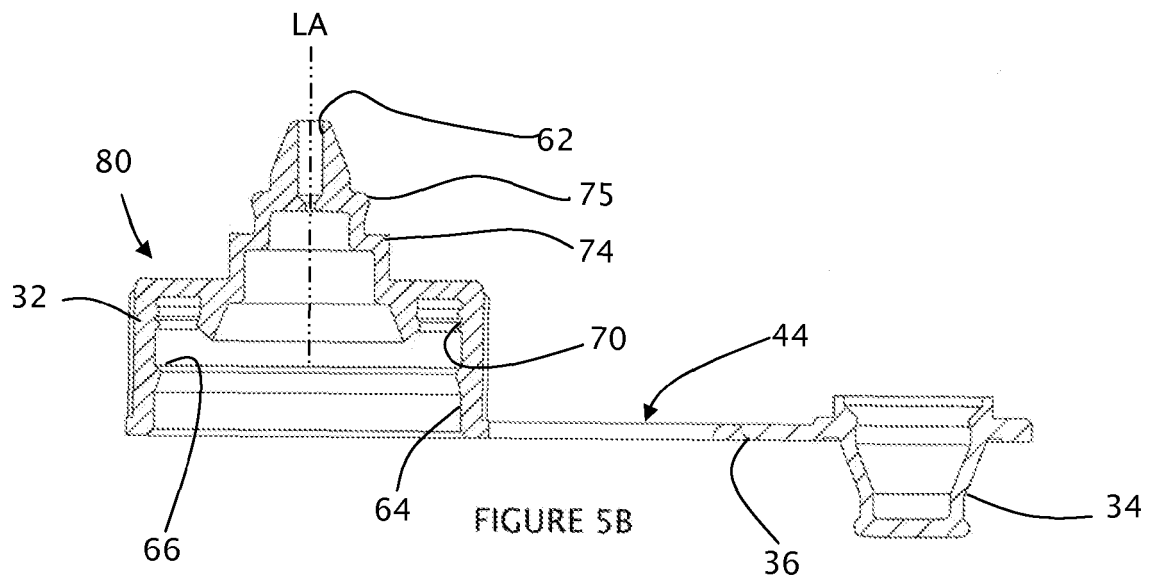
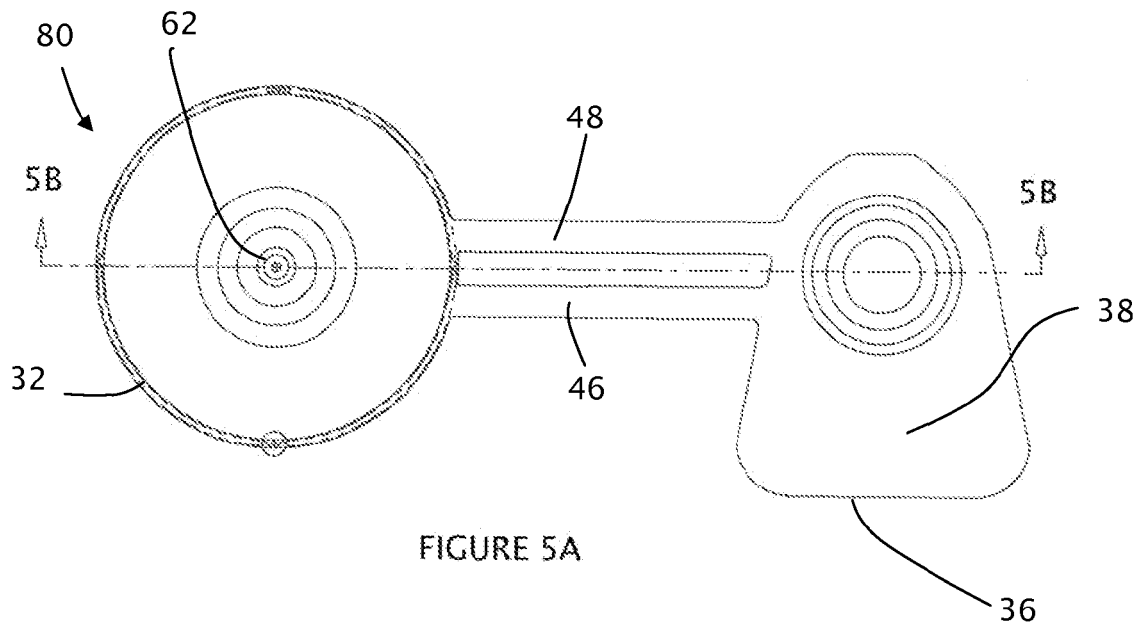


FIGURE 4C



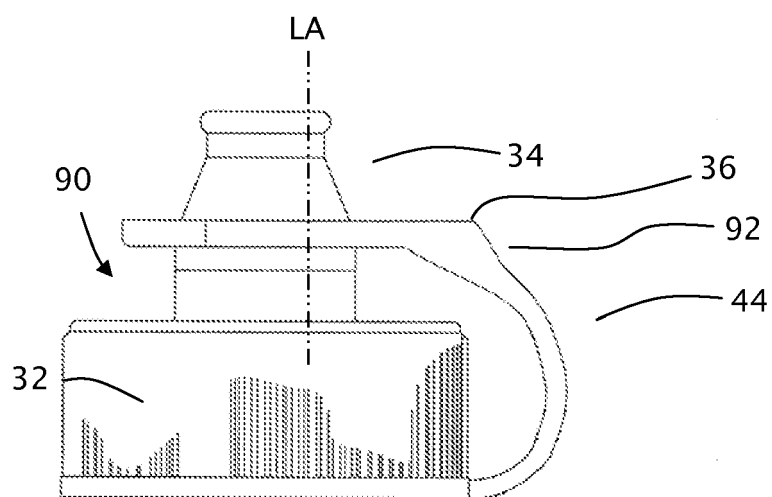


FIGURE 6



## EUROPEAN SEARCH REPORT

Application Number  
EP 08 16 6373

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2002/125274 A1 (BEECROFT W GORDON [US]) 12 September 2002 (2002-09-12) * paragraphs [0029] - [0032]; figures 3-6 *	1-11	INV. B65D47/08
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search Munich		Date of completion of the search 19 November 2008	Examiner Cazacu, Corneliu
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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 ..... &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 (03.02) (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 16 6373

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19-11-2008

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