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(54) **CONTAINER CLOSURE HAVING MEANS FOR INTRODUCING AN ADDITIVE INTO THE CONTENTS OF THE CONTAINER**

BEHÄLTERVERSCHLUSS MIT MITTELN ZUM EINLEITEN EINES ADDITIVS IN DEN INHALT DES BEHÄLTERS

FERMETURE DE CONTENANT PRESENTANT UN MOYEN PERMETTANT D'INTRODUIRE UN ADDITIF DANS LE CONTENU DU CONTENANT

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Description

[0001] The present invention relates to a closure device for releasing an additive liquid into a liquid in a container by operation of the closure device and to a container including such a closure device. The invention also relates to a method of assembling a closure device and a method of introducing an additive liquid by means of operating a closure device.

[0002] In a number of applications, such as mixtures of different liquids, it may be necessary to release and mix an additive liquid into another liquid shortly before the liquid mixture is used. It may not be possible or desirable to store the liquids in a premixed form, as they may react undesirably with each other when stored as the mixture for a period of time. An example of this may be two component pharmaceuticals which have a longer shelf life when unmixed than they do when mixed. However, it can also apply to other liquids or to mixtures of liquids and gases, such as water, alcoholic beverages, other beverages, and other solvents or solutions. The liquid to which the additive liquid is introduced may be a carbonated or a non-carbonated liquid.

[0003] An assembly for releasing an additive liquid into a liquid in a container upon release of a closure from the container is known from the prior art. International Patent Application WO97/05039 discloses a device for releasing a liquid into another liquid held in a container. The known device is for use with containers having releasable closures. The device according to the prior art comprises a fluid chamber for storing a fluid. The fluid chamber is positioned adjacent an opening in the container. The fluid chamber comprises a fluid outlet for releasing fluid into the liquid.

[0004] The known device has the disadvantage that the closure must be at least partially opened to enable the mixing of the fluid stored in the fluid chamber with the liquid in the container. Moreover the device is complex to manufacture and requires many parts.

[0005] United States Patent No. 6,843,368 B1 discloses a closure device for introducing a pressurised additive to liquid in a container via a dip tube or conduit. The closure disclosed is only capable of being assembled as it is being fitted to the container.

[0006] International Patent Application WO 01/83313 A discloses a closure device which releases powder into a bottle when opened. The device is not pressurised and simply relies on gravity to allow the powder to flow into the container when the closure is opened.

[0007] According to a first aspect of the present invention there is provided a closure device assembled prior to fitting to a container having a main liquid compartment and an opening with a neck, the assembled closure device comprising a cap member defining a pressurised fluid chamber containing an additive liquid and a housing having a plug member sealingly engageable in an aperture in a bottom wall of the fluid chamber,

the plug member including a nozzle directed away from the fluid chamber, wherein the cap member is provided with a primary engagement means

which engages with a corresponding primary engagement means provided on the housing to allow the cap member to be lifted relative to the housing from a closed position in which the plug member closes the aperture to an open position in which the plug member is at least partially withdrawn from the aperture to provide a communication path in use from the fluid chamber through the nozzle to the main liquid compartment.

[0008] The housing may include an inner housing wall adapted to fit inside the neck of the opening and the closure device includes sealing means which seals between the fluid chamber and the inner housing wall. This maintains a seal between the fluid chamber and inner housing wall, and therefore between the fluid chamber and the neck as the cap member and fluid chamber are lifted relative to the housing and container; in both the closed and open positions. The contents of the fluid chamber can thus pass into the main liquid compartment and be mixed, for example by shaking the container without risk of the contents escaping between the closure member and the container.

[0009] In a preferred embodiment the primary engagement means on the cap member includes an internal thread and the primary engagement means on the housing includes an external thread so that the cap member is lifted relative to the housing by rotation of the cap member. However other forms of primary engagement means are possible, for example a bayonet type engagement or a friction pull engagement or a longitudinal sliding engagement, or any other suitable form of engagement. The primary engagement means may prevent the cap member from becoming completely separated from each other.

[0010] The cap member may include a top cap wall, an outer cap wall on which is provided the internal thread and an inner cap wall extending from the top cap wall to the bottom wall and arranged inside the outer cap wall. The bottom wall may be formed separately from the remainder of the cap member, which may be formed as a single moulding.

[0011] The fluid chamber may be defined by the top cap wall, the inner cap wall and the bottom wall.

[0012] The housing may comprise an outer housing wall on which is provided the external thread. The thread may have a relatively steep angle, so that the cap member rises quickly when rotated.

[0013] The outer housing wall may be provided with an internal secondary thread adapted in use to engage with an external secondary thread provided on a neck of an opening of the container. Thus in use the outer housing wall may be screwed onto outside of the neck.

[0014] In one embodiment, the primary engagement means on the housing may comprise an external thread provided on an upper portion of the housing which in use extends above the neck of the opening.

[0015] The housing may further comprise an inner housing wall arranged inside the outer housing wall and provided with internal sealing means to seal against an outer surface of the inner cap wall and external sealing means to seal against an internal surface of the neck of the opening. The inner housing wall may be connected to the outer housing wall by a web which sits on top of the neck in use. The web may be open, closed, solid or any other suitable construction to connect the inner housing wall to the outer housing wall.

[0016] The housing may further comprise a frame which supports the plug member so that the plug member is arranged inside the inner housing wall and extends upwardly towards the fluid chamber in use. The frame may include apertures allowing fluid passage there-through, to avoid the creation of a vacuum between the fluid chamber and housing, so that the housing is free to slide relative to the cap member when the cap member is inserted into or withdrawn from the housing. The apertures also discourage liquid from lying in the frame after firing which minimise any residue of liquid in the frame.

[0017] The plug member includes a nozzle directed away from the fluid chamber.

[0018] The plug member may include a cylindrical outer surface which engages with a sealing means provided in the bottom wall. The sealing means must be capable of holding pressurised fluid in the fluid chamber when this fluid is at higher pressure than the contents of the container.

[0019] The sealing means may comprise an upper seal which seals against the cylindrical outer surface of the plug member when the cap member is in the closed position and which allows the passage of fluid between the upper seal and the plug member when the cap member is in the open position.

[0020] The sealing means may comprise a lower seal which seals against the cylindrical outer surface of the plug member when the cap member is in the closed and open positions. This ensures that in the open position pressurised fluid can only escape into the container through the communication path and nozzle, and does not leak around the plug member.

[0021] The plug member may include an internal fluid passage which extends to the cylindrical outer surface at a position below the upper seal when the cap member is in the closed position, the internal fluid passage being in communication with the nozzle.

[0022] The cap member may include an anti-tamper strip provided on the cap member to prevent rotation of the cap member relative to the housing without at least partial removal of the anti-tamper strip.

[0023] The anti-tamper strip may comprise an extension of the outer cap wall connected to the outer cap wall by a neck portion thinner than the outer cap wall, the extension being provided with a flange which engages beneath the outer housing wall to prevent lifting of the cap member relative to the housing. The strip may have a tab which can be pulled to tear the strip from the outer

cap wall along the neck.

[0024] The primary engagement means of the cap member and housing may include mutually engageable detent means to prevent the rotation of the cap member relative to the housing beyond a predetermined limiting angle of rotation. When the cap member is rotated, it initially rotates relative to the housing, but once the detent means engage the cap member and housing rotate together.

[0025] The housing may include an anti-tamper device which prevents rotation of the cap member and housing relative to the neck of the container until a predetermined torque is applied to the cap member.

[0026] The anti-tamper device may comprise an extension of the outer housing wall connected to the outer housing wall by at least one neck portion of reduced cross-sectional area relative to the outer housing wall, the extension being provided with a detent means adapted to engage in use with a detent means provided on the neck of the container to prevent lifting of the housing relative to the neck without rupture of the at least one neck portion.

[0027] The fluid chamber may contain an additive liquid and a head space of pressurised gas.

[0028] According to a second aspect of the present invention there is provided a container having a main liquid compartment, an opening having a neck, and a closure device closing said opening, wherein the closure device is assembled prior to fitting to the container, the assembled closure device comprising a cap member defining a pressurised fluid chamber containing an additive liquid and a housing having a plug member sealingly engageable in an aperture in a bottom wall of the fluid chamber, the plug member including a nozzle directed away from the fluid chamber, wherein the cap member is provided with a primary engagement means which engages with a corresponding primary engagement means provided on the housing to allow the cap member to be lifted relative to the housing from a closed position in which the plug member closes the aperture to an open position in which the plug member is at least partially withdrawn from the aperture to provide a communication path in use from the fluid chamber through the nozzle to the main liquid compartment and wherein the housing of the closure device is secured to the neck of the container.

[0029] The housing may include an inner housing wall arranged inside the neck of the opening and the closure device includes sealing means which seals between the fluid chamber and the inner housing wall. This maintains a seal between the fluid chamber and inner housing wall in both the closed and open positions.

[0030] The primary engagement means on the cap member may include an internal thread and the primary engagement means on the housing includes an external thread, to allow the cap member to be lifted relative to the housing by rotation of the cap member.

[0031] The main liquid compartment may contain a primary liquid, which may contain water or be a beverage.

However the primary liquid could be an alcoholic beverage, a cosmetic preparation, a pharmaceutical product, a dairy product or an agricultural feed or other product, or any other suitable liquid or semi-liquid substance.

[0032] The fluid chamber contains an additive liquid and may contain a head space of pressurised gas.

[0033] The cap member may include a top cap wall, an outer cap wall on which is provided the internal thread and an inner cap wall extending from the top cap wall to the bottom wall and arranged inside the outer cap wall.

[0034] The fluid chamber may be defined by the top cap wall, the inner cap wall and the bottom wall.

[0035] The housing may comprise an outer housing wall on which is provided the external thread. The outer housing wall may be located outside the neck of the container and may be provided with an internal secondary thread engaged with an external secondary thread provided on the neck of the container.

[0036] In one embodiment, the primary engagement means on the housing may comprise an external thread provided on an upper portion of the housing which extends above the neck of the container.

[0037] The housing may further comprise an inner housing wall arranged inside the neck of the container and provided with internal sealing means to seal against an outer surface of the inner cap wall and external sealing means to seal against an internal surface of the neck of the opening.

[0038] The housing may further comprise a frame which supports the plug member so that the plug member is arranged inside the inner housing wall and extends upwardly towards the fluid chamber in use.

[0039] The plug member includes a nozzle directed away from the fluid chamber.

[0040] The plug member may include a cylindrical outer surface which engages with a sealing means provided in the bottom wall.

[0041] The sealing means may comprise an upper seal which seals against the cylindrical outer surface of the plug member when the cap member is in the closed position and which allows the passage of fluid between the upper seal and the plug member when the cap member is in the open position. The sealing means may comprise a lower seal which seals against the cylindrical outer surface of the plug member when the cap member is in the closed and open positions.

[0042] The plug member may include an internal fluid passage which extends to the cylindrical outer surface at a position below the upper seal when the cap member is in the closed position, the internal fluid passage being in communication with the nozzle.

[0043] The cap member may include an anti-tamper strip to prevent rotation of the cap member relative to the housing without at least partial removal of the anti-tamper strip. The anti-tamper strip may comprise an extension of the outer cap wall connected to the outer cap wall by a neck portion thinner than the outer cap wall, the extension being provided with a flange which engages beneath

the outer housing wall to prevent lifting of the cap member relative to the housing.

[0044] The primary engagement means of the cap member and housing may include mutually engageable detent means to prevent the rotation of the cap member relative to the housing beyond a predetermined limiting angle of rotation.

[0045] The housing may include an anti-tamper device which prevents rotation of the cap member and housing relative to the neck of the container until a predetermined torque is applied to the cap member. The anti-tamper device may comprise an extension of the outer housing wall connected to the outer housing wall by at least one neck portion of reduced cross-sectional area relative to the outer housing wall, the extension being provided with a detent means adapted to engage in use with a detent means provided on the neck of the container to prevent lifting of the housing relative to the neck without rupture of the at least one neck portion.

[0046] According to a third aspect of the invention there is provided a method of assembling a closure device containing additive liquid for introduction into a main liquid compartment of a container, the method comprising the following steps:

25 providing a cap member,
securing a bottom wall to said cap member to define a pressurisable fluid chamber, inverting the cap member and introducing an additive liquid into the fluid chamber through an aperture in the bottom wall,
30 providing a housing having a plug member, the plug member including a nozzle directed away from the fluid chamber,
attaching the housing to the cap member by relative axial movement of the housing and cap member, both having corresponding primary engagement means therefor, so that the plug member enters and closes the aperture in the bottom wall of the fluid chamber,
35 pressurising the fluid chamber, and
storing the closure device with the pressurised chamber containing the additive liquid for subsequent fitting to the container.

[0047] An inner housing wall of the housing may enclose and seal against the fluid chamber.

[0048] The relative axial movement of the housing and cap member may be accomplished by engagement of an external thread on the housing with an internal thread on the cap member.

[0049] The method may include the further step of purging the fluid chamber before introduction of the additive liquid, for example purging with nitrogen or any other suitable gas.

[0050] The pressurising step may be accomplished by providing pressurised fluid to a passage in said plug member, the passage being in communication with a valve means which prevents release of the pressurised fluid from the fluid chamber. The valve means may comprise a seal which engages with the plug member when the aperture is closed by the plug member. The upper

seal is arranged to function as a flap valve such that it will allow the introduction of pressurised fluid into the fluid chamber, but once pressurised the seal is urged against the plug member to seal the fluid chamber closed.

[0051] The pressurised fluid may be a gas which forms a head space in the fluid chamber of between 0% and 60% of the volume of the fluid chamber.

[0052] The step of securing the bottom wall to the cap member may include sealing the bottom wall to a free edge of an inner cylindrical wall of the cap member.

[0053] The method may include the further step of securing the closure device to a neck of a container having a main liquid compartment by engagement of an internal thread on the housing with an external thread on the neck of the container.

[0054] The closure device may be a push fit onto the neck of a container to lock the closure device onto the container.

[0055] According to a fourth aspect of the invention there is provided a method of introducing an additive liquid into a main liquid compartment of a container having an opening with a neck, the neck having attached to it a closure device comprising a housing attached to the neck and a cap member defining a pressurised fluid chamber attached to the housing, wherein the closure device is assembled and filled with the additive liquid prior to attachment to the neck, the method comprising the steps of raising the cap member on the housing, both having corresponding primary engagement means therefor, causing a plug member provided on said housing to move relative to the cap member from a closed position in which an aperture provided in a bottom wall of said fluid chamber is closed by said plug member to an open position in which the plug member is at least partially withdrawn from the aperture to provide a communication path from the fluid chamber through a nozzle provided in the plug member and directed away from the fluid chamber to the main liquid compartment, and releasing the pressurised additive liquid from said fluid chamber along said communication path into said main liquid compartment.

[0056] Optionally during the raising of the fluid chamber relative to the housing a seal is maintained between the fluid chamber and an inner housing wall of the housing arranged in the neck of the container.

[0057] The cap member may be raised by rotating the cap member such that the fluid chamber is raised by screw thread action relative to the housing.

[0058] The cap member may be rotated by a first angle of between 0° and 90°, optimally about 45°, from the closed position to the open position. Further rotation of the cap member may be limited to a second angle of between 0° and 90°, optimally about 45°, by the mutual engagement of detent means provided on the cap member and housing. The second angle is predetermined by the position of the detent means. It is selected so that it is sufficient to ensure opening of the plug member and consequent mixing of the additive liquid, allowing for manufacturing tolerances.

[0059] The raising of said cap member relative to the housing may be achieved by engagement of an internal thread on the cap member with an external thread on the housing.

5 **[0060]** The internal thread may be provided on an outer cap wall of the cap member.

[0061] The fluid chamber may be defined by a top cap wall, a bottom wall and an inner cap wall extending from the top cap wall to the bottom wall and arranged inside the outer cap wall.

10 **[0062]** The external thread may be provided on the outer face of an outer housing wall.

[0063] The rotation of the cap member further to remove the cap member and housing from the container may be achieved by engagement of an internal secondary thread provided on a neck of an opening of the container.

15 **[0064]** The internal secondary thread may be provided on the inner face of the outer housing wall.

20 **[0065]** The inner cap wall may extend inside the neck of the container.

[0066] The housing may include an inner housing wall arranged inside the neck of the container, and provided with sealing means to seal between an outer surface of the inner housing wall and an internal surface of the neck of the container.

25 **[0067]** Optionally, during the raising of said cap member relative to the housing, a sealing means seals between an external surface of the inner cap wall and an internal surface of the inner housing wall.

30 **[0068]** Optionally the communication path includes a nozzle in the plug member and an internal fluid passage which extends from the nozzle to a position on the surface of the plug member which is in communication with the fluid chamber when the plug member is in the open position.

35 **[0069]** The method may further include the step of at least partially removing an anti-tamper strip provided at the outer cap wall, thereby allowing rotation of the cap member relative to the housing.

40 **[0070]** The method further may include the step of applying sufficient torque to the cap member, during the step of rotating the cap member further to remove the cap member and housing from the container, to remove an anti-tamper device.

45 **[0071]** The invention will be described, by way of example only, with reference to the drawings in which:

Fig. 1 shows a cross-section through a closure device according to the invention secured to the neck of a container;

Fig. 2 shows a side elevation of the closure device of Fig. 1;

Fig. 3 is a cross-section on line III-III in Fig. 2;

50 Figs. 4A, 4B, 4C and 4D are sequential cross-sectional drawings showing the operation of the closure device of Fig. 1 to introduce additive liquid into a container and to remove the closure device from the

container;

Figs. 5A and 5B are sequential cross-sectional drawings showing the assembly and filling of the closure device of Fig. 1;

Figs. 6A and 6B are views from below and above respectively of the components of a modified closure device according to Fig. 1;

Fig. 7 is a view from below of another embodiment of a closure device according to the invention;

Fig. 8 is a cross-section through one example of a bottom wall of the cap member of the closure device of Fig. 1;

Fig. 9 is a perspective view from one side of a further alternative housing;

Fig. 10 is a cross-section through a closure device including the housing of Fig. 9;

Fig. 11 is a schematic view of the closure of Fig. 10 on a bottle;

Fig. 12 is a cross-section view through a further embodiment of a closure device;

Fig. 13 is a schematic view of the closure of Fig. 12 on a bottle; and

Fig. 14 is a schematic view of a still further embodiment of a closure device on a bottle.

[0072] With reference to Figs. 1 to 3 there is shown a closure device 10 together with the upper part of a container 12. The container is a standard PET bottle having a main liquid compartment 14 and a standard 30 mm neck 16 with an external thread 18. For the purposes of this invention the thread is described as a secondary thread 18.

[0073] The closure device 10 comprises two main parts, a cap member 20, which defines a fluid chamber 22, and a housing 40. The cap member 20 includes a bottom wall 24, which although it may be made of a different material is secured to the remainder of the cap member 20 to form a unitary member. An aperture 25 is provided in the bottom wall 24. The cap member 20 includes a top cap wall 26, an outer cap wall 28, and an inner cap wall 32, which may all be formed as a single moulding from polypropylene or any other suitable plastic. The outer cap wall includes an internal primary thread 30 adapted to engage a corresponding external primary thread on the housing 40, as will be described below. Together the internal and external primary threads form part of the primary engagement means which allow the cap member 20 to be lifted relative to the housing 40. The outer cap wall 28 also includes surface depressions 34 on the outer surface to aid gripping of the outer cap wall. Any suitable surface features may be provided instead of the depressions 34 shown.

[0074] The housing 40 is also preferably formed as a unitary polypropylene moulding, although it can be formed from any other suitable material. It comprises a plug member 42 arranged on the central axis of the closure member 10, an outer housing wall 44 adapted to fit

outside the neck 16, a web 45 which sits on top of the neck 16, an inner housing wall 46 which extends down from the web 45 inside the neck and which seals against the neck 16, and a frame 48 which extends from the inner housing wall 46 and supports the plug member 42.

[0075] The outer housing wall 44 has an external primary thread 50 which engages the internal primary thread 30 on the cap member as part of the primary engagement means. It also has an internal secondary thread 52 which engages the external secondary thread 18 on the neck 16 of the container.

[0076] Internal sealing means 54 are provided to seal between the inner cap wall 32 and the inner housing wall 44. In the illustrated example the internal sealing means 54 are formed as ribs on the outer surface of the inner cap wall, but they could be formed as ribs on the inner surface of the inner housing wall, or as any other suitable sealing means. The internal sealing means 54 prevents the contents of the container 12 passing between the inner cap wall 32 and the inner housing wall 44 during storage and while the cap member 20 is raised relative to the housing 40, as later described.

[0077] External sealing means in the form of a taper 56 and rib 58 are provided to seal between the inner housing wall 44 and the neck 16 of the container 12. Such seals are well known in the art and serve to prevent the contents of the container 12 passing between the inner housing wall 44 and the neck during storage. A taper seal may be used for the internal sealing means 54 also.

[0078] The plug member 42 has a nozzle 60 extending below it. A nozzle passage 61 is provided to convey pressurised liquid from the fluid chamber 22 when the closure device is opened. The plug member 42 is formed with a cylindrical outer surface 62, which engages sealingly with sealing means 64 provided at the aperture 25 in the bottom wall 24. In the example the sealing means comprises an upper seal 66 which when the plug member 42 is in the closed position of Fig 1 engages with the cylindrical outer surface 62 above an internal fluid passage 70, while a lower seal 68 engages with the cylindrical outer surface 62 below the an internal fluid passage 70.

[0079] The upper surface 76 of the bottom wall 24 slopes towards the plug member 42, so that all the liquid is drained from the fluid chamber 22 when the plug member is in the open position. The lower seal 68 is held by a collar 72 provided on the frame 48 which urges the lower seal 68 against the plug member 42.

[0080] In the illustrated example the bottom wall 24 includes a flange 74 which locks onto a corresponding flange at the edge of the inner cap wall 32 when the cap member is assembled. However any other suitable method of vapour-tight connection may be used, such as laser welding.

[0081] At the lower edge of the outer cap wall 28 is an anti-tamper strip 80, with a tab 81 which can be pulled to remove the strip. The strip is an extension 82 of the outer cap wall 28, connected by a neck portion 84, and engaging the underside 88 of the outer housing wall 44

by a detent flange 86. Such anti-tamper strips are known in the art and are not described further. Until the anti-tamper strip 80 is at least partially removed, the cap member 20 cannot be unscrewed from the housing 40. Once the anti-tamper strip 80 is at least partially removed the cap member 20 can be unscrewed from the housing 40 by interaction of the internal thread 30 on the cap and the external thread 50 on the housing. The threads include mutually engaging detent means 90, 92, best seen in Fig. 4, which serve to limit the relative rotation of the cap member 20 and housing 40. It is to be understood that any suitable mutually engaging shape or protrusion may be used to limit this movement. The anti-tamper strip may be replaced by any other suitable anti-tamper means, or may be omitted.

[0082] At the lower edge of the outer housing wall 44 is provided a further anti-tamper device 100. The device is an extension 102 of the outer housing wall 44, connected by one or more neck portions 104, and includes a detest flange 106 which engages a corresponding detent means 108 provided on the container neck 16. Such anti-tamper devices are known in the art and are not described further. A predetermined torque applied to the cap member 20 is required to break the neck portions 104 and allow the housing 40 to be raised on the secondary threads 18, 52 relative to the neck 16. The anti-tamper device 100 remains on the neck 16 of the container 12 below the detent 108. Any other suitable anti-tamper device may be used instead, or it may under certain circumstances be omitted.

[0083] Figs. 4A to 4D show the operation of the closure device of the invention.

[0084] In Fig. 4A the closure device 10 is secured to a container 12 containing a primary liquid (not shown), for example water in its main liquid compartment 14. The fluid chamber 22 in the cap member contains a liquid additive 120 and a head space 122 of pressurised gas. The closure device 10 is in the closed position, in which the fluid chamber 22 is sealed closed by the plug member 42 which is engaged in the aperture 25 in the bottom wall 24. The housing 40 is screwed fully onto the neck 16 through the secondary threads 18, 52, and the cap member 20 is screwed fully onto the outer housing wall 44 through the internal and external primary threads 30, 50. The contents of the container 12 may be at atmospheric pressure, or may be pressurised to a pressure less than that of the fluid chamber 22. There is a seal 54 provided between the fluid chamber 22 and inner housing wall 46, and further seals are provided between the inner housing wall 46 and the neck 16 so that the contents of the container are sealed from the external atmosphere.

[0085] To trigger the firing of the liquid additive 120 into the main liquid compartment 14 of the container 12, the cap member 20 must be unscrewed relative to the housing 40 to the position shown in Fig. 4B, through a first angle of 45° according to the preferred embodiment. However it is to be understood that this first angle may be any desired angle by appropriate selection of the

thread and pitch. First the anti-tamper strip 80 is at least partially removed so that the outer cap wall 28 is free to be raised relative to the outer housing wall 44. Then the cap member 20 is grasped and rotated. The primary threads 30, 50 have a relatively large thread angle, so that a relatively large vertical displacement is effected by a relatively small rotation. As the cap member rises, the fluid chamber 22 is lifted away from the plug member 42. When the upper seal 66 of the bottom wall 24 passes above the top of the plug member 42, as shown in Fig. 4B, the main liquid compartment 14 comes into fluid communication with the fluid chamber 22, and the pressurised additive liquid 120 is free to pass between the upper seal 66 and the outer surface 62 of the plug member 42, into the internal fluid passage 70, along the nozzle passage 61 and out of the nozzle 60 into the main liquid compartment 14. The lower seal 68 in the bottom wall 24 continues to seal between the bottom wall 24 and the plug member 42, so that the additive liquid 120 cannot leak into the main liquid compartment 14 along any other path. Typically the primary thread 30, 50 is a standard 30/25 PET bottle thread with 9mm pitch, of the type used with PET water bottles, and the closure device 10 is arranged so that the additive liquid 120 is fired into the main liquid compartment 14 when the cap member is rotated through 45° from the closed position under optimum tolerance. In practice this angle could be smaller or greater, in the range 0° to 90°.

[0086] The volume of the head space 122 is chosen to be sufficiently large so that all the additive liquid 120 is expelled into the main liquid compartment 14. The top surface 76 of the bottom wall 24 slopes down towards the aperture 25, so that under gravity all the additive liquid flows to the aperture. The upper end of the plug member 42 is also shaped to ensure that any liquid thereon drains to the perimeter of the plug member 42.

[0087] Referring now to Fig. 4C, following release of the additive liquid 120, the cap member 20 is rotated further through a second angle of 45° according to the preferred embodiment, until the mutually engageable detent means 90, 92 on the cap 20 and housing 40 engage with each other and prevent further relative rotation. Typically this happens when the cap member 20 is rotated through a total of 90° from the closed position. At this point the torque on the cap member 20 is transferred to the outer housing wall 44 and the housing 40 begins to rotate relative to the container neck 16. In the illustrated embodiment an anti-tamper device 100 is provided on the housing 40, so an increase torque must be applied to first break the neck portions 104 of the anti-tamper device 100 before the housing can be raised relative to the container 12 by engagement of the secondary threads 18, 52. The secondary threads 18, 52 are typically MCA2 threads of 3.2mm pitch. Fig. 4C shows the closure device in a partially raised position. As the cap member 20 is rotated, the entire closure device 10 is lifted from the container 12, until it is as shown in Fig. 4D, removed from the container 12.

[0088] If required, the closure device 10 can be screwed back onto the container 12, to close the container. As the cap member is rotated, the cap member 20 will rotate back to its original position relative to the housing 40, and then the cap member 20 and housing 40 will rotate together on the external secondary thread 18 provided on the neck 16, until they can be rotated no further and the container 12 is sealed closed.

[0089] Referring to Figs. 5A and 5B, there is shown a method of assembling a closure device 10 according to the invention. The cap member 20, without the bottom wall 24, is formed by moulding from polypropylene for example. The housing 40 is also formed separately by moulding from polypropylene for example.

[0090] The bottom wall 24 is shown in more detail in Fig. 8. It can be formed of any suitable material and is formed so that it can be readily secured to the inner cap wall 32 of the cap member 20 to form the fluid chamber 22. Although it can be formed of one material, in Fig. 8 it is shown formed from two materials, a frame 77 of a relatively rigid plastic and a sealing portion of relatively flexible material. In the example of Fig. 8 there is a first sealing portion 64 of softer sealing material to provide the upper and lower seals 66, 68 which engage with the plug member 42. There is also a second sealing portion 78 which provides a secure seal against the inner face of the inner cap wall 32. The frame 77 provides the structural strength and rigidity required of the bottom wall 24 to resist the pressure arising from the pressurised fluid chamber 22 in use. Because the material of the frame 77 is relatively strong and stiff, weight may be saved by forming cut-outs 79. A suitable technique for manufacturing the bottom wall 24 is inset moulding, in which the frame 77 is first formed by moulding and then is placed in a second mould and has the sealing portions 64, 78 formed around it. Suitable materials for the sealing portion are natural or synthetic rubber or thermoplastic elastomers. Suitable materials for the frame are metal or rigid plastics.

[0091] The bottom wall 24 is secured to the inner cap wall 32 by any appropriate technique, for example by engagement of a detent flange 74 on a corresponding groove in the external face of the inner cap wall 32, or by laser, sonic or spin welding. The fluid chamber 22 is then defined by the bottom wall 24, the top cap wall 26 and the inner cap wall 32.

[0092] The cap member 20 is placed in the inverted position shown in Fig. 5A and, after purging with nitrogen or other suitable purging means to remove contaminants, the additive liquid 120 is then introduced into the fluid chamber 22 through the aperture 25 in the bottom wall 24.

[0093] The housing 40 is then placed on the cap member 20 by engagement of the external primary thread 50 on the housing 40 with the internal primary thread 30 on the cap member 20 so that the plug member 42 enters and closes the aperture 25 in the bottom wall 24, thereby sealing the additive liquid 120 in the fluid chamber 22, as shown in Fig. 5B.

[0094] The fluid chamber 22 may be pressurised either at the time of filling or at any other time before using the closure device 10 to close a container 12. The pressurising step may be accomplished by providing pressurised gas to the nozzle passage 61. The nozzle passage 61 is in communication with an internal fluid passage 70 which exits on the cylindrical outer surface 62 of the of the plug member 42, and so is in communication with the volume 63 between the upper 66 and lower seals 68. The lower seal 68 is held against the plug member 42 by a collar 72 on the housing 40, and continues to seal against the plug member 42 even when the volume 63 is pressurised. The upper seal 66 provides a one-way valve means to enable the fluid chamber 22 to be pressurised. The upper seal 66 functions as a flap valve. When the pressure in the volume 63 is greater than the pressure in the fluid chamber 22 the upper seal is urged away from the plug member 42 so that pressurised gas can flow from the volume 63 past the upper seal 66 to the fluid chamber 22. When the source of pressurised gas is removed, and the pressure in the volume 63 and the nozzle passage 61 reverts to atmospheric pressure, the upper seal 66 is urged against the plug member 42 to seal the fluid chamber 22 closed.

[0095] Typically the gas forms a head space 122 in the fluid chamber 22 of between 0% and 60% of the volume of the fluid chamber 22.

[0096] After the fluid chamber 22 has been pressurised, the closure device 10 is secured to the neck 16 of a container 12 by engagement of the internal secondary thread 52 on the housing 40 with the external secondary thread 18 on the neck 16 of the container, to seal the contents of the container.

[0097] In an alternative embodiment which does not form part of the invention, when used with a pressurised container 10, for example a container containing a carbonated beverage, the fluid chamber need not be pressurised before securing to the neck of the container. The internal pressure of a carbonated beverage may be typically 310 kPa (45 psi), and the one-way valve described above will allow the fluid chamber 22 to reach the same pressure. If the pressure in the main liquid compartment 14 is temporarily increased further, for example to 480kPa (70psi) by pasteurisation, then the pressure in the fluid chamber 22 will also reach this pressure by scavenging pressure from the head space in the main liquid compartment 14 through the one-way valve. However when the pressure in the main liquid compartment 14 reverts to its previous pressure, say 310 kPa (45 psi), the pressure in the fluid chamber 22 will remain at the higher pressure, say 480kPa (70psi) because the seal 66 will prevent the flow of fluid from the fluid chamber 22. If the headspace 122 in the fluid chamber 22 is sufficiently large, this pressure difference will be sufficient to fire the liquid additive on operation of the closure device.

[0098] Although the plug member 42 may be formed as a unitary moulding with the remainder of the housing 40, Figs. 6A and 6B illustrate an alternative embodiment

in which the plug member 142 is formed separately and inserted by a snap fit into an aperture 143 provided in the housing. Other components of the closure device are the same as those illustrated with respect to Figs. 1 to 5 and so are not described further. The plug member 142 may be formed of a different material to the remainder of the housing 142. This is of benefit if the housing material is incompatible with the liquid additive 120, and it is desired to make the plug member 142 of a different material which is compatible, since the plug member 142 remains in contact with the liquid additive 120 during storage. The plug member 142 may be made of metal or any suitable moulded plastic material.

[0099] Fig. 7 shows another embodiment of the invention similar to that of Figs. 1 to 5. Parts which are the same as those described with reference to Figs. 1 to 5 are denoted by the same reference sign. It differs in that the internal primary thread 30 on the cap member 20 and the external primary thread 50 on the housing 40 are replaced by a pair of dogs 458 on the inside of the cap member 20 and a pair of bayonet slots 450 provided on the outer housing wall 44. The dogs 458 engage in the slots 450 to form the primary engagement means which allow the cap member 20 to be lifted relative to the housing 40.

[0100] Although only one dog and slot is illustrated, it will be understood that two or more may be arranged around the circumference of the cap member 20 and housing 40. The dog may be provided on the housing and the slots on the cap member, if required. Each bayonet slot includes a first horizontal section 452 which allows relative rotation of the cap member 20 and housing 40 in the closed position, a vertical section 454 which allows sliding of the cap member 20 relative to the housing 40 from the closed position to the open position, and a second horizontal section 456 which allows relative rotation of the cap member 20 and housing 40 in the open position. The vertical section 454 and the dogs 458 form a longitudinal guidance means.

[0101] The first horizontal section 452 may be omitted, so that when the anti-tamper strip 80 is removed no turning of the cap member 20 is required to allow the cap member 20 to slide relative to the housing 40 from the closed position to the open position. In fact the internal pressure in the fluid chamber 22 acting on the top of the plug portion 42 may be sufficient to effect this movement automatically.

[0102] The second horizontal section 456 may be omitted if it is required for the cap member 20 and housing 40 to rotate together to remove the closure member 10 from the container 12 immediately. The dog 458 and slot 450 will thus act as a mutually engaging detent means to lock the cap member 20 and housing 40 together rotationally.

[0103] Figs. 9 to 14 show further embodiments of the invention in which parts which are the same as those described with reference to Figs. 1-8 are denoted by the same reference sign.

[0104] Figs. 9 to 11 illustrate an embodiment in which a similar reduction in the diameter of the cap member is achieved by providing an upper portion 401 of the housing having an area of reduced diameter above the web 45 of the housing. The upper portion of the housing may be integrally formed with the remainder of the housing 40. In this embodiment, the primary engagement means is an external thread 404 on the area of reduced diameter of the housing and a corresponding internal thread 405 on the outer cap wall.

[0105] In this embodiment, the anti-tamper strip 80 of the outer cap wall 28 extends down towards the container 12 in the form of a skirt.

[0106] Figs. 12 and 13 show a further embodiment of the invention similar to that of Figs. 8 to 11 in which the height of the cap is increased to accommodate the primary engagement means between the cap and the housing in the upper part of the housing 401 above the web 45. In this embodiment, the housing is similar in form to that shown in Fig. 9 with the primary engagement means provided by an external thread 404 on the reduced diameter upper portion of the housing and an internal thread 405 on outer cap wall. By increasing the height of the cap member, the volume of the fluid chamber can be increased such that additional additive can be carried within the cap member.

[0107] The outer surface of the cap member is tiered in this embodiment. The upper part of the cap member 20a surrounding the upper part of the housing 401 has a reduced diameter with respect to the main part of the cap member 20b reflecting the reduced diameter of the upper part of the housing.

[0108] The anti-tamper strip 80 has an extended diameter with respect to the main part of the cap member 20b and may be extended towards the container 12 as in the previous embodiment. Upon removal of the anti-tamper strip a skirt would be left surrounding the container 12.

[0109] Fig 14 shows an embodiment of the present invention which is a further development of the embodiment of Figs. 12 and 13. In this embodiment, the outer cap wall 281 is tapered from the top surface to the bottom of the anti-tamper strip 80 in order to provide a more aesthetic closure which may be stackable to reduce storage space within a bottling facility. The operation of this embodiment would be similar to that shown in the embodiments of Figs. 12 and 13.

[0110] The present invention provides a closure device which requires fewer components than prior art devices. The closure device is simple to manufacture, as in one embodiment it requires only three moulded components, the cap member body 20, the cap member bottom wall 24 and the housing 40. The closure device is assembled and filled with the liquid additive 120 and then stored or transported before use on a standard container 12. It does not require separate filling at the bottling location.

[0111] The closure device allows introduction and mixing of the liquid additive 120 into the contents of the main liquid compartment 14 of a container 12 without removal

of the closure device 10 from the container 12.

[0112] The closure device can be used with any standard container 12, of any shape or volume, of any material, for example PET, glass, metal or any suitable plastic. The external secondary thread 18 on the neck 16 of the container 12 can be any standard thread.

[0113] The closure device optimises use of the volume within the neck 16 of the container 12, since the fluid chamber extends across the whole available area of the neck 16. The internal diameter of the fluid chamber 22 is limited only by the thickness of the inner housing wall 46 and the inner cap wall 32. The volume of the fluid chamber 22 may be varied by varying the length of the fluid chamber.

[0114] The closure device cannot be operated to introduce the liquid additive 120 into the main liquid compartment 14 unless the anti-tamper strip 80 is at least partially removed, thereby providing security to the consumer that the additive has not been mixed with the contents of the container prematurely, for example while sitting on a shelf in a shop.

[0115] The internal shape of the fluid chamber 22, which has a top surface 76 of the bottom wall 24 which slopes down towards the aperture 25 and plug member 42, ensures that only a minimum amount of residual liquid additive remains in the fluid chamber after release of the additive. Hence the closure device 190 can be removed and placed on a surface without significant deposition of additive on the surface. The sloping shape allows the full amount of liquid additive 120 to be delivered even if the container is tilted from the vertical during operation of the closure device to fire the additive.

[0116] The materials of the closure device can be selected to avoid any compatibility problems with the liquid additive 120. During storage the liquid additive is only in contact with the cap member 20 and the plug member 42. The plug member can be made separately from a different material to the remainder of the housing, if required. A liner, for example of stainless steel, can be used inside the fluid chamber to avoid contact with the moulded cap member 20, if required. Certain flavouring or colouring additives are not compatible with sealant materials. The bottom wall 24 can thus be manufactured, for example by inset moulding, so that the upper surface 76 of the bottom wall 24 is polypropylene or other suitable inert material, while the seals 64, 78 are protected below the material of the upper surface.

[0117] The closure device of the invention offers a simplified process for filling and assembling the closure device, and can be assembled and fitted to a container without the need for adhesive. The fluid chamber 22 can be easily pressurised, using any appropriate source of pressurised gas, which can simply fit to the nozzle 60 on the housing 40 once the closure device has been assembled. No specialised aerosol technology is necessary. The liquid additive 120 can be denser or more viscous, and the area of the nozzle passage 61 and internal fluid passage 70 can be increased if required, to improve the flow of a

more viscous additive. Additives which require shaking to dissolve them can be used with the closure device of the invention, since it permits shaking of the container after firing with no risk of spillage through between the closure device and container, because the closure device remains sealed to the neck.

[0118] The closure device remains in one piece when removed, and can be recyclable. Recyclability is improved if the closure and housing are made of the same material.

[0119] Modifications and variations are possible without departing from the scope of the invention. In addition to the modifications and variations described above, the liquid additive may be replaced by a gel or a free flowing powder or the like. The bottom wall 24 may be formed integrally with the remainder of the cap member 20. The closure member may be used with a container holding a carbonated beverage, providing the pressure of the main liquid compartment 14 is less than the pressure of the fluid chamber 22. The primary threads 30, 50 may be of any suitable thread design, and arranged so that the closure device fires, that is ejects the liquid additive 120 into the main liquid compartment 14, after any suitable angle of rotation, for example 45°, and allows removal of the closure device from the container after any suitable further angle of rotation, for example 270° to 450°.

Claims

1. A closure device (10) assembled prior to fitting to a container (12) for releasing an additive liquid (120) into a main liquid compartment (14) of the container (12) having an opening with a neck (16), the assembled closure device (10) comprising a cap member (20) defining a pressurised fluid chamber (22) containing the additive liquid (120) and a housing (40) having a plug member (42) sealingly engageable in an aperture (25) in a bottom wall (24) of the fluid chamber (22), the plug member (42) including a nozzle (60) directed away from the fluid chamber (22), wherein the cap member (20) is provided with a primary engagement means (30) which engages with a corresponding primary engagement means provided on the housing (40) to allow the cap member (20) to be lifted relative to the housing (40) from a closed position in which the plug member (42) closes the aperture (25) to an open position in which the plug member (42) is at least partially withdrawn from the aperture (25) to provide a communication path in use from the fluid chamber (22) through the nozzle (60) to the main liquid compartment (14).
2. A closure device according to claim 1, wherein the housing (40) includes an inner housing wall (46) adapted to fit inside the neck (16) of the opening and wherein the closure device (10) includes sealing

- means (54) which seals between the fluid chamber (22) and the inner housing wall (46), and wherein the primary engagement means on the cap member (20) includes an internal thread (30) and the primary engagement means on the housing (40) includes an external thread (50).
3. A closure device (10) according to claim 2, wherein the cap member (20) includes a top cap wall (26), an outer cap wall (28) on which is provided the internal thread (30) and an inner cap wall (32) extending from the top cap wall (26) to the bottom wall (24) and arranged inside the outer cap wall (28), the fluid chamber (22) being defined by the top cap wall (26), the inner cap wall (32) and the bottom wall (24), and wherein the housing (40) comprises an outer housing wall (44) on which is provided the external thread (50).
 4. A closure device according to claim 3, wherein the outer housing wall (44) is provided with an internal secondary thread (52) adapted in use to engage with an external secondary thread (18) provided on the neck (16) of the opening of the container (12).
 5. A closure device according to any of claims 3 to 4, wherein the housing (40) further comprises a frame (48) which supports the plug member (42) so that the plug member (42) is arranged inside the inner housing wall (46) and extends upwardly towards the fluid chamber (22) in use.
 6. A closure device according to any preceding claim, wherein the plug member (42) includes an internal fluid passage (70) which is sealed from the fluid chamber (22) in the closed position and which is in fluid communication with the fluid chamber (22) in the open position.
 7. A closure device according to claim 6, wherein the plug member (42) includes a cylindrical outer surface (62) which engages with a sealing means provided in the bottom wall (24).
 8. A closure device according to claim 7 wherein the sealing means comprises:
 - an upper seal (66) which seals against the cylindrical outer surface (62) of the plug member (42) when the cap member (20) is in the closed position and which allows the passage of fluid between the upper seal (66) and the plug member (42) when the cap member (20) is in the open position, and
 - a lower seal (68) which seals against the cylindrical outer surface (62) of the plug member (42) when the cap member (20) is in the closed and open positions.
 9. A closure device according to claim 8 wherein the plug member (42) includes an internal fluid passage (70) which extends to the cylindrical outer surface (62) at a position below the upper seal (66) when the cap member (20) is in the closed position, the internal fluid passage (70) being in communication with the nozzle (60).
 10. A closure device according to any preceding claim, wherein the primary engagement means of the cap member (20) and housing (40) include mutually engageable detent means (86; 88) to prevent the rotation of the cap member (20) relative to the housing (40) beyond a predetermined limiting angle of rotation.
 11. A closure device according to any preceding claim, wherein the fluid chamber (22) contains a head space of pressurised gas.
 12. A container (12) having a main liquid compartment (14), an opening having a neck (16), and a closure device (10) according to any preceding claim closing said opening, wherein the housing (40) of the closure device is secured to the neck (16) of the container (12).
 13. A container according to claim 12, wherein the housing (40) comprises an outer housing wall (44) located outside the neck (16) of the container (12) and provided with an internal secondary thread (52) engaged with an external secondary thread (18) provided on the neck (16) of the container (12).
 14. A container according to any of claims 12 to 13, wherein the housing (40) further comprises an inner housing wall arranged inside the neck (16) of the container (12) and provided with internal sealing means (54) to seal against an outer surface of the inner cap wall (32) and external sealing means (56; 58) to seal against an internal surface of the neck (16) of the opening.
 15. A method of assembling a closure device (10) containing additive liquid for introduction into a main liquid compartment (14) of a container (12), the method comprising the following steps:
 - providing a cap member (20),
 - securing a bottom wall (24) to said cap member (20) to define a pressurisable fluid chamber (22),
 - inverting the cap member (20) and introducing an additive liquid (120) into the fluid chamber (22) through an aperture (25) in the bottom wall (24),
 - providing a housing (40) having a plug member (42), the plug member (42) including a nozzle (60) directed away from the fluid chamber (22),

- attaching the housing (40) to the cap member (20) by relative axial movement of the housing (40) and cap member (20) both having corresponding primary engagement means (30, 50) therefor, so that the plug member (42) enters and closes the aperture (25) in the bottom wall (24) of the fluid chamber (22),
 5 pressurising the fluid chamber (22), and
 storing the closure device (10) with the pressurised chamber (22) containing the additive liquid (120) for subsequent fitting to the container (12).
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- 16.** A method according to claim 15, whereby the relative axial movement of the housing (40) and cap member (20) is accomplished by engagement of an external thread (50) on the housing (40) with an internal thread (30) on the cap member (20).
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- 17.** A method according to claim 15 or 16, wherein the pressurising step is accomplished by providing pressurised fluid to a passage (61) in said plug member (42), the passage (61) being in communication with a valve means which prevents release of the pressurised fluid from the fluid chamber (22).
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- 18.** A method according to claim 17, wherein the valve means comprises a seal which engages with the plug member (42) when the aperture (25) is closed by the plug member (42).
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- 19.** A method according to claim 17 or 18, wherein the pressurised fluid is a gas and the gas forms a head space in the fluid chamber (22) of between 0% and 60% of the volume of the fluid chamber (22).
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- 20.** A method according to any of claims 15 to 19, including the further step of securing the closure device (10) to a neck (16) of a container (12) having a main liquid compartment (14) by engagement of an internal thread (30) on the housing (40) with an external thread (50) on the neck (16) of the container (12).
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- 21.** A method according to any of claims 15 to 20, wherein the closure device is a closure device according to any of claims 1 to 11.
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- 22.** A method of introducing an additive liquid (120) into a main liquid compartment (14) of a container (12) having an opening with a neck (16), the neck (16) having attached to it a closure device (10) comprising a housing (40) attached to the neck (16) and a cap member (20) defining a pressurised fluid chamber (22) attached to the housing (40), wherein the closure device (10) is assembled and filled with the additive liquid (120) prior to attachment to the neck (16), the method comprising the steps of raising the cap member (20) on the housing (40), both having corresponding primary engagement means (30, 50) therefor, causing a plug member (42) provided on said housing (40) to move relative to the cap member (20) from a closed position in which an aperture (25) provided in a bottom wall (24) of said fluid chamber (22) is closed by said plug member (42) to an open position in which the plug member (42) is at least partially withdrawn from the aperture (25) to provide a communication path from the fluid chamber (22) through a nozzle (60) provided in the plug member (42) and directed away from the fluid chamber (22) to the main fluid compartment (14), and releasing the pressurised additive liquid (120) from said fluid chamber (22) along said communication path (61) into said main liquid compartment (14).
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- 23.** A method according to claim 22, wherein during the raising of the fluid chamber (22) relative to the housing (40) a seal is maintained between the fluid chamber (22) and an inner housing wall (46) of the housing (40) arranged in the neck (16) of the container (12).
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- 24.** A method according to claim 22 or 23, wherein the cap member (20) is raised by rotating the cap member (20) through a first angle such that the fluid chamber (22) is raised by screw thread action relative to the housing (40).
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- 25.** A method according to claim 24, wherein further rotation of the cap member (20) by more than the first angle relative to the housing (40) is prevented by the mutual engagement of detent means (86; 88) provided on the cap member (20) and housing (40).
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- 26.** A method according to any of claims 22 to 25, wherein the raising of said cap member (20) relative to the housing (40) is achieved by engagement of an internal thread (30) on the cap member (20) with an external thread (50) on the housing (40).
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- 27.** A method according to any of claims 22 to 26, including the further step of rotating the cap member (20) further to remove the cap member (20) and housing (40) from the container (12) by engagement of an internal secondary thread (52) on the housing with an external secondary thread (18) provided on the neck (16) of the opening of the container (12).
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- 28.** A method according to any of claims 22 to 27, wherein the communication path includes an internal fluid passage (70) in the plug member (42) which extends from the nozzle (60) to a position on the surface of the plug member (42) which is in communication with the fluid chamber (22) when the plug member (42) is in the open position.
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Patentansprüche

1. Eine Verschlussvorrichtung (10), die vor dem Anbringen an einem Behälter (12) zusammengebaut wird, zum Abgeben einer Zusatzflüssigkeit (1) in einen Hauptflüssigkeitsraum (14) des Behälters (12), welcher eine Öffnung mit einem Hals (16) aufweist, wobei die zusammengebaute Verschlussvorrichtung (10) ein Deckelelement (20), das eine unter Druck stehende, die Zusatzflüssigkeit (120) enthaltende Fluidkammer (22) definiert, und ein Gehäuse (40) mit einem Stöpselement (42), das abdichtend in eine Apertur (25) in einer unteren Wand (24) der Fluidkammer (22) eingreifen kann, beinhaltet, wobei das Stöpselement (42) eine Düse (60) umfasst, die von der Fluidkammer (22) weg weist, wobei das Deckelelement (20) mit einem primären Eingriffsmittel (30) versehen ist, das in ein entsprechendes primäres Eingriffsmittel, welches an dem Gehäuse (40) bereitgestellt ist, eingreift, um zu ermöglichen, dass das Deckelelement (20) relativ zu dem Gehäuse (40) aus einer geschlossenen Position, in der das Stöpselement (42) die Apertur (25) schließt, in eine offene Position, in der das Stöpselement (42) mindestens teilweise aus der Apertur (25) zurückgezogen ist, angehoben wird, um im Einsatz einen Verbindungsweg von der Fluidkammer (22) durch die Düse (60) zu dem Hauptflüssigkeitsraum (14) bereitzustellen.
2. Verschlussvorrichtung gemäß Anspruch 1, wobei das Gehäuse (40) eine innere Gehäusewand (46) umfasst, die angepasst ist, um innerhalb des Halses (16) der Öffnung zu passen, und wobei die Verschlussvorrichtung (10) ein Abdichtungsmittel (54) umfasst, das zwischen der Fluidkammer (22) und der inneren Gehäusewand (46) abdichtet, und wobei das primäre Eingriffsmittel an dem Deckelelement (20) ein Innengewinde (30) umfasst und das primäre Eingriffsmittel an dem Gehäuse (40) ein Außengewinde (50) umfasst.
3. Verschlussvorrichtung (10) gemäß Anspruch 2, wobei das Deckelelement (20) eine obere Deckelwand (26), eine äußere Deckelwand (28), an der das Innengewinde (30) bereitgestellt ist, und eine innere Deckelwand (32), die sich von der oberen Deckelwand (26) zu der unteren Wand (24) erstreckt und innerhalb der äußeren Deckelwand (28) eingerichtet ist, umfasst, wobei die Fluidkammer (22) durch die obere Deckelwand (26), die innere Deckelwand (32) und die untere Wand (24) definiert ist und wobei das Gehäuse (40) eine äußere Gehäusewand (44) beinhaltet, an der das Außengewinde (50) bereitgestellt ist.
4. Verschlussvorrichtung gemäß Anspruch 3, wobei die äußere Gehäusewand (44) mit einem sekundären Innengewinde (52) versehen ist, das angepasst ist, um im Einsatz in ein an dem Hals (16) der Öffnung des Behälters (12) bereitgestelltes sekundäres Außengewinde (18) einzugreifen.
5. Verschlussvorrichtung gemäß einem der Ansprüche 3 bis 4, wobei das Gehäuse (40) ferner einen Rahmen (48) beinhaltet, der das Stöpselement (42) stützt, so dass das Stöpselement (42) innerhalb der inneren Gehäusewand (46) eingerichtet ist und sich im Einsatz nach oben zu der Fluidkammer (22) erstreckt.
6. Verschlussvorrichtung gemäß einem der vorhergehenden Ansprüche, wobei das Stöpselement (42) einen Innenfluiddurchgang (70) umfasst, der in der geschlossenen Position von der Fluidkammer (22) abdichtet ist und der in der offenen Position mit der Fluidkammer (22) in Fluidverbindung steht.
7. Verschlussvorrichtung gemäß Anspruch 6, wobei das Stöpselement (42) eine zylinderförmige äußere Oberfläche (62) umfasst, die in ein in der unteren Wand (24) bereitgestelltes Abdichtungsmittel eingreift.
8. Verschlussvorrichtung gemäß Anspruch 7, wobei das Abdichtungsmittel Folgendes beinhaltet:
 - eine obere Abdichtung (66), die gegen die zylinderförmige äußere Oberfläche (62) des Stöpselements (42) abdichtet, wenn sich das Deckelelement (20) in der geschlossenen Position befindet, und die den Durchgang von Fluid zwischen der oberen Abdichtung (66) und dem Stöpselement (42) ermöglicht, wenn sich das Deckelelement (20) in der offenen Position befindet, und
 - eine untere Abdichtung (68), die gegen die zylinderförmige äußere Oberfläche (62) des Stöpselements (42) abdichtet, wenn sich das Deckelelement (20) in der geschlossenen und der offenen Position befindet.
9. Verschlussvorrichtung gemäß Anspruch 8, wobei das Stöpselement (42) einen Innenfluiddurchgang (70) umfasst, der sich, wenn sich das Deckelelement (20) in der geschlossenen Position befindet, an einer Position unterhalb der oberen Abdichtung (66) zu der zylinderförmigen äußeren Oberfläche (62) erstreckt, wobei der Innenfluiddurchgang (70) mit der Düse (60) in Verbindung steht.
10. Verschlussvorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die primären Eingriffsmittel des Deckelelements (20) und des Gehäuses (40) gegenseitig eingreifbare Rastmittel (86; 88) umfassen, um die Drehung des Deckelelements (20) rela-

- tiv zu dem Gehäuse (40) über einen vorbestimmten beschränkenden Drehungswinkel hinaus zu verhindern.
11. Verschlussvorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Fluidkammer (22) einen Gasraum mit unter Druck stehendem Gas enthält. 5
12. Ein Behälter (12) mit einem Hauptflüssigkeitsraum (14), einer Öffnung mit einem Hals (16) und einer die Öffnung schließenden Verschlussvorrichtung (10) gemäß einem der vorhergehenden Ansprüche, wobei das Gehäuse (40) der Verschlussvorrichtung an dem Hals (16) des Behälters (12) gesichert ist. 10
13. Behälter gemäß Anspruch 12, wobei das Gehäuse (40) eine äußere Gehäusewand (44) beinhaltet, die sich außerhalb des Halses (16) des Behälters (12) befindet und mit einem sekundären Innengewinde (52) versehen ist, das in ein sekundäres Außengewinde (18), welches an dem Hals (16) des Behälters (12) bereitgestellt ist, eingreift. 20
14. Behälter gemäß einem der Ansprüche 12 bis 13, wobei das Gehäuse (40) ferner eine innere Gehäusewand beinhaltet, die innerhalb des Halses (16) des Behälters (12) eingerichtet ist und mit einem Innenabdichtungsmittel (54), um gegen eine äußere Oberfläche der inneren Deckelwand (32) abzudichten, und einem Außenabdichtungsmittel (56; 58), um gegen eine Innenoberfläche des Halses (16) der Öffnung abzudichten, versehen ist. 25
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15. Ein Verfahren zum Zusammenbauen einer Verschlussvorrichtung (10), die Zusatzflüssigkeit zur Einführung in einen Hauptflüssigkeitsraum (14) eines Behälters (12) enthält, wobei das Verfahren die folgenden Schritte beinhaltet: 35
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- Bereitstellen eines Deckelelements (20),
Sichern einer unteren Wand (24) an dem Deckelement (20), um eine unter Druck setzbare Fluidkammer (22) zu definieren,
Umdrehen des Deckelelements (20) und Einführen einer Zusatzflüssigkeit (120) in die Fluidkammer (22) durch eine Apertur (25) in der unteren Wand (24), Bereitstellen eines Gehäuses (40) mit einem Stöpsselement (42), wobei das Stöpsselement (42) eine Düse (60) umfasst, die von der Fluidkammer (22) weg weist,
Befestigen des Gehäuses (40) an dem Deckelement (20) durch eine relative axiale Bewegung des Gehäuses (40) und des Deckelelements (20), wobei beide ein entsprechendes primäres Eingriffsmittel (30, 50) dafür aufweisen, so dass das Stöpsselement (42) in die Apertur (25) in der unteren Wand (24) der Fluidkammer (22) eintritt und diese schließt,
Unter-Druck-Setzen der Fluidkammer (22) und Lagern der Verschlussvorrichtung (10) mit der unter Druck stehenden Kammer (22), welche die Zusatzflüssigkeit (120) enthält, zum nachfolgenden Anbringen an dem Behälter (12).
16. Verfahren gemäß Anspruch 15, wobei die relative axiale Bewegung des Gehäuses (40) und des Deckelelements (20) durch das Eingreifen eines Außengewindes (50) an dem Gehäuse (40) in ein Innengewinde (30) an dem Deckelement (20) erreicht wird.
17. Verfahren gemäß Anspruch 15 oder 16, wobei der Schritt des Unter-Druck-Setzens durch das Bereitstellen von unter Druck stehendem Fluid für einen Durchgang (61) in dem Stöpsselement (42) erreicht wird, wobei der Durchgang (61) mit einem Ventilmittel in Verbindung steht, das die Abgabe des unter Druck stehenden Fluids aus der Fluidkammer (22) verhindert.
18. Verfahren gemäß Anspruch 17, wobei das Ventilmittel eine Abdichtung beinhaltet, die in das Stöpsselement (42) eingreift, wenn die Apertur (25) von dem Stöpsselement (42) geschlossen ist.
19. Verfahren gemäß Anspruch 17 oder 18, wobei das unter Druck stehende Fluid ein Gas ist und das Gas einen Gasraum in der Fluidkammer (22) von zwischen 0 % und 60 % des Volumens der Fluidkammer (22) bildet.
20. Verfahren gemäß einem der Ansprüche 15 bis 19, das den weiteren Schritt des Sicherns der Verschlussvorrichtung (10) an einem Hals (16) eines Behälters (12) mit einem Hauptflüssigkeitsraum (14) durch das Eingreifen eines Innengewindes (30) an dem Gehäuse (40) in ein Außengewinde (50) an dem Hals (16) des Behälters (12) umfasst.
21. Verfahren gemäß einem der Ansprüche 15 bis 20, wobei die Verschlussvorrichtung eine Verschlussvorrichtung gemäß einem der Ansprüche 1 bis 11 ist.
22. Ein Verfahren zum Einführen einer Zusatzflüssigkeit (120) in einen Hauptflüssigkeitsraum (14) eines Behälters (12), welcher eine Öffnung mit einem Hals (16) aufweist, wobei der Hals (16) eine an ihm befestigte Verschlussvorrichtung (10) aufweist, die ein an dem Hals (16) befestigtes Gehäuse (40) und ein an dem Gehäuse (40) befestigtes Deckelement (20), das eine unter Druck stehende Fluidkammer (22) definiert, beinhaltet, wobei die Verschlussvorrichtung (10) vor dem Befestigen an dem Hals (16) zusammengebaut und mit der Zusatzflüssigkeit (120) gefüllt wird, wobei das Verfahren die folgenden

- Schritte beinhaltet: Heben des Deckelelements (20) an dem Gehäuse (40), wobei beide entsprechende primäre Eingriffsmittel (30, 50) dafür aufweisen, Verursachen, dass sich ein an dem Gehäuse (40) bereitgestelltes Stöpselement (42) relativ zu dem Deckelelement (20) aus einer geschlossenen Position, in der eine in einer unteren Wand (24) der Fluidkammer (22) bereitgestellte Apertur (25) von dem Stöpselement (42) geschlossen ist, in eine offene Position, in der das Stöpselement (42) mindestens teilweise aus der Apertur (25) zurückgezogen ist, bewegt, um einen Verbindungsweg von der Fluidkammer (22) durch eine Düse (60), welche in dem Stöpselement (42) bereitgestellt ist und von der Fluidkammer (22) weg weist, zu dem Hauptfluidraum (14) bereitzustellen, und Abgeben der unter Druck stehenden Zusatzflüssigkeit (120) aus der Fluidkammer (22) entlang dem Verbindungsweg (61) in den Hauptflüssigkeitsraum (14).
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- 10 **Revendications**
1. Un dispositif de fermeture (10) assemblé avant d'être emboîté sur un conteneur (12) destiné à libérer du liquide additif (120) dans un compartiment à liquide principal (14) du conteneur (12) présentant une ouverture avec un col (16),
- 15 le dispositif de fermeture assemblé (10) comprenant un élément formant couvercle (20) définissant une chambre à fluide pressurisée (22) contenant le liquide additif (120) et un logement (40) présentant un élément formant bouchon (42) pouvant être engagé, de façon à le fermer de manière étanche, dans un orifice (25) dans une paroi de fond (24) de la chambre à fluide (22),
- 20 l'élément formant bouchon (42) incluant une buse (60) dirigée de façon à s'éloigner de la chambre à fluide (22),
- 25 où l'élément formant couvercle (20) est muni d'un moyen d'engagement primaire (30) qui se met en prise avec un moyen d'engagement primaire correspondant prévu sur le logement (40) afin de permettre à l'élément formant couvercle (20) d'être soulevé relativement au logement (40) d'une position fermée dans laquelle l'élément formant bouchon (42) ferme l'orifice (25) à une position ouverte dans laquelle l'élément formant bouchon (42) est au moins en partie retiré de l'orifice (25) afin de fournir une voie de communication, à l'utilisation, allant de la chambre à fluide (22) au compartiment à liquide principal (14) en passant par la buse (60).
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2. Un dispositif de fermeture selon la revendication 1, où le logement (40) inclut une paroi de logement interne (46) adaptée pour s'emboîter à l'intérieur du col (16) de l'ouverture et où le dispositif de fermeture (10) inclut un moyen d'étanchéité (54) qui réalise une étanchéisation entre la chambre à fluide (22) et la paroi de logement interne (46), et où le moyen d'engagement primaire sur l'élément formant couvercle (20) inclut un filet intérieur (30) et le moyen d'engagement primaire sur le logement (40) inclut un filet extérieur (50).
3. Un dispositif de fermeture (10) selon la revendication 2, où l'élément formant couvercle (20) inclut une paroi de couvercle de dessus (26), une paroi de couvercle externe (28) sur laquelle est prévu le filet intérieur (30) et une paroi de couvercle interne (32)
23. Verfahren gemäß Anspruch 22, wobei während des Hebens der Fluidkammer (22) relativ zu dem Gehäuse (40) eine Abdichtung zwischen der Fluidkammer (22) und einer in dem Hals (16) des Behälters (12) eingerichteten inneren Gehäusewand (46) des Gehäuses (40) aufrechterhalten wird.
24. Verfahren gemäß Anspruch 22 oder 23, wobei das Deckelelement (20) durch das Drehen des Deckelelements (20) um einen ersten Winkel gehoben wird, so dass die Fluidkammer (22) mittels Schraubengewindeaktion relativ zu dem Gehäuse (40) gehoben wird.
25. Verfahren gemäß Anspruch 24, wobei eine weitere Drehung des Deckelelements (20) um mehr als den ersten Winkel relativ zu dem Gehäuse (40) durch das gegenseitige Eingreifen von Rastmitteln (86; 88), die an dem Deckelelement (20) und dem Gehäuse (40) bereitgestellt sind, verhindert wird.
26. Verfahren gemäß einem der Ansprüche 22 bis 25, wobei das Heben des Deckelelements (20) relativ zu dem Gehäuse (40) durch das Eingreifen eines Innengewindes (30) an dem Deckelelement (20) in ein Außengewinde (50) an dem Gehäuse (40) erzielt wird.
27. Verfahren gemäß einem der Ansprüche 22 bis 26, das den weiteren Schritt des weiteren Drehens des Deckelelements (20) umfasst, um das Deckelelement (20) und das Gehäuse (40) von dem Behälter (12) zu entfernen, indem ein sekundäres Innengewinde (52) an dem Gehäuse in ein an dem Hals (16) der Öffnung des Behälters (12) bereitgestelltes sekundäres Außengewinde (18) eingreift.
28. Verfahren gemäß einem der Ansprüche 22 bis 27,

- s'étendant de la paroi de couvercle de dessus (26) à la paroi de fond (24) et arrangée à l'intérieur de la paroi de couvercle externe (28), la chambre à fluide (22) étant définie par la paroi de couvercle de dessus (26), la paroi de couvercle interne (32) et la paroi de fond (24), et où le logement (40) comprend une paroi de logement externe (44) sur laquelle est prévu le filet extérieur (50).
4. Un dispositif de fermeture selon la revendication 3, où la paroi de logement externe (44) est munie d'un filet secondaire intérieur (52) adapté à l'utilisation pour se mettre en prise avec un filet secondaire extérieur (18) prévu sur le col (16) de l'ouverture du conteneur (12).
 5. Un dispositif de fermeture selon n'importe lesquelles des revendications 3 et 4, où le logement (40) comprend de plus un cadre (48) qui soutient l'élément formant bouchon (42) de façon à ce que l'élément formant bouchon (42) soit arrangé à l'intérieur de la paroi de logement interne (46) et s'étende vers le haut en direction de la chambre à fluide (22) à l'utilisation.
 6. Un dispositif de fermeture selon n'importe quelle revendication précédente, où l'élément formant bouchon (42) inclut un passage à fluide intérieur (70) qui est fermé de manière étanche relativement à la chambre à fluide (22) dans la position fermée et qui est en communication fluïdique avec la chambre à fluide (22) dans la position ouverte.
 7. Un dispositif de fermeture selon la revendication 6, où l'élément formant bouchon (42) inclut une surface externe cylindrique (62) qui se met en prise avec un moyen d'étanchéité prévu dans la paroi de fond (24).
 8. Un dispositif de fermeture selon la revendication 7 où les moyens d'étanchéité comprennent :
 - un joint d'étanchéité supérieur (66) qui réalise une étanchéisation contre la surface externe cylindrique (62) de l'élément formant bouchon (42) lorsque l'élément formant couvercle (20) est dans la position fermée et qui permet le passage de fluide entre le joint d'étanchéité supérieur (66) et l'élément formant bouchon (42) lorsque l'élément formant couvercle (20) est dans la position ouverte, et
 - un joint d'étanchéité inférieur (68) qui réalise une étanchéisation contre la surface externe cylindrique (62) de l'élément formant bouchon (42) lorsque l'élément formant couvercle (20) est dans les positions fermée et ouverte.
 9. Un dispositif de fermeture selon la revendication 8 où l'élément formant bouchon (42) inclut un passage à fluide intérieur (70) qui s'étend à la surface externe cylindrique (62) au niveau d'une position en dessous du joint d'étanchéité supérieur (66) lorsque l'élément formant couvercle (20) est dans la position fermée, le passage à fluide intérieur (70) étant en communication avec la buse (60).
 10. Un dispositif de fermeture selon n'importe quelle revendication précédente, où les moyens d'engagement primaires de l'élément formant couvercle (20) et du logement (40) incluent des moyens d'encliquetage mutuellement engageables (86 ; 88) pour empêcher la rotation de l'élément formant couvercle (20) relativement au logement (40) au-delà d'un angle de rotation limitatif prédéterminé.
 11. Un dispositif de fermeture selon n'importe quelle revendication précédente, où la chambre à fluide (22) contient un espace libre de gaz pressurisé.
 12. Un conteneur (12) ayant un compartiment à liquide principal (14), une ouverture avec un col (16), et un dispositif de fermeture (10) selon n'importe quelle revendication précédente fermant ladite ouverture, où le logement (40) du dispositif de fermeture est assujetti au col (16) du conteneur (12).
 13. Un conteneur selon la revendication 12, où le logement (40) comprend une paroi de logement externe (44) située en dehors du col (16) du conteneur (12) et munie d'un filet secondaire intérieur (52) mis en prise avec un filet secondaire extérieur (18) prévu sur le col (16) du conteneur (12).
 14. Un conteneur selon n'importe lesquelles des revendications 12 et 13, où le logement (40) comprend de plus une paroi de logement interne arrangée à l'intérieur du col (16) du conteneur (12) et munie de moyens d'étanchéité intérieurs (54) destinés à réaliser une étanchéisation contre une surface externe de la paroi de couvercle interne (32) et des moyens d'étanchéité extérieurs (56 ; 58) destinés à réaliser une étanchéisation contre une surface intérieure du col (16) de l'ouverture.
 15. Une méthode pour assembler un dispositif de fermeture (10) contenant du liquide additif destiné à être introduit dans un compartiment à liquide principal (14) d'un conteneur (12), la méthode comprenant les étapes suivantes :
 - fournir un élément formant couvercle (20), assujettir une paroi de fond (24) sur ledit élément formant couvercle (20) afin de définir une chambre à fluide pouvant être pressurisée (22), renverser l'élément formant couvercle (20) et introduire un liquide additif (120) dans la chambre à fluide (22) par un orifice (25) dans la paroi de

- fond (24),
 fournir un logement (40) présentant un élément formant bouchon (42), l'élément formant bouchon (42) incluant une buse (60) dirigée de façon à s'éloigner de la chambre à fluide (22), attacher le logement (40) sur l'élément formant couvercle (20) grâce à un déplacement axial relatif du logement (40) et de l'élément formant couvercle (20), tous deux présentant des moyens d'engagement primaires correspondants (30, 50) pour ce faire, afin que l'élément formant bouchon (42) pénètre dans l'orifice (25) dans la paroi de fond (24) de la chambre à fluide (22) et le ferme, pressuriser la chambre à fluide (22), et stocker le dispositif de fermeture (10) avec la chambre pressurisée (22) contenant le liquide additif (120) pour l'emboîter ultérieurement sur le conteneur (12).
16. Une méthode selon la revendication 15, grâce à laquelle le déplacement axial relatif du logement (40) et de l'élément formant couvercle (20) est effectué en mettant en prise un filet extérieur (50) sur le logement (40) avec un filet intérieur (30) sur l'élément formant couvercle (20).
17. Une méthode selon la revendication 15 ou la revendication 16, où l'étape de pressurisation est réalisée en apportant du fluide pressurisé dans un passage (61) dans ledit élément formant bouchon (42), le passage (61) étant en communication avec un moyen formant soupape qui empêche la libération du fluide pressurisé de la chambre à fluide (22).
18. Une méthode selon la revendication 17, où le moyen formant soupape comprend un joint d'étanchéité qui se met en prise avec l'élément formant bouchon (42) lorsque l'orifice (25) est fermé par l'élément formant bouchon (42).
19. Une méthode selon la revendication 17 ou la revendication 18, où le fluide pressurisé est un gaz et le gaz forme un espace libre dans la chambre à fluide (22) occupant entre 0 % et 60 % du volume de la chambre à fluide (22).
20. Une méthode selon n'importe lesquelles des revendications 15 à 19, incluant l'étape supplémentaire d'assujettir le dispositif de fermeture (10) sur un col (16) d'un conteneur (12) présentant un compartiment à liquide principal (14) en mettant en prise un filet intérieur (30) sur le logement (40) avec un filet extérieur (50) sur le col (16) du conteneur (12).
21. Une méthode selon n'importe lesquelles des revendications 15 à 20, où le dispositif de fermeture est un dispositif de fermeture selon n'importe lesquelles des revendications 1 à 11.
22. Une méthode pour introduire un liquide additif (120) dans un compartiment à liquide principal (14) d'un conteneur (12) présentant une ouverture avec un col (16), col (16) sur lequel est attaché un dispositif de fermeture (10) comprenant un logement (40) attaché sur le col (16) et un élément formant couvercle (20) définissant une chambre à fluide pressurisée (22) attaché sur le logement (40), où le dispositif de fermeture (10) est assemblé et rempli du liquide additif (120) avant d'être attaché sur le col (16), la méthode comprenant les étapes d'élever l'élément formant couvercle (20) sur le logement (40), tous deux présentant des moyens d'engagement primaires correspondants (30, 50) pour ce faire, amenant un élément formant bouchon (42) prévu sur ledit logement (40) à se déplacer relativement à l'élément formant couvercle (20) d'une position fermée dans laquelle un orifice (25) prévu dans une paroi de fond (24) de ladite chambre à fluide (22) est fermé par ledit élément formant bouchon (42) à une position ouverte dans laquelle l'élément formant bouchon (42) est au moins en partie retiré de l'orifice (25) afin de fournir une voie de communication allant de la chambre à fluide (22) au compartiment à fluide principal (14) en passant par une buse (60) prévue dans l'élément formant bouchon (42) et dirigée de façon à s'éloigner de la chambre à fluide (22), et de libérer le liquide additif pressurisé (120) de ladite chambre à fluide (22) le long de ladite voie de communication (61) dans ledit compartiment à liquide principal (14).
23. Une méthode selon la revendication 22, où lorsque la chambre à fluide (22) est élevée relativement au logement (40), un joint d'étanchéité est maintenu entre la chambre à fluide (22) et une paroi de logement interne (46) du logement (40) arrangée dans le col (16) du conteneur (12).
24. Une méthode selon la revendication 22 ou la revendication 23, où l'élément formant couvercle (20) est élevé en faisant tourner l'élément formant couvercle (20) sur un premier angle de telle sorte que la chambre à fluide (22) soit élevée par une action de filet de vis relativement au logement (40).
25. Une méthode selon la revendication 24, où la rotation plus avant de l'élément formant couvercle (20) de plus du premier angle relativement au logement (40) est empêchée grâce à l'engagement mutuel des moyens d'encliquetage (86 ; 88) prévus sur l'élément formant couvercle (20) et le logement (40).
26. Une méthode selon n'importe lesquelles des revendications 22 à 25, où l'élévation dudit ledit élément formant couvercle (20) relativement au logement (40) est accomplie en mettant en prise un filet inté-

rieur (30) sur l'élément formant couvercle (20) avec un filet extérieur (50) sur le logement (40).

- 27.** Une méthode selon n'importe lesquelles des revendications 22 à 26, incluant l'étape supplémentaire de faire tourner l'élément formant couvercle (20) plus avant pour ôter l'élément formant couvercle (20) et le logement (40) du conteneur (12) en mettant en prise un filet secondaire intérieur (52) sur le logement avec un filet secondaire extérieur (18) prévu sur le col (16) de l'ouverture du conteneur (12). 5
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- 28.** Une méthode selon n'importe lesquelles des revendications 22 à 27, où la voie de communication inclut un passage à fluide intérieur (70) dans l'élément formant bouchon (42) qui s'étend de la buse (60) à une position sur la surface de l'élément formant bouchon (42) qui est en communication avec la chambre à fluide (22) lorsque l'élément formant bouchon (42) est dans la position ouverte. 15
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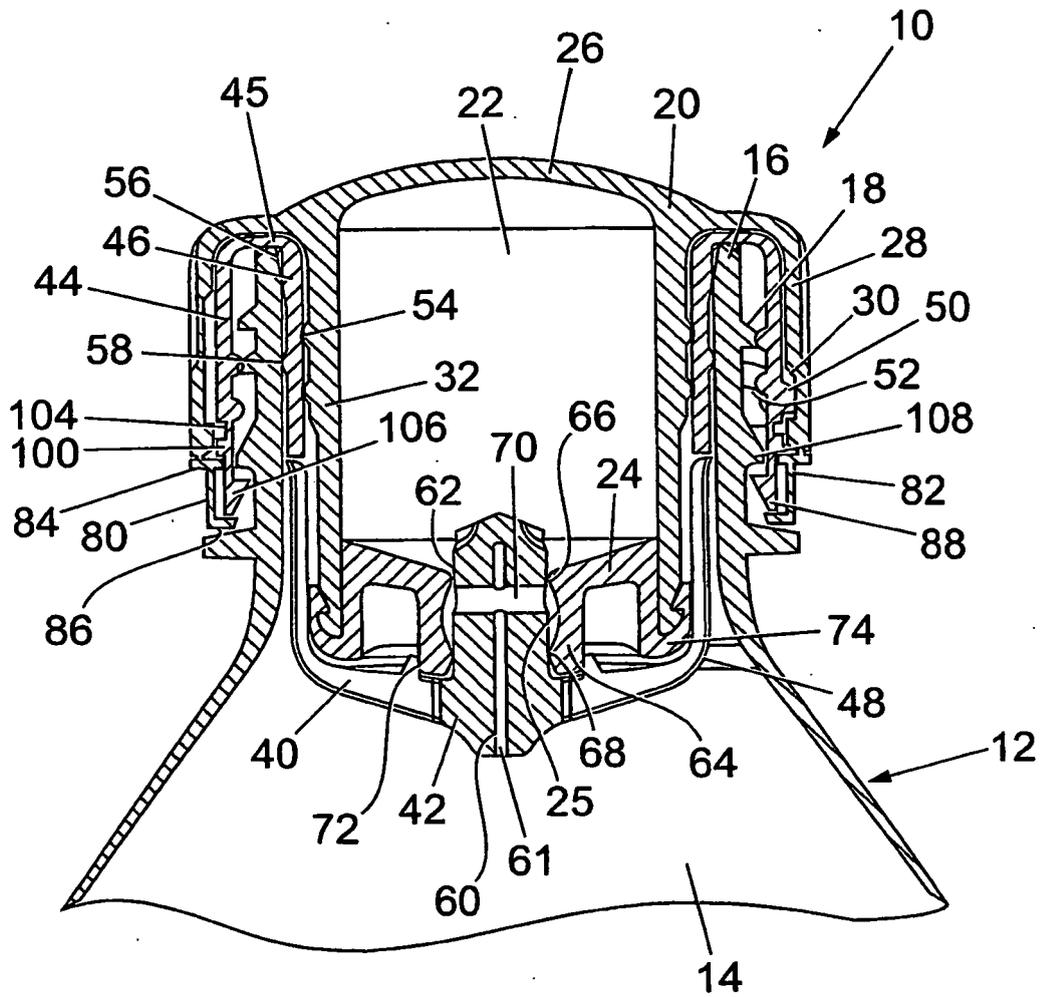
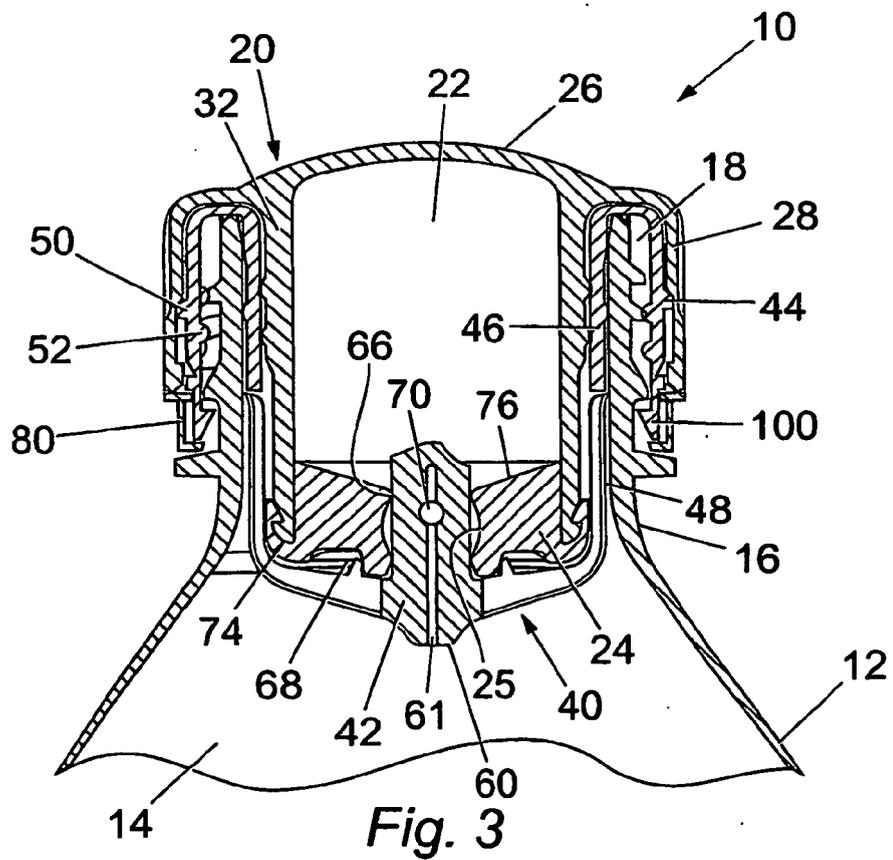
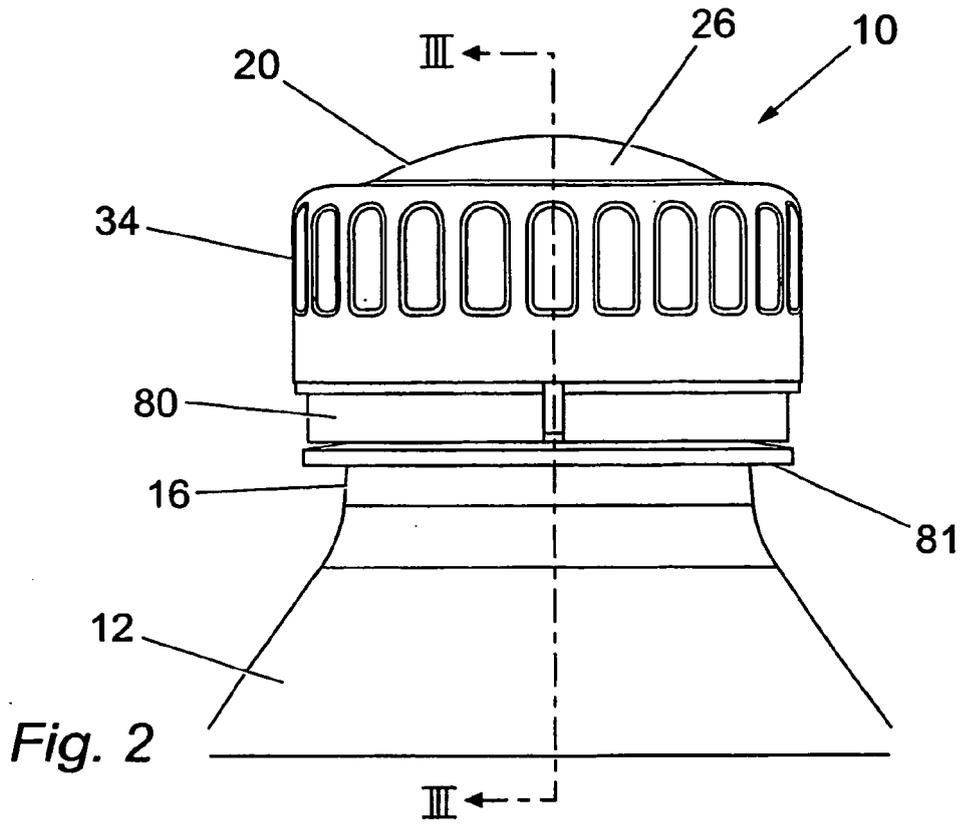


Fig. 1



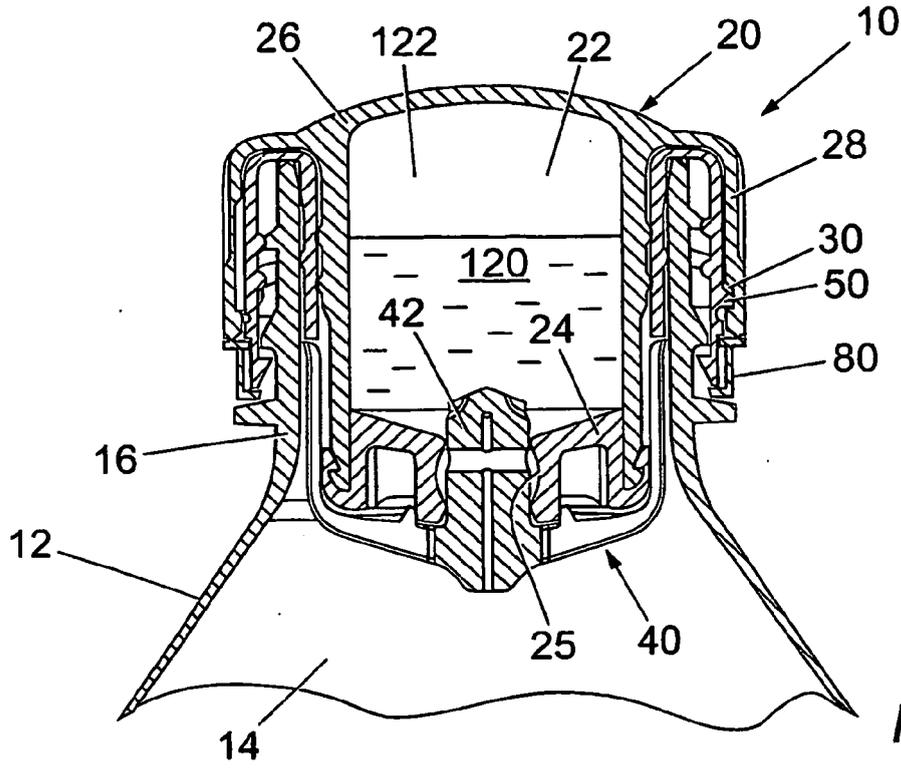


Fig. 4A

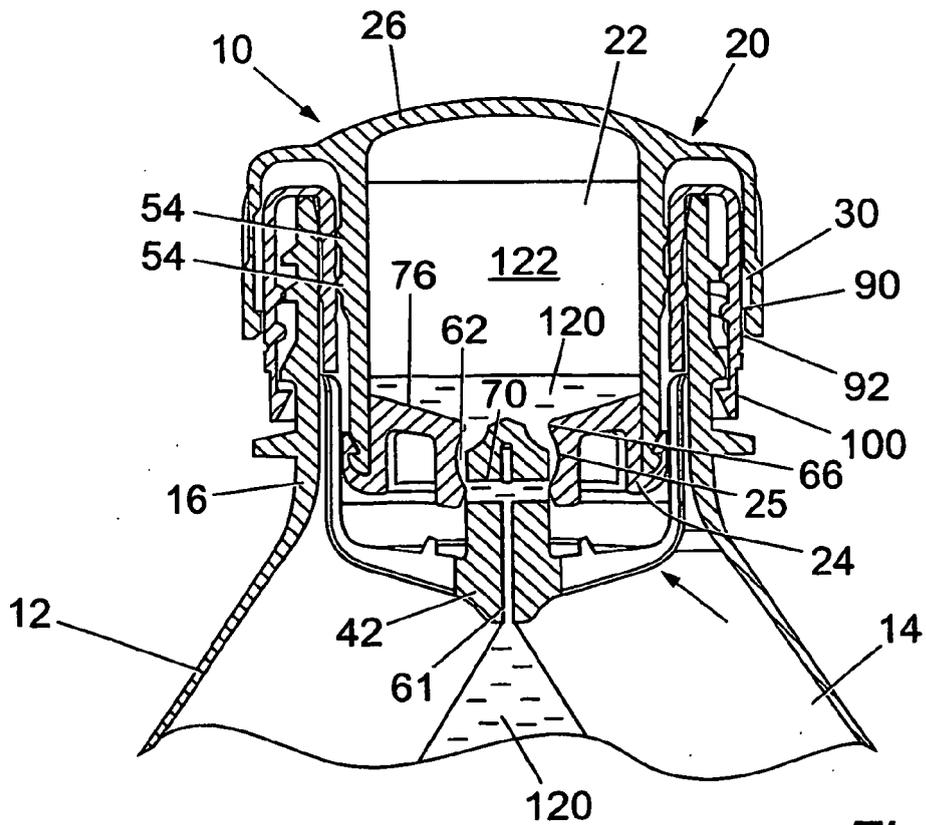


Fig. 4B

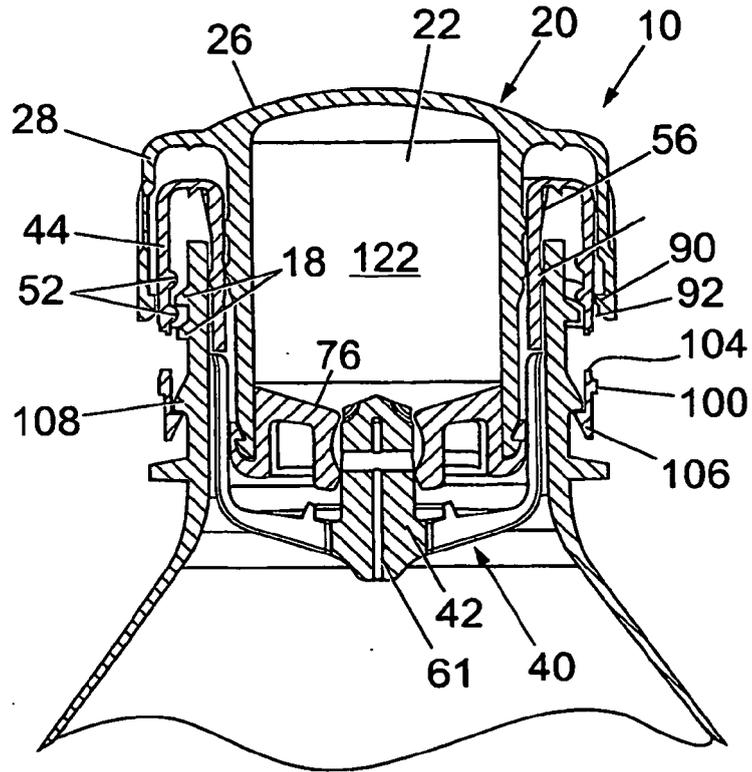


Fig. 4C

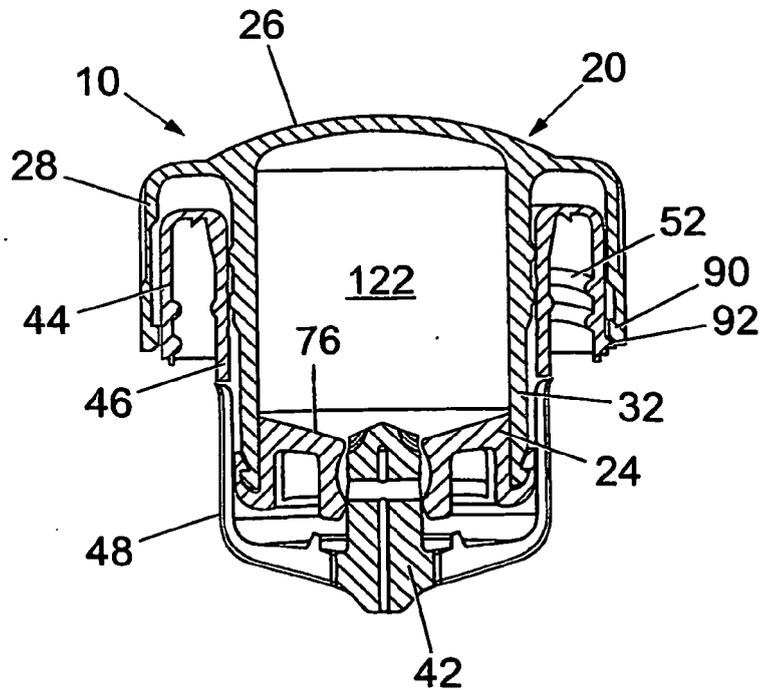


Fig. 4D

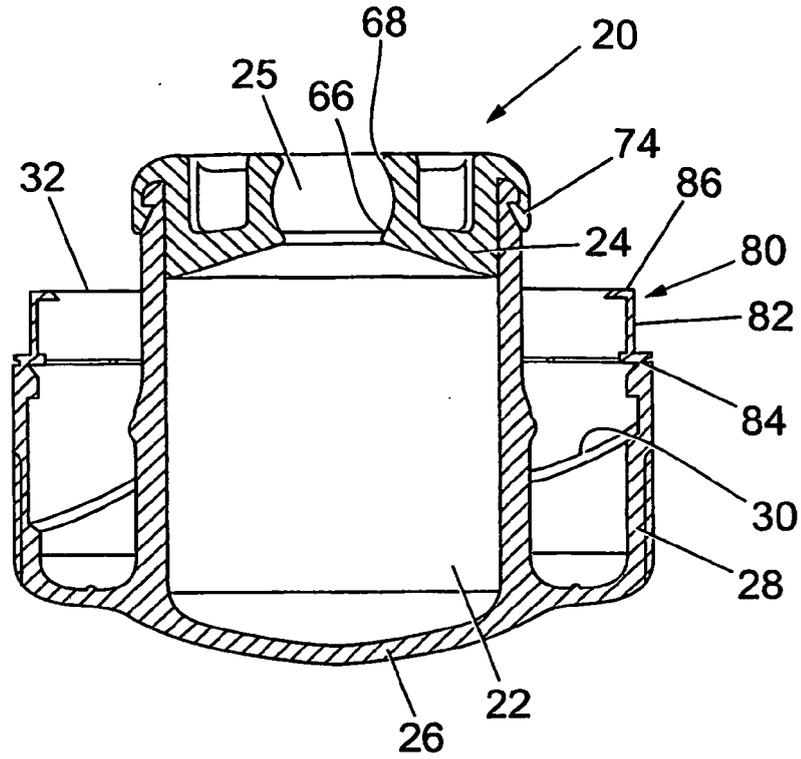


Fig. 5A

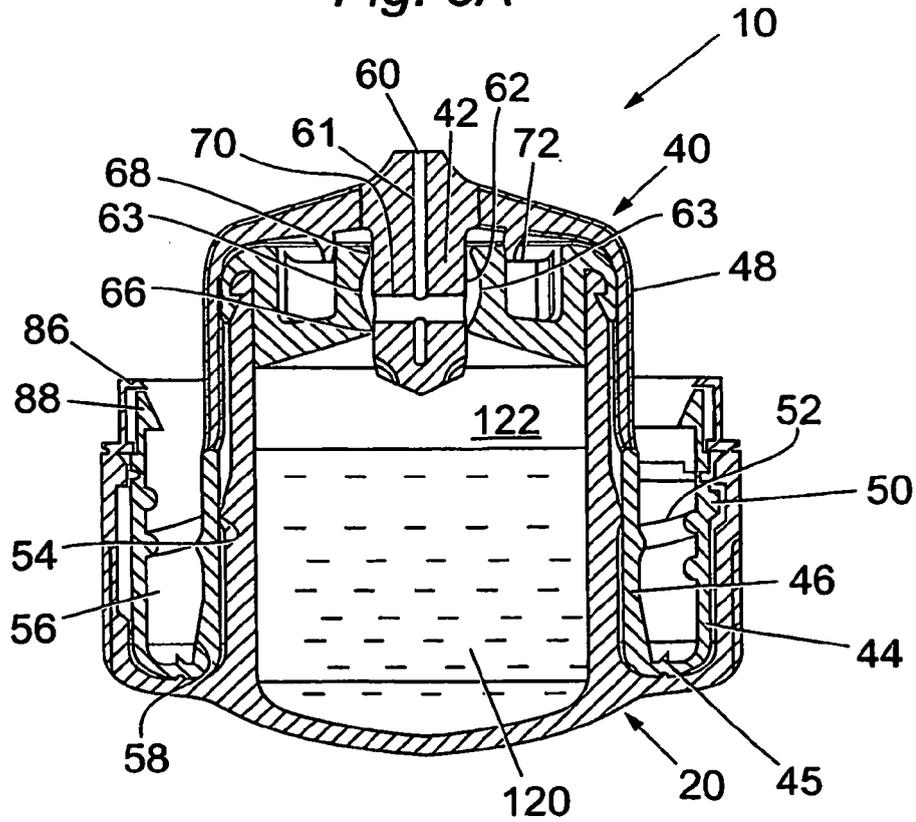


Fig. 5B

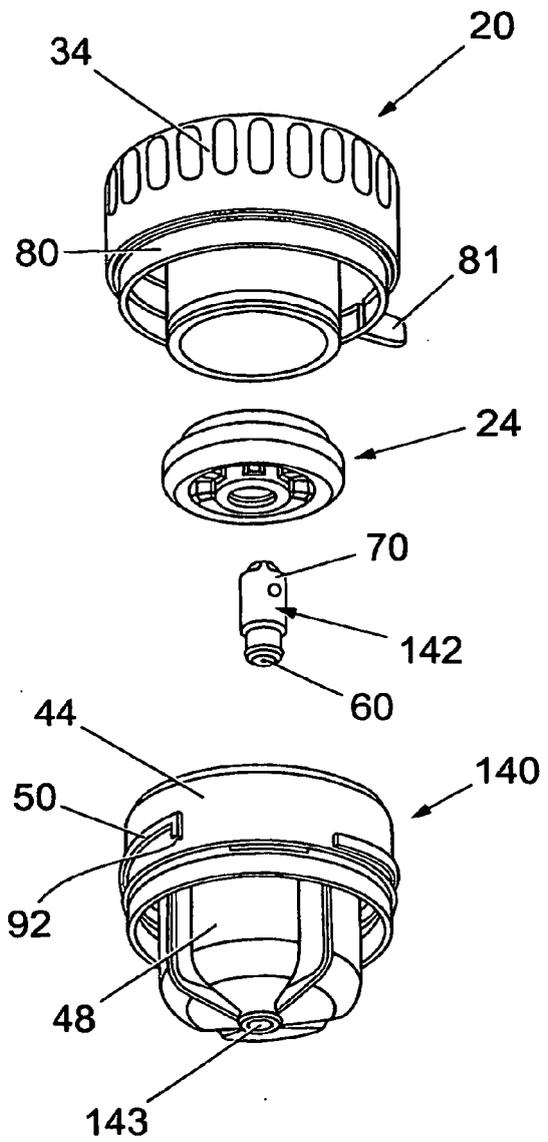


Fig. 6A

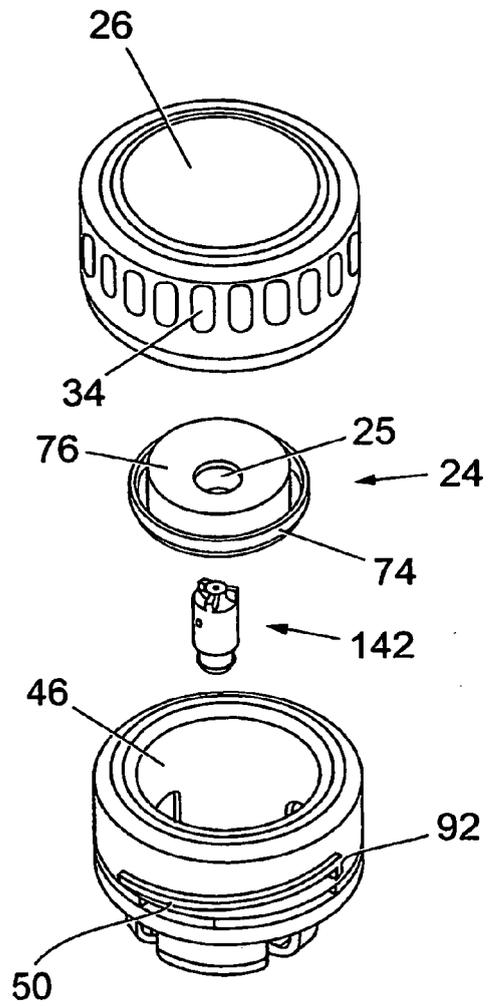
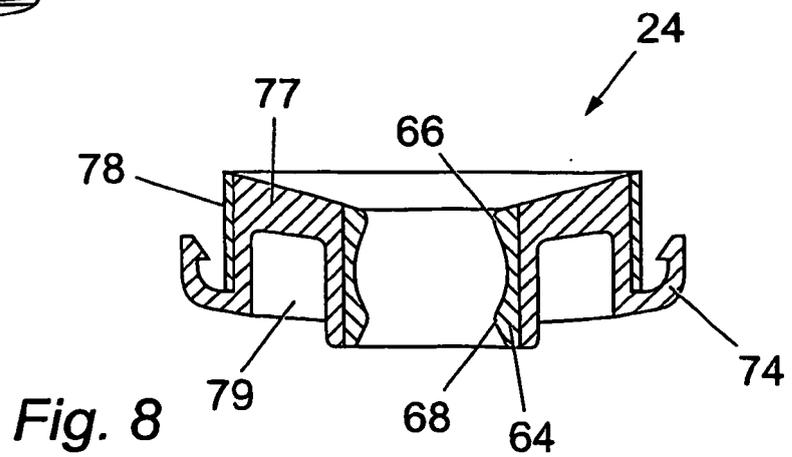
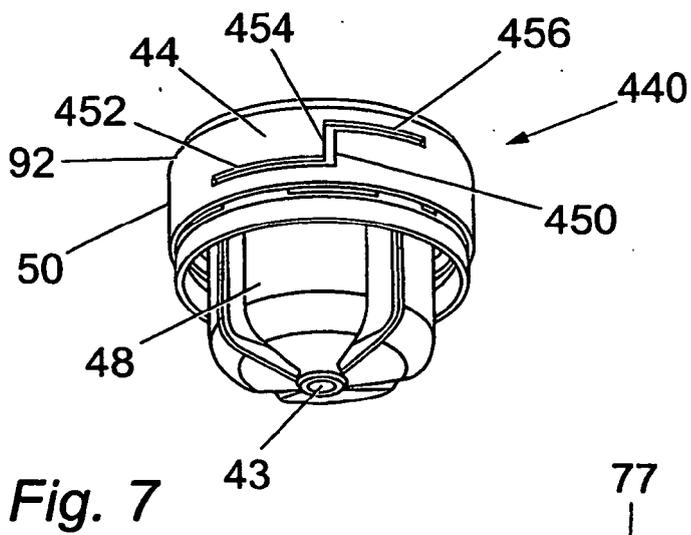
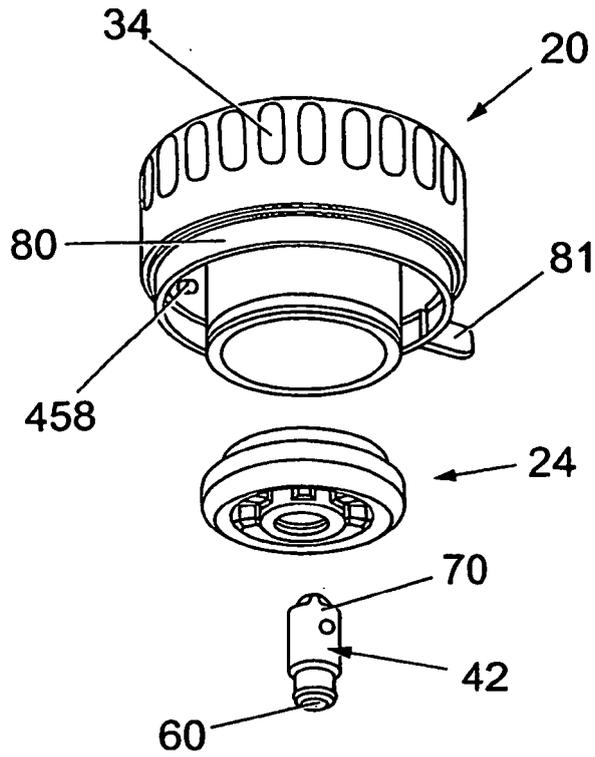


Fig. 6B



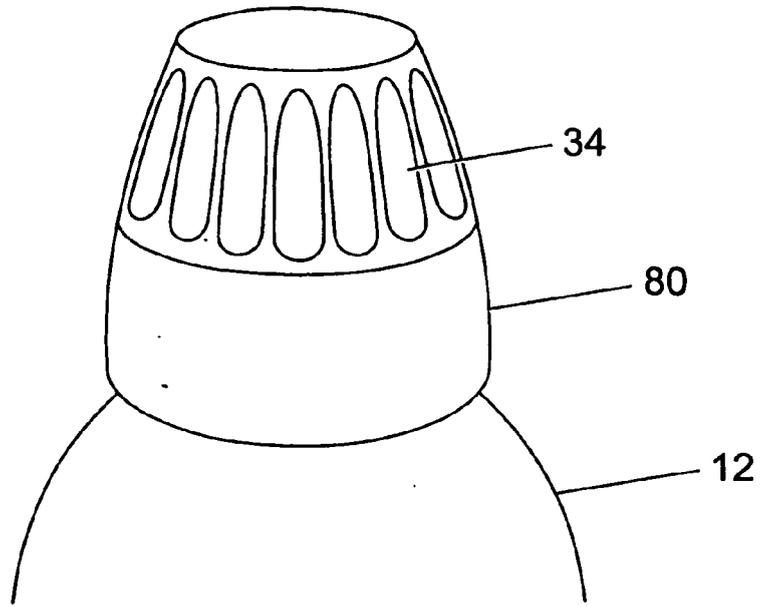


Fig. 11

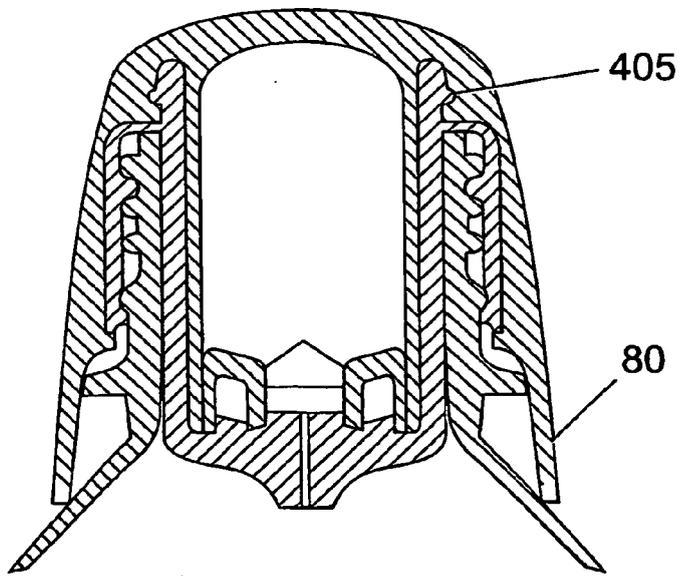


Fig. 10

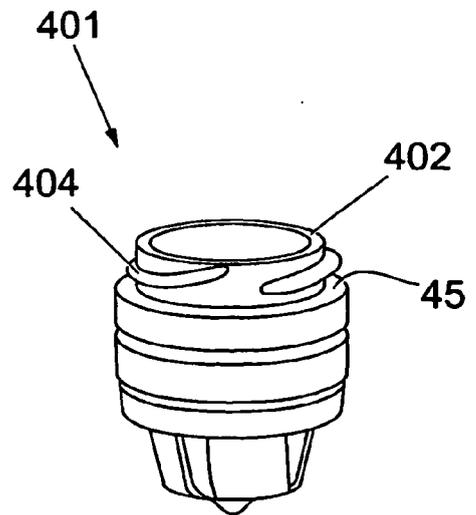


Fig. 9

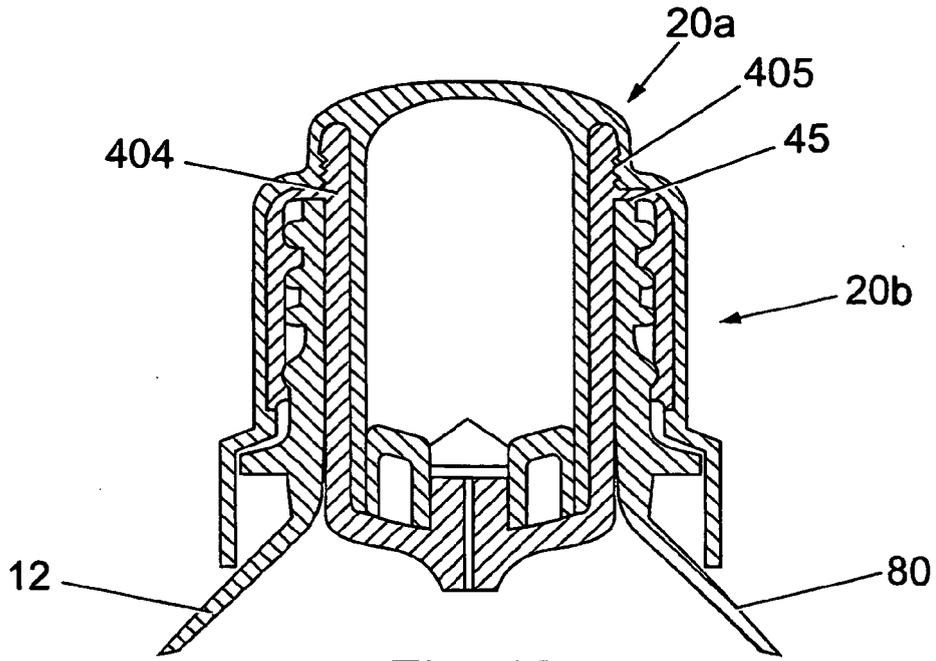


Fig. 12

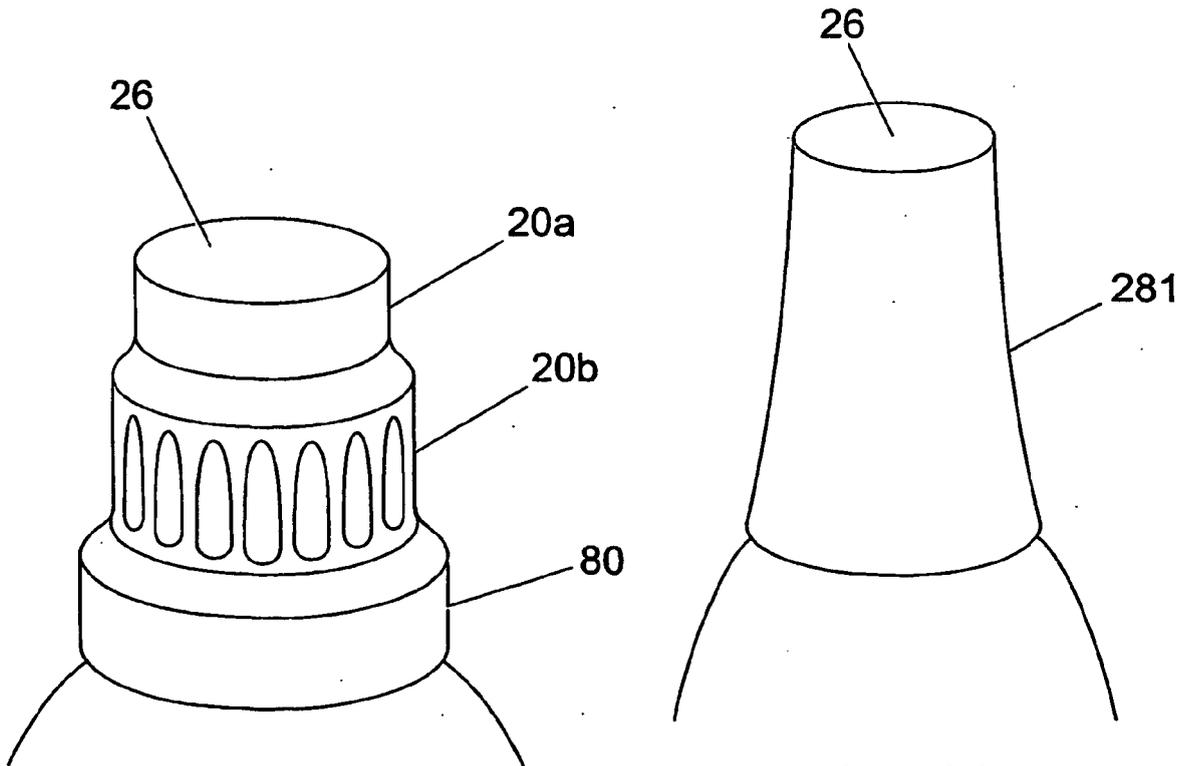


Fig. 13

Fig. 14

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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