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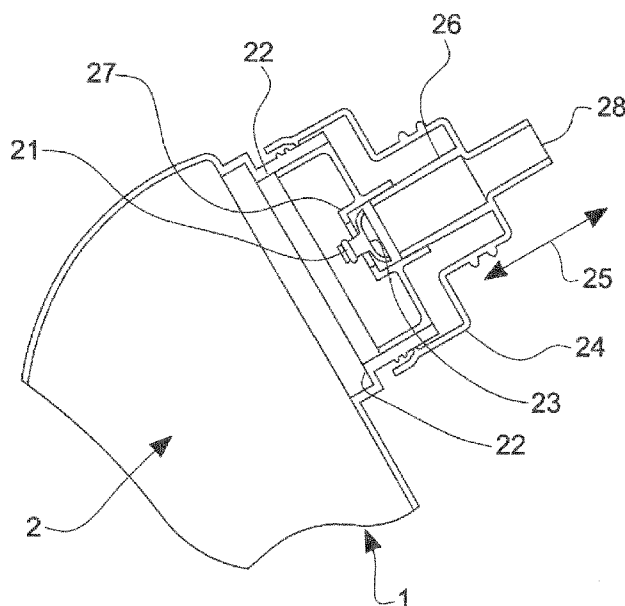


Figure 2(b)

(57) Abstract: A dispenser assembly for dispensing a fluid is disclosed. The dispenser assembly comprises: a cap removably engageable to sealably enclose a dispenser outlet; a conduit configured to provide fluid communication between an inlet that is disposed proximal to a reservoir of said container and said dispenser outlet; a valve arrangement disposed in operative relationship with said conduit, the valve arrangement moveable between a closed position in which a valve member is sealably engaged in said conduit to prevent fluid communication between said inlet and said dispenser outlet and an open position in which the valve member is displaced in said conduit to permit fluid communication between said inlet and said dispenser outlet; and wherein said cap is configured to cooperate with said valve arrangement to return said valve member from said open position to said closed position responsive to said cap enclosing said dispenser outlet.



Dispenser Assembly

The present invention relates to a dispenser for dispensing a fluid. In particular, but not exclusively, the present invention relates to a dispenser for dispensing a dangerous liquid such as a poisonous or toxic liquid.

Background

The term “fluid” will be used herein generically to describe non-solid materials of the type that are capable of flowing (“fluidized materials”), including, but not limited to, liquids, pastes, gels, powders and the like and the term “dispenser” will be used to refer to a wide range of containers and packages for dispensing fluids, including, but not limited to, food condiments, beverages, cosmetics, cleaning, pharmaceutical, healthcare and household products.

Dispensing containers for dangerous or harmful substances generally include a safety feature associated with the lid or cap of the container that inhibits removal of the lid or cap by requiring a sequence of movements or simultaneous movements to be performed on the lid or cap in order to remove it. Such safety features are generally referred to as “childproof” or “child resistant” since they were developed in order to inhibit a child’s access to dangerous contents within the container such as medicines whether in solid or liquid form. However, children may learn to remove such “child resistant” lids or caps and users having weak hand strength such as the aged or infirm may be unable to remove “child resistant” lids or caps. Perversely, this leads to some users leaving the lids or caps off the container or at least in an intermediate configuration which is not childproof and easy to remove thereby making the contents accessible to children or other persons who may not be aware of the dangerous nature of the contents of the container.

Aspects and embodiments in accordance with the present invention were devised with the foregoing in mind.

Summary

Viewed from a first aspect there is provided a dispenser assembly for a container for dispensing a fluid, comprising: a cap removably engageable to sealably enclose a dispenser outlet; a conduit configured to provide fluid communication between an inlet that is disposed proximal to a reservoir of said container and said dispenser outlet; a valve arrangement disposed in operative relationship with said conduit, the valve arrangement moveable between a closed position in which a valve member is sealably engaged in said conduit to

prevent fluid communication between said inlet and said dispenser outlet and an open position in which the valve member is displaced in said conduit to permit fluid communication between said inlet and said dispenser outlet; and wherein said cap is configured to be cooperate with said valve arrangement to return said valve member from said open position to said closed position responsive to said cap enclosing said dispenser outlet.

Such a dispenser assembly requires at least two separate actuation activities in order to gain access to the contents of the dispenser. Furthermore, once the first activity (i.e. removal of the cap to expose the dispensing outlet) has been completed, access to the contents of the dispenser is still inhibited. Dispensing the contents requires a specific deliberate action on the part of the user to dispense the contents. Thus, inadvertent dispenser contents may be reduced or avoided.

In at least one embodiment the valve arrangement includes a valve member for controlling liquid communication through a conduit between an inlet from a fluid reservoir and the dispenser outlet. The valve arrangement is moveable between a closed position in which a valve member is sealably engaged in the conduit to prevent fluid communication through the conduit between the reservoir inlet and a dispenser outlet, and an open position in which the valve member is displaced to permit fluid communication through the conduit between the reservoir inlet and a dispenser outlet. The valve member is in operative relationship with the conduit to permit liquid communication therethrough responsive to a user input that causes the displacement of the valve member relative to the conduit. A valve arrangement is suitable for controlling the flow of a fluid.

More importantly, and in accordance with the invention, the cap is configured to cooperate with said valve arrangement to return the valve member to the closed position responsive to the cap enclosing said dispenser outlet.

The valve arrangement may be movable between a first configuration in which the valve member is in the closed position and a second configuration in which the valve member is in the open position only while the cap is also disposed in a particular configuration in which the dispenser outlet is exposed which reduces the likelihood of accidental dispensing or spillage of contents. Such accidents may be further reduced by the valve arrangement being constrained in the closed position whilst the cap is in an orientation that encloses the dispenser outlet.

Where the valve assembly is biased to return the valve member from the open position to the closed position, it may also be preferable to constrain the valve member in the open position

when the cap is not enclosing the dispenser outlet but it is important for the reasons set forth in the foregoing preamble that the valve member is returned to the closed when the cap is returned to the configuration in which the dispenser outlet is closed.

Typically, the valve arrangement is operative to permit fluid transfer between the inlet and the dispenser outlet responsive to movement of the valve member relative to the conduit. The movement may result from the valve member and conduit being slideably moveable relative to one another, and/or rotatable relative to one another.

Preferably actuation to move the valve member between the closed position and the open position, and between the open position and the closed position, is responsive to a user input.

Where the conduit and valve assembly form part of a closure mutually cooperative engagement formations may be provided that are configured for removably retaining the closure in an outlet port of a container.

Typically, the valve member is configured for occluding the conduit while the valve arrangement is in the closed position.

The cap may be rotatable about an axis of the closure, rotatable relative to an axis of the closure, or slideable relative to an axis of the closure.

Preferably, the cap will be integrally formed with the closure and is coupled to the closure by a live hinge. Alternatively, the cap may be removably coupled to the closure. The cap may engage with the valve arrangement for removably retaining the valve arrangement in the closed position or and/or be translatable with respect to the valve arrangement to move the valve member to the open position.

In at least one embodiment, the dispenser assembly is mounted on a plug member insertable into an open end or access port of the reservoir, the plug member comprising the valve assembly that is movable with respect to the conduit from the open configuration to the closed configuration.

The cap and the valve arrangement may include mutually cooperative engagement formations that are configured for removably retaining the valve member in the closed position.

In a yet further embodiment of the invention an actuation member may be provided that is configured to move the valve member between the closed position and the open position.

The actuation member may be used for maintaining the valve member in the open position when the cap is removed and the valve member may be biased to return to the closed position upon said cap enclosing said dispenser outlet.

The valve member is preferably made from a resilient polymeric material. The valve member made of such a resilient may be compressed responsive to the cap being engaged in a configuration for removably retaining the valve member in the open position. Synergistically, the valve member formed from such a resilient material may be configured for urging the valve member from the open position to the closed position responsive to said cap being disengaged from the configuration.

According to a preferred embodiment of the invention, the valve member is an umbrella valve. In alternative embodiments the valve member may be a slit valve, or an occlusion valve. However, it will be appreciated by those skilled in the art the valve may be formed from any material or in any configuration that releasably and sealably occlude the conduit in the closed position and prevents fluid communication between the inlet to the dispenser outlet.

A particular goal of the present invention is that the cap and valve arrangement comprise mutually cooperative engagement formation that are configured to provide a "child resistant" release mechanism. Preferably, the mutually cooperative engagement formations are arranged to provide a squeeze and pull release mechanism.

A yet further embodiment of the invention provides, a dispenser assembly comprising: a cap removably engageable to sealably enclose a dispenser outlet; a conduit configured to provide fluid communication between an inlet that is disposed proximal to a reservoir of said container and said dispenser outlet; a valve arrangement disposed in operative relationship with said conduit, the valve arrangement moveable between a closed position in which a valve member is sealably engaged in said conduit to control fluid communication between said inlet and said dispenser outlet and an open position in which the valve member is displaced in said conduit to permit fluid communication between said inlet and said dispenser outlet; and wherein said valve arrangement further comprises an actuation formation and at least one resilient member, the actuation member being configured for urging the valve member between the closed position and the open position responsive to a user input, and the resilient member biased to return the valve member to the closed position upon removal of said user input.

The conduit may further comprises an occlusion member in its interior configured to occlude the outlet while the closure is in the closed position. In this way, further accidental spillage leakage of the content of the dispenser may be avoided or the likelihood reduced.

In one or more embodiments a bias mechanism configured to bias the valve assembly away from the open position. Such an arrangement maintains the valve member in a position that occludes the conduit and prevents fluid communication with the outlet unless the valve assembly is orientated in the correct configuration thereby reducing the likelihood of leakage were accidental dispensing of contents. Suitably, the bias mechanism is fixed at one end to the conduit.

In one or more embodiments, the mutually cooperative engagement formations comprise a detente arrangement located on an outer surface of the plug. The engagement formation are movable between an engaged and disengaged position, wherein in the engaged position the formation is retained in the detente and in the disengaged position the closure is movable to a position in which the formations disengage from the detente. Suitably, the mutually cooperative engagement formations are arranged to provide a "child resistant" release mechanism. For example, the mutually cooperative engagement formations are arranged to provide a squeeze and pull release mechanism.

List of figures

One or more embodiments in accordance with the present invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figures 1(a)-(d) schematically illustrate a first embodiment of the present invention showing the removal of the cap from the dispenser assembly that comprises the primary child resistant feature of the dispenser assembly;

Figures 2(a)-(b) schematically illustrates cross-sectional views of a first embodiment of the present invention showing (a) the valve assembly in its closed configuration; and (b) the valve assembly in its open configuration;

Figure 3 schematically illustrates cross-sectional views of a second embodiment of the present invention showing (a) the valve assembly in its closed configuration; and (b) the valve assembly in its open configuration;

Figure 3 schematically illustrates cross-sectional views of a second embodiment of the

present invention showing (a) the valve assembly in its closed configuration; and (b) the valve assembly in its open configuration;

Description

Referring now to Figures 1(a)-(d) a container or dispenser 1 (hereinafter a dispenser) is shown that comprises a fluid storage chamber or reservoir 2 (hereinafter reservoir), and a lid or cap 3 (hereinafter a cap). The dispenser 1 also includes a dispenser assembly 4 that is movable to bring the reservoir into fluid communication with an outlet 5.

The dispenser assembly 4 is generally securably coupled to the dispenser 1 by means of screw-fit, snap-fit, or press-fit connection proximal to an access port (not shown). The dispenser 1 shown includes a flange or lip 8 that provides a stop to ensure that the valve assembly 4 is correctly coupled to the dispenser 1 and is not pushed too far into reservoir 2 or too little into the reservoir resulting in leakage of the contents. Additionally, it may also be used to provide a convenient feature that may be gripped between the user's fingers when pulling the dispenser assembly 4 open.

Lid 3 is made of a deformable material such as a medium density plastics material such as polypropylene and the like, and also includes a detente 17 which is shaped to accommodate a protrusion 18. When the lid 3 is pushed onto dispenser assembly 4 the wall of the lid encountering protrusion 18 deforms sufficiently for the lid to pass over protrusion 18 until protrusion 18 engages with detente 17 to releasably couple the lid to the valve member 4. The lid may be removed by simply squeezing the sidewalls 20 thereby causing the sidewalls 21 in the vicinity of cavity 17 to move outwards away from valve member 4. Movement of sidewalls 21 away from valve member 4 release protrusion 18 from cavity 17 thereby permitting lid 3 to be removed.

As can be seen in Figure 1(a)-(d), the cap 3 is securably and releasably coupled to the dispenser assembly by a screw-fit connection. However, referring now to figure 1(a)-(d) the first embodiment incorporates a primary child resistance feature that requires squeezing of the sides 6 of lid 3 in the direction generally shown by arrows 7 to release lid 3 from the valve assembly 4. Typically the child resistant feature will comprise mutually cooperative features formed on an inner surface of the lid 3 which in use engage with détentes formed on an outer surface of the dispenser assembly 4, so that upon squeezing the sides 6 in the direction generally shown in direction shown by arrows 7 the walls of the lid 3 deform and the cooperative features disengage from the détentes permitting the lid 3 to be rotated to release the lid 3 from the dispenser assembly 4.

Having released the child resistant feature of the dispenser assembly 4, the lid 3 may then be removed from the dispenser assembly 4.

Referring now to Figures 2(a), there is shown a schematic cross-sectional drawing of the dispenser assembly 4. An access port of the dispenser 1 is shown generally at 20. Preferably, the dispenser assembly is sealably engaged within the port 20 to prevent leakage of fluid from the reservoir 2.

The valve assembly includes an inner portion 22 and an outer portion 24. The inner portion 22 comprises a threaded region on an outer surface thereof for receiving a reciprocally threaded inner region of outer portion 24. The threaded portions of inner portion 22 and outer portion 24 are configured such that rotation of the outer portion 24 relative to the inner portion 22 causes the slideable displacement of the outer portion 24 in a direction shown generally by arrow 25. A valve member 23 is shown in the closed position in which the conduit is occluded to prevent fluid communication between the inlet 21 and outlet 28.

A conduit 26 is disposed axially in the valve assembly 4 and has an inlet 21 located proximally within the port 20 and a dispenser outlet 28 formed at a distal end for dispensing fluid communicated from the inlet 21 to the outlet 28. Accordingly, when the outer portion 24 is rotated relative to the inner portion 22 it causes the slideable displacement of the outer portion 24 in the direction shown generally by the arrow 25.

As can be seen in Figure 2(a) the valve member is an umbrella type valve. The annular edges of the valve member 21 engage against a flange 27 and in the closed configuration shown are pressed against the flange 21 by ends of walls of the conduit 26. The valve member 21 is thereby maintained in the closed position until the outer portion 24 is rotated relative to the inner portion 21.

In use, when the user wishes to dispense fluid from the reservoir 2 he displaces the outer portion 24 relative to the inner portion 22. In the described embodiment the walls of reservoir 2 are made of a deformable material such as a deformable plastics material and therefore may be squeezed to apply pressure to liquid stored in reservoir 2 thereby forcing the fluid through inlet 21 onward through the interior of conduit 26 to outlet 28 for dispensing of the fluid. Since the valve member is not retained against the flange the pressure within the reservoir and/or the fluid causes the valve member to deform allowing fluid to pass around the edges of the valve member into the conduit and out through the outlet 28.

Upon cessation of pressure being applied the resilience of the material of the valve member 21 causes it to return to the closed position. Alternatively, or additionally, the user replacing the cap by screwing it onto the threaded section causes the outer portion to be slideably returned downwardly. This action causes the ends of the conduit to once more bear against the edges of the valve member holding it in the closed position.

Such an arrangement comprises two safety features. The second safety feature is only accessible once the first or primary safety feature has been removed. A simple single direction operation, i.e. pulling or screwing the valve member 4 away from the reservoir into the open position creates a liquid path between the reservoir cavity 12 and the outlet 5 so that liquid stored in the reservoir cavity 12 may be dispensed.

Figure 4 illustrates a second embodiment of the invention. Likewise, a cap 3 is shown which forms a primary safety feature that is removed by a squeeze and pull or squeeze and twist action as described in relation to the foregoing embodiment. In this second embodiment, a plunger 33 is shown that is housed within the conduit 26. An outlet end of the plunger 33 comprises an opening 37.

Referring now to Figure 3(a) that shows a sectional illustration of the second embodiment of the invention. As can be seen the plunger is slideably located within the conduit 26. At an end proximate to the inlet from the reservoir a stopper 35 is located which in the closed position engages to occlude the open end of inlet of the conduit and thereby prevent the communication of fluid from the reservoir into the conduit. A resilient member 34 is located between the stopper 35 and the plunger 33 and is configured to urge the stopper into engagement with the open end of the inlet of the conduit.

In use, the user presses the end 37 of the plunger against a surface to displace the plunger 33 axially within the conduit 26. This causes the resilient member 34 to compress and the plunger to disengage from the open end of the conduit and thereby opening the conduit to permit fluid to be communicated between the inlet and the outlet. In the described embodiment the walls of reservoir 2 are made of a deformable material such as a deformable plastics material and therefore may be squeezed to apply pressure to liquid stored in reservoir 2 thereby forcing the fluid through inlet 21 onward through the interior of conduit 26 to outlet 28 for dispensing of the fluid. Since the valve member is not retained against the inlet aperture the pressure within the reservoir allows the fluid to pass around the edges of the valve member into the conduit and out through the outlet 28.

The recess 37 in the outlet end of the conduit permits fluid to be dispensed even when the end 37 is pressed against a surface.

Once the axially directed pressure is removed the resilient member causes the plunger to return and the valve member once again is disposed in the closed position.

Referring now to Figures 5(a) and 5(b), a third embodiment of the invention is illustrated that includes a slideable cam 50. Those skilled in the art will appreciate that this is merely an exemplary embodiment and the cam surface may equally well be rotatable. The conduit 26 includes a resilient plug member 52. Preferably, the plug member 52 is formed from a resilient foam material of the type used in ear plugs which may be housed within a protective bag or cover to prevent any interaction between the fluid and the foam material.

As shown in Figure 5(a) in the closed position the plug member expands to occlude the conduit 26. In use, having actuated the primary safety feature by disengaging the lid 3, the cam is slideably moved so that the cam surface compresses the plug member 51 permitting fluid to be communicated between the inlet from the reservoir to the outlet.

When the user releases the cam 50, the cam surface is either displaced by the resilient member returning from a compressed to decompressed configuration or it is urged outwardly upon the cap 3 being engaged. In either case the resilience of the resilient member 52 occludes the conduit to prevent fluid from being communicated from the inlet to the outlet.

Referring now to Figures 6 and Figures 7(a)-(b) a fourth embodiment of the invention is shown.

As used herein any reference to "one embodiment" or "an embodiment" means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" or the phrase "in an embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or.

For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

In addition, use of the "a" or "an" are employed to describe elements and components of the invention. This is done merely for convenience and to give a general sense of the invention. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. For example, the second embodiment of a dispenser in accordance with the present invention has been described with reference to a moulded helical spring. However, the spring need not be moulded but may be a conventional helical spring made of wire. Optionally, or additionally, the spring may be a leaf spring or some other resilient member configured to bias the valve member into the closed position. Although polypropylene has been provided as an example of material for which the dispenser may be made, other plastics materials or other suitable material such as a resin may also be utilised.

The scope of the present disclosure includes any novel feature or combination of features disclosed therein either explicitly or implicitly or any generalisation thereof irrespective of whether or not it relates to the claimed invention or mitigate against any or all of the problems addressed by the present invention. The applicant hereby gives notice that new claims may be formulated to such features during prosecution of this application or of any such further application derived therefrom. In particular, with reference to the appended claims, features from dependent claims may be combined with those of the independent claims and features from respective independent claims may be combined in any appropriate manner and not merely in specific combinations enumerated in the claims.

Claims

1. A dispenser assembly comprising:
 - a cap removably engageable to sealably enclose a dispenser outlet;
 - a conduit configured to provide fluid communication between an inlet that is disposed proximal to a reservoir of said container and said dispenser outlet;
 - a valve arrangement disposed in operative relationship with said conduit, the valve arrangement moveable between a closed position in which a valve member is sealably engaged in said conduit to prevent fluid communication between said inlet and said dispenser outlet and an open position in which the valve member is displaced in said conduit to permit fluid communication between said inlet and said dispenser outlet; and
 - wherein said cap is configured to be cooperate with said valve arrangement to return said valve member from said open position to said closed position responsive to said cap enclosing said dispenser outlet.
2. A dispenser assembly according to claim 1, wherein the valve member is constrained in the closed position while the cap is enclosing the dispenser outlet.
3. A dispenser assembly according to claim 1 or claim 2, wherein the cap is configured to engage with the valve arrangement for removably retaining the valve member in the open position when the cap is not enclosing the dispenser outlet.
4. A dispenser assembly according to any of claims 1 to 3, wherein the valve arrangement is operative to permit fluid transfer between the inlet and the dispenser outlet responsive to relative movement of the valve member relative to the conduit.
5. A dispenser assembly according to claim 4, wherein the valve member and conduit are slideably moveable relative to one another between the open position and the closed position.
6. A dispenser assembly according to claim 4 or claim 5, wherein the valve member and conduit are rotatable relative to one another between the open position and the closed position.
7. A dispenser assembly according to any preceding claim, wherein the valve assembly is configured to be actuatable to move the valve member between the closed position and the

open position, and between the open position and the closed position, responsive to a user input.

8. A dispenser assembly according to any of claims 1 to 7, wherein the conduit and valve assembly form part of a closure that further comprises mutually cooperative engagement formations that are configured for removably retaining the closure in an outlet port of a container.
9. A dispenser assembly according to any of any preceding claim, wherein the valve member is configured for occluding the conduit while the valve arrangement is in the closed position.
10. A dispenser assembly according to any preceding claim, wherein the cap is configured to be rotatable about an axis of the closure.
11. A dispenser assembly according to any of claims 1 to 5, wherein the cap is configured to be rotatable relative to an axis of the closure.
12. A dispenser assembly according to any of claims 1 to 5, wherein the cap is configured to be slideable relative to an axis of the closure.
13. A dispenser assembly according to any of any preceding claim, wherein the cap is coupled to the closure by a live hinge.
14. A dispenser assembly according to any of claims 1 to 12, wherein the cap is configured to be removably coupled to the closure.
15. A dispenser assembly according to any preceding claim, wherein the cap is configured to engage with the valve arrangement for removably retaining the valve arrangement in the closed position.
16. A dispenser assembly according to any preceding claim, wherein the cap is translatable with respect to the valve arrangement to move the valve member to the open position.
17. A dispenser assembly as claimed in any preceding claim, wherein the cap and the valve arrangement comprise mutually cooperative engagement formations configured for removably retaining the valve member in the closed position.
18. A dispenser assembly according to any preceding claim, wherein said valve arrangement further comprises an actuation member configured to move the valve member between the closed position and the open position.

19. A dispenser assembly according to claim 18, wherein the actuation member is configured for maintaining the valve member in the open position when the cap is removed.
20. A dispenser assembly according to claim 18 or claim 19, wherein valve member is biased to return to the closed position upon said cap enclosing said dispenser outlet.
21. A dispenser assembly according to any preceding claim, wherein the valve member is made from a resilient polymeric material.
22. A dispenser assembly according to any of claims 3 to 21, wherein the valve arrangement further comprises a resilient member that is compressed responsive to the cap being engaged in a configuration for removably retaining the valve member in the open position.
23. A dispenser assembly as claimed in claim 22, wherein the resilient member is configured for urging the valve member from the open position to the closed position responsive to said cap being disengaged from the configuration removably retaining the valve member in the open position.
24. A dispenser assembly according to any preceding claims, wherein the valve member is an umbrella valve.
25. A dispenser assembly according to any preceding claim, wherein the valve member is a slit valve.
26. A dispenser assembly according to any preceding claim, wherein the valve member is an occlusion valve.
27. A dispenser assembly according to any preceding claim, wherein the cap and valve arrangement comprise mutually cooperative engagement formation that are configured to provide a "child resistant" release mechanism.
28. A dispenser assembly according to claim 27, wherein the mutually cooperative engagement formations are arranged to provide a squeeze and pull release mechanism.
29. A dispenser assembly substantially as hereinbefore described and with reference to respective embodiments illustrated in the drawings.
30. A bottle comprising a dispenser assembly according to any preceding claim.
31. A dispenser substantially as hereinbefore described and with reference to respective embodiments illustrated in the drawings.

32. An dispenser assembly comprising:

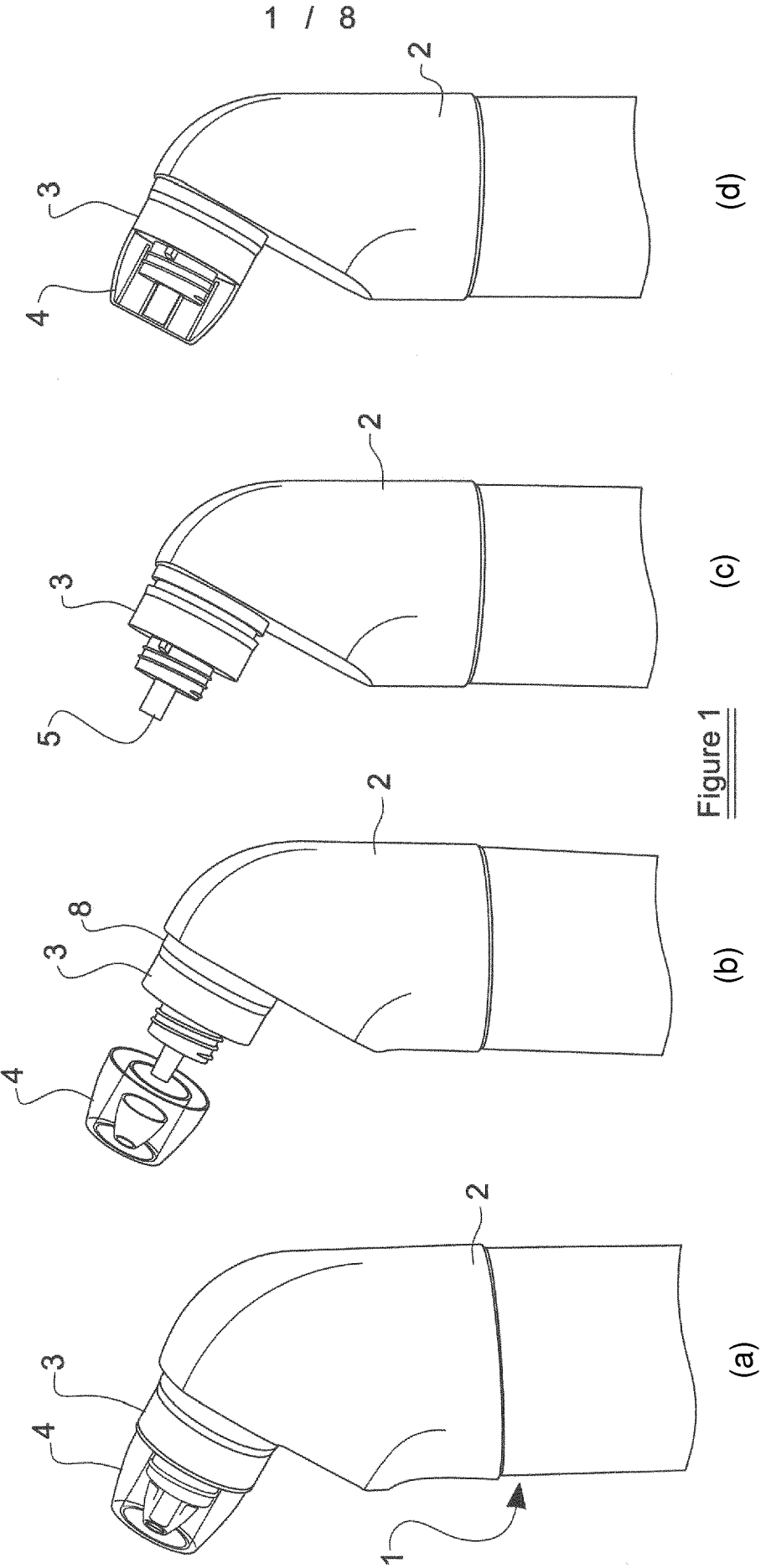
a cap removably engageable to sealably enclose a dispenser outlet;

a conduit configured to provide fluid communication between an inlet that is disposed proximal to a reservoir of said container and said dispenser outlet;

a valve arrangement disposed in operative relationship with said conduit, the valve arrangement moveable between a closed position in which a valve member is sealably engaged in said conduit to control fluid communication between said inlet and said dispenser outlet and an open position in which the valve member is displaced in said conduit to permit fluid communication between said inlet and said dispenser outlet; and

wherein said valve arrangement further comprises an actuation formation and at least one resilient member, the actuation member being configured for urging the valve member between the closed position and the open position responsive to a user input, and the resilient member biased to return the valve member to the closed position upon removal of said user input.

33. A dispenser assembly substantially as hereinbefore described and with reference to respective embodiments illustrated in the drawings.



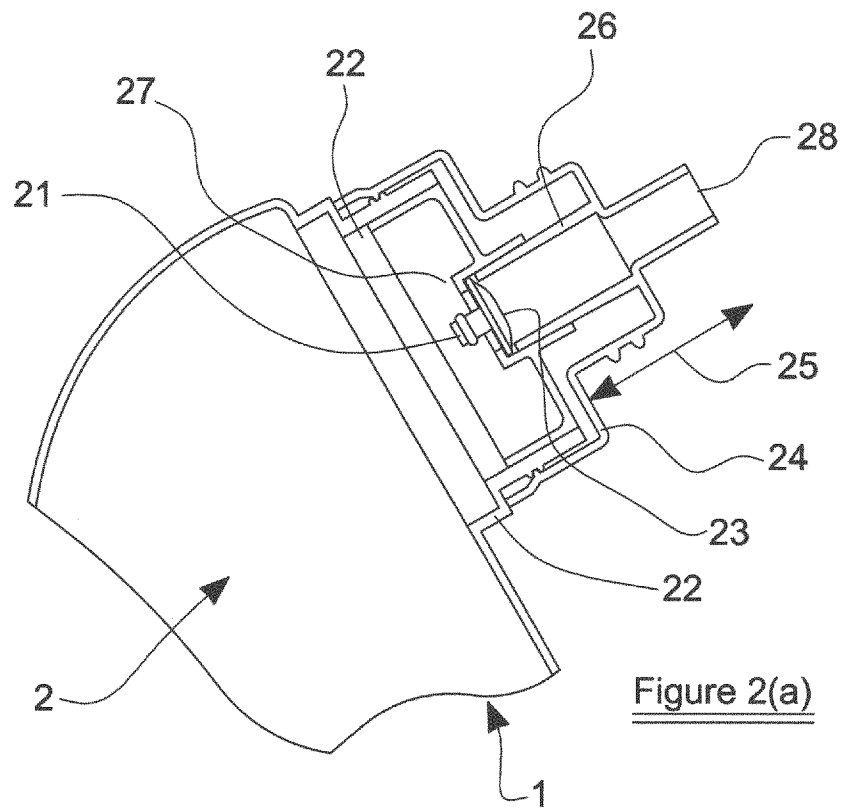


Figure 2(a)

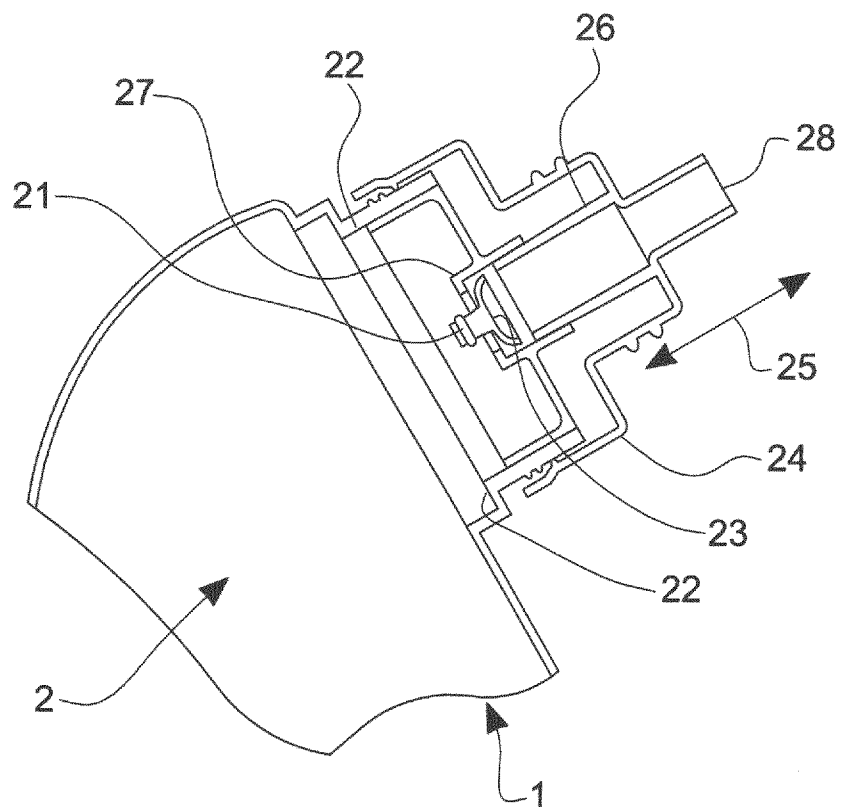


Figure 2(b)

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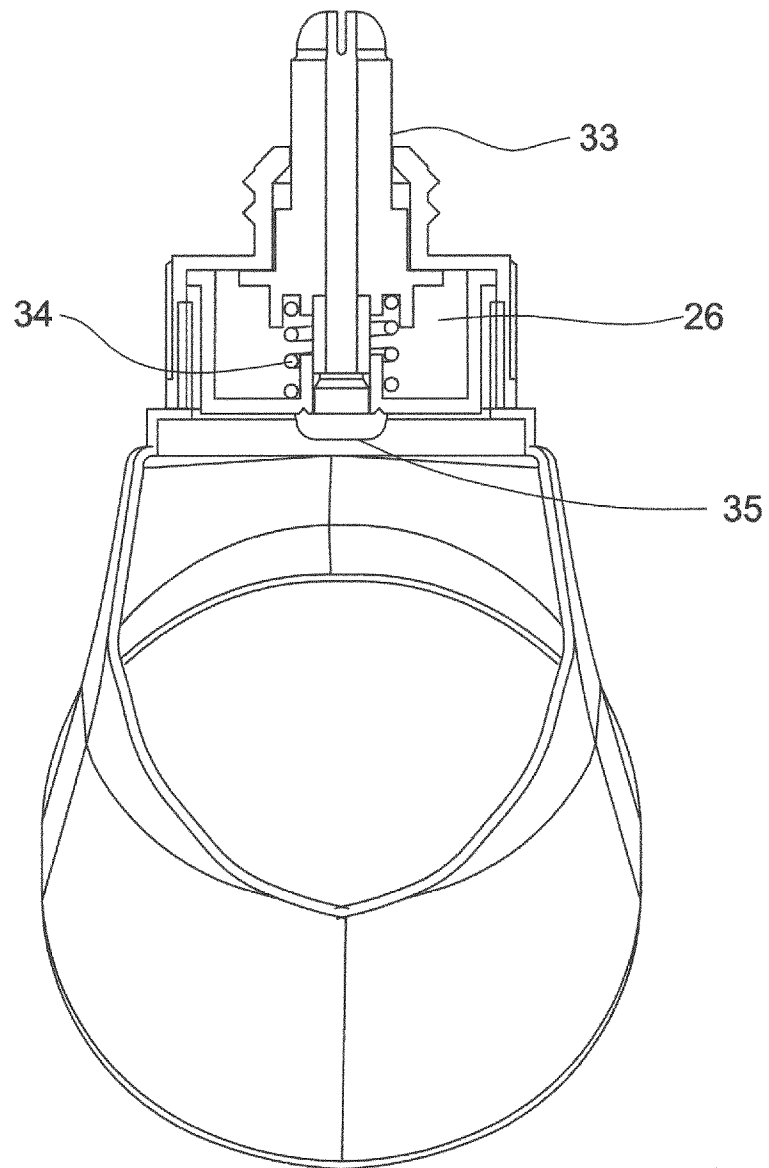


Figure 3(a)

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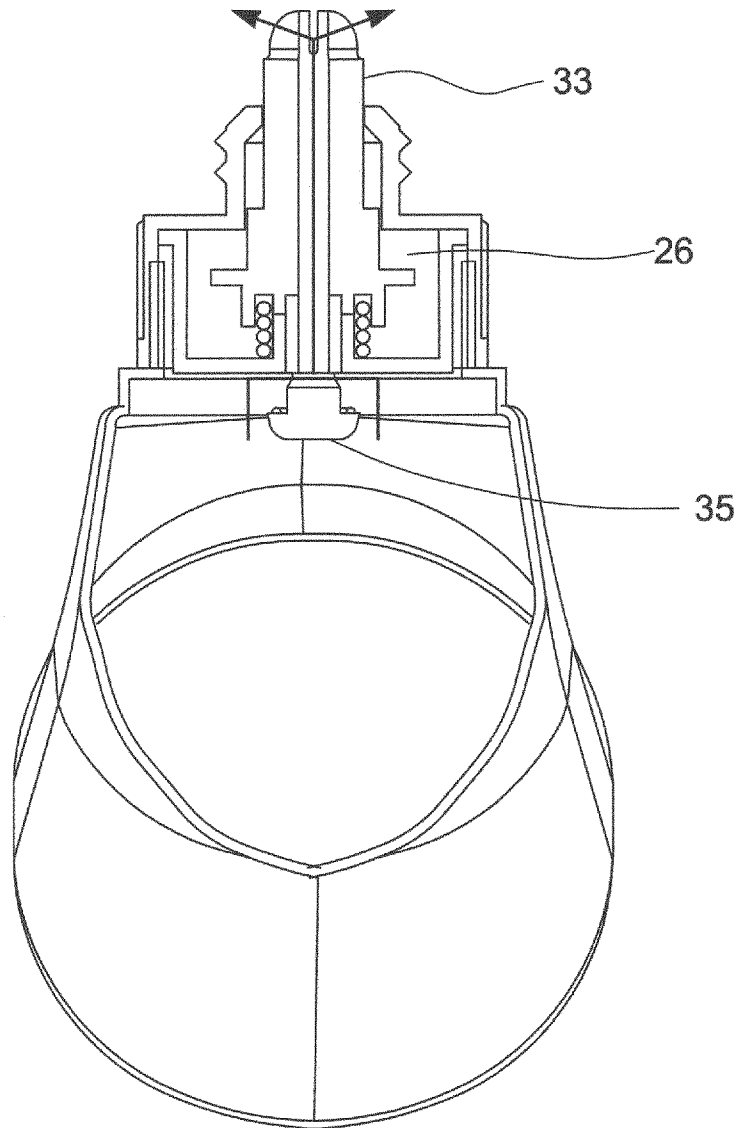


Figure 3(b)

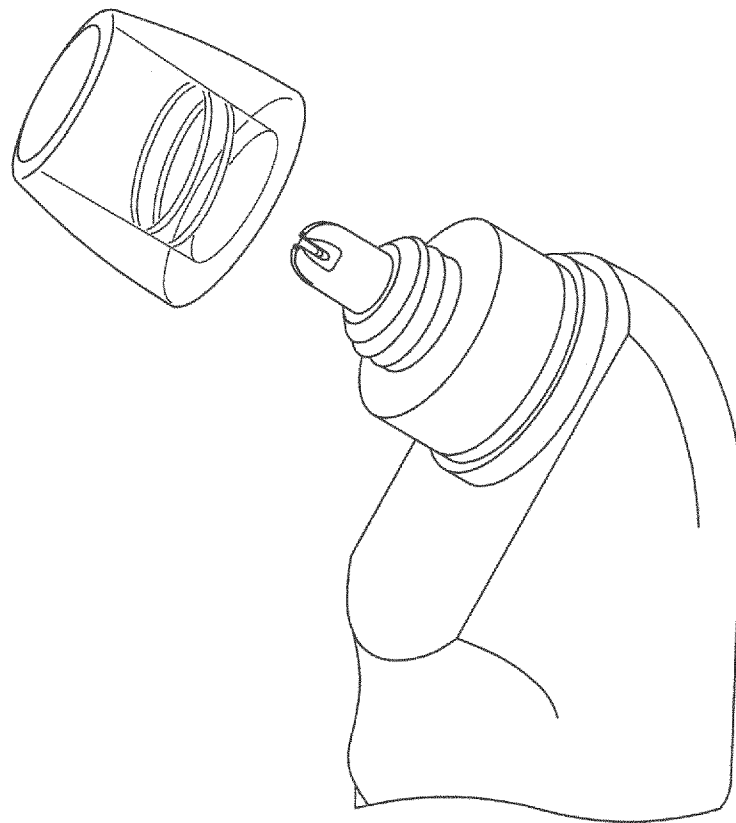


Figure 4

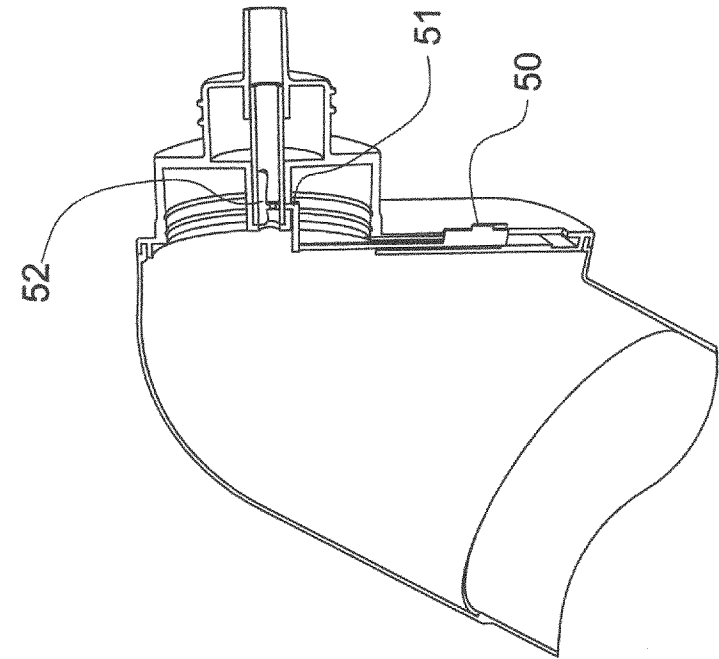


Figure 5(b)

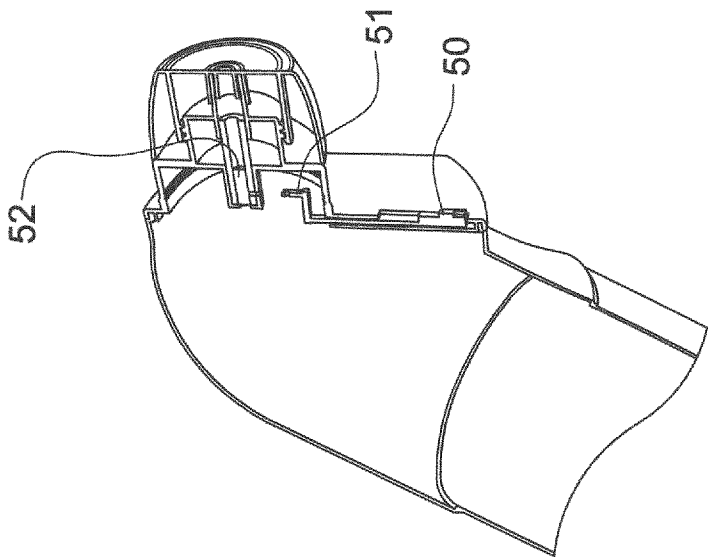


Figure 5(a)

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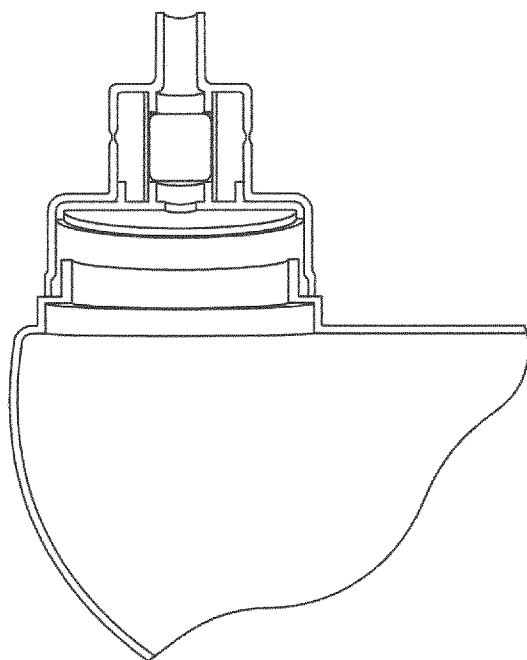


Figure 6

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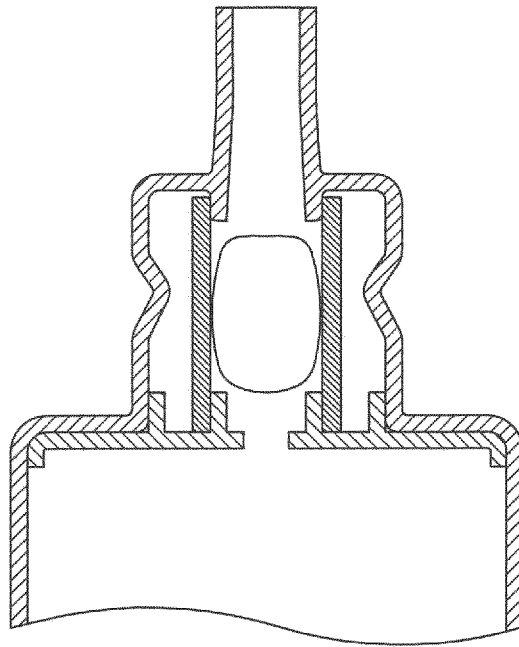


Figure 7(a)

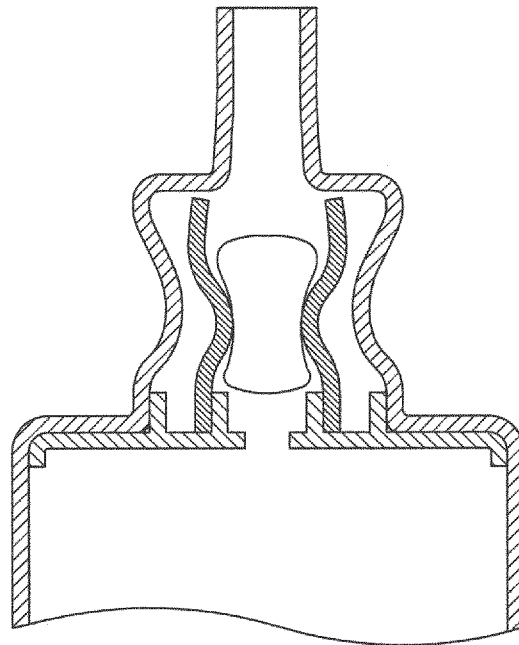


Figure 7(b)