Induction-sealable closure for liquid container

A closure (1) for a container carrying a liquid comprises a first body (2) and a second body (3) mounted rotatably onto said first body, whereby the first body comprises a valve seat; the second body comprises a valve element housed in said valve seat, the valve being closed when the closure is in a closed position and said valve being open when the closure is in an open position. The passageway constituted by the valve seat and the valve element is parallel to a main axis of rotation (4) of the second body with reference to the first body. The closure is child-resistant and induction-sealable. It further comprises a vent.
Description

Field of the Invention

[0001] The present invention is related to closures for liquid containers. Particularly, the present invention is related to child-resistant closures. The present invention is equally related to closures for liquid containers with external trigger and dispensing devices.

State of the Art

[0002] Child-resistant closures are used nowadays for containers carrying lightly inflammable and/or toxic liquids, in order to prevent accidental exposure of a child to the container’s content. These liquids, which may contain hazardous agricultural or household chemicals, are dispensed from the container in a number of different ways. In some applications, e.g. for pesticides, it is desirable to apply the liquid solution by spraying in order to achieve a maximal coverage of the surface to be treated. In a spraying device, the fluid is dispensed under pressure through a nozzle. The nozzle may be integrally comprised in the closure, or may be mounted in an outlet hose or extension rod. Pressure is applied by squeezing the container or pressurizing the liquid with the use of a pump.

[0003] Document US 2004/0129728 discloses a child-resistant fluid delivery device comprising a tubular wand with spray nozzle. The wand is assembled onto a liquid container through a child-resistant rotatable connector. This connector is provided with a ratchet mechanism to permit attachment of the connector to the container and thereafter prevent removal of the connector from the container. The spray nozzle is protected by a child-resistant cover of the "squeeze-and-turn"-type. A drawback here is that, in order to be child-resistant, the wand has to remain assembled with the container.

[0004] Patent document US 3874562 discloses a squeeze bottle having a closure with a flip spout. The bottle dispenses liquid in a pump-like fashion. The closure comprises a vent and inlet and outlet check valves, the combination of which constitutes what in effect is a pump. The flip spout can rotate between a closed and open position. The vent is located within the housing that accepts the flip spout when in closed position. The flip spout is provided with a bump, which closes the vent when the spout is closed, thereby avoiding leakage of liquid through the vent. However, if the spout is not fully rotated to the closed position, there is a possibility of leakage through the vent. This closure is also not child-resistant.

Aims of the Invention

[0005] The present invention aims at providing a child-resistant closure for a container, to which a dispensing device can be connected and disconnected, the closure arranged for not being removed from the container, so as to obviate the drawbacks of the prior art.

Summary of the Invention

[0006] The present invention is related to a closure, as set out in the appended claims, for a container carrying a liquid. According to the present invention there is provided a closure comprising a first body, a second body, a valve and an outlet. The first body comprises an upper face, a sidewall, a valve seat and means for mounting onto a discharge opening of the container. The first body also comprises a passageway for the evacuation of liquid out of the container. The second body comprises a valve element and is mounted onto the first body. The valve seat of the first body is arranged for housing the valve element of the second body. The valve seat and the valve element together constitute the valve. The closure comprises means for rotating the second body with reference to the first body between a position in which the valve is open and a position in which the valve is closed. In the closure, for opening and closing the valve, the second body is arranged to rotate around a main axis essentially perpendicular to the upper face of the first body. Preferably, when the valve is open, the container communicates with the outlet of the closure through said valve.

[0007] According to a preferred embodiment, the valve element and valve seat are arranged so that the passageway through the valve (i.e. at the location of the valve) is essentially parallel to the main axis. Preferably, said passageway through the valve is essentially concentric with the main axis. According to an equally preferred embodiment, the valve element and valve seat are arranged so that the passageway through the valve is essentially perpendicular to the main axis.

[0008] In a more preferred embodiment, the combination of valve element and valve seat comprises a cylindrical extension, arranged to liquid-tightly fit inside a cylindrical opening and to rotate with reference to said cylindrical opening. The cylindrical opening and the extension provide a liquid passageway. Preferably, one of the cylinders comprises a transverse member which narrows the liquid passageway and the other of the two cylinders comprises tabs. The member and the tabs are arranged for sliding over each other, whereby the tabs open or close the valve. The sliding is performed by said rotation of the second body.

[0009] Preferably, the narrowing of the liquid passageway is achieved by the transverse member comprising one or more apertures. The tabs are arranged for opening or closing said apertures.

[0010] Even more preferably, the first body comprises a vent and the second body comprises a second valve arranged for closing the vent. The vent is closed when the closure is in a closed position. According to a preferred embodiment, the vent is comprised in the upper face of the first body. According to an equally preferred embodiment, the vent comprises an L-shaped channel,
the channel abutting in the upper face of the first body. The vent passes in both cases through the upper face of the first body.

0011 Preferably, the first body of the closure comprises a projection and the second body comprises a lip. The projection is arranged for engaging with the lip when the second body is in the closed position thereby preventing rotation of the second body towards the open position. The lip is more preferably arranged for being disengaged from the projection by application of a squeezing force on the second body at an essentially right angle with reference to the location of said projection and lip.

0012 Preferably, the first body of the closure comprises a tab and the second body comprises a flap, arranged for engaging with the tab at a position in which the valve is open. The action of said engaging produces a click-sound.

0013 The closure according to the invention preferably comprises a double-sided induction seal comprising an electrically conductive core layer coated at both sides with plastic. The double-sided induction seal is preferably located at a distance from the upper face of the first body.

0014 Preferably, the outlet of the closure comprises a socket arranged for accepting a connector plug.

0015 The present invention equally provides a method of sealing a closure non-removably onto a container, the method comprising the steps of: providing a closure and providing a seal between the closure and the container, characterised in that the seal is a double-sided induction seal comprising an electrically conductive core layer coated at both sides with plastic. The method further comprises the step of induction-heating the seal.

Brief Description of the Drawings

0016 Figure 1 represents the closure according to the invention.

0017 Figure 2a represents the closure base that is mounted onto a container. Figure 2b represents a top view of the closure base.

0018 Figure 3 represents a cross section of the closure and the dip tube.

0019 Figure 4 represents a bottom view of the closure cap that is mounted on top of the base.

0020 Figure 5 represents a cross-sectional view of the closure.

0021 Figure 6 represents a bottom view of the closure base comprising an induction seal.

0022 Figures 7a and 7b represent respectively a cross sectional and upper view of the closure base.

0023 Figures 8a, 8b and 8c represent respectively a bottom view, a cross sectional view of the cap and a cross sectional view of the vent valve.

0024 Figure 9 represents a cross sectional view and an upper view of the closure in which the passageway through the valve for closing the closure is provided perpendicular to the axis of rotation.

Detailed description of the Invention

0025 The closure according to the invention, for a container carrying liquids, may be provided with a spout for discharging the container’s content, or with a spray nozzle. Preferably, the closure is provided with a socket at its outlet. The socket accepts a connector plug of an extension hose. At the distal end of the extension hose a spray gun is preferably provided. Liquid may be withdrawn from the container by the sucking action of the spray gun creating a vacuum at the outlet of the extension hose. The liquid in the container may be brought under pressure. The closure may be arranged for attaching a dip tube to it for withdrawing liquid from the bottom of the container.

0026 The closure comprises two main bodies: a first body or closure base, comprising means for mounting onto the discharge opening of the container, and a second body or cap that is secured onto the base and is allowed to rotate thereby opening or closing a liquid passageway from the container to the outlet of the closure.

0027 For proper operation, the closure preferably comprises a vent. The vent is closed off when the closure is in its closed position. The vent is preferably also closed when the cap is positioned in between the open and closed positions.

0028 The closure is preferably attached in such a way to the container that it can not be removed from the container without damaging both the container and the closure. Securing the closure on the container is preferably achieved by use of a double-sided induction seal. The induction seal is interposed between the container’s discharge opening and the closure base. Induction-heating the seal bonds the closure to the container.

0029 The closure according to the invention is preferably child-resistant. Preferably, the cap’s rotation from the closed to the open position is child-resistant. The liquid passageway in the container can only be opened after application of a squeezing force onto the cap. The squeezing force releases a lip that otherwise is stuck behind a projection. A valve in the closure that closes off the liquid passageway is designed so as not or almost not to deform during the squeezing action. This ensures a liquid-tight closure and prevents accidental discharge of liquid. These properties are best achieved when the valve is located in the vicinity of, and preferably concentrically around the cap’s axis of rotation and the valve opening is as small as possible.

0030 An additional child-resistant feature of the cap is the tight mounting of the cap onto the closure base. A circular groove and rib, present both on the cap and on the base, engage in each other and ensure that the cap is not easily torn off the base.

Description of a Preferred Embodiment of the Invention

0031 One embodiment of the closure according to...
the present invention is depicted in figure 1. Figure 1 presents a closure 1 for a liquid container, said closure comprising a base part 2 and a cap 3 on top of base 2. Cap 3 can rotate with reference to base 2 around axis 4 between an open and closed position. Referring to figure 3, base 2 is screwed onto a container with aid of internal thread 31. The thread 31 is provided at the inner side of the sidewall 210 of base 2. It is therefore necessary for this embodiment that the discharge opening of the container accepting closure 1 is provided with an external thread of the same size. Figures 2a and 2b present the base 2 with cap 3 removed. On top of sidewall 210, the base is provided with an upper face 200. Face 200 is related to the axis of rotation 4, in that axis 4 is essentially perpendicular to face 200.

[0032] Figure 4 presents cap 3 turned upside down. Cap 3 is assembled onto base 2 by pressing circular rib 41 and groove 42 into circular groove 21 and rib 22 respectively. The cap comprises a hollow cylindrical extension 43 which fits liquid-tightly into a cylindrical opening 23 arranged in the base. The cylindrical opening 23 defines a passageway for the fluid out of the container. The engagement of rib 41 into groove 21 and of rib 22 into groove 42 enable a tight fit of cap 3 onto base 2 and make it difficult for e.g. a child to accidentally remove the cap from the base.

[0033] The cylinders 43 and 23 constitute a combination of a valve element and valve seat respectively, arranged concentrically with the main axis 4 around which the cap can rotate. Referring to figure 2b, into cylindrical opening 23 a transverse member 24 is provided, with a number of apertures 25. The transverse member 24 narrows the liquid passageway of cylinder 23 to only the apertures 25. In the present embodiment, the transverse member has four apertures. Cylinder 23 abuts in face 200 and extends at both sides of the transverse member 24 as shown in figure 3, thus defining the liquid passageway out of the container. The lower end of the cylinder 23, proximal to the container, is meant to frictionally hold a dip tube 70 (see figure 3) which leads to the bottom of the container from where liquid is taken. Referring to figure 4, the cylindrical extension 43 abuts in tabs 44 around aperture 45.

[0034] When assembled, tabs 44 slide over transverse member 24. In a closed position, tabs 44 close all apertures 25. No liquid can escape from the container. By rotating cap 3 towards the open position, tabs 44 will free the apertures 25, thereby providing a passage for the liquid out of the container. The apertures 25 should be large enough in size and/or sufficient in number so as to avoid an excessive pressure loss when the liquid flows through apertures 25.

[0035] The reverse arrangement of cylinders 23 and 43 is equally possible. In that case, the base 2 comprises a cylindrical extension with tabs 44 at its end aperture, and the cap 3 comprises a cylindrical opening with a transverse member comprising apertures 25. In the same way as described above, the extension fits in the opening in a liquid-tight way. In this reverse embodiment, the cylindrical opening plays the part of the valve element (i.e. the movable part), which rotates around the cylindrical extension, the latter playing the part of the valve seat (i.e. the non-movable part). In both the embodiment shown in the drawings, and the reverse embodiment described above, the tabs 44 and transverse member 24 with apertures 25 may be interchanged, i.e. tabs 44 may be provided in the cylindrical opening, while the transverse member 24 with apertures 25 is provided at the end of the cylindrical extension.

[0036] The walls of cylinders 23 and 43 constitute a liquid-tight seal so as to avoid liquid leakage. A small internal diameter of cylinder 23 reduces possible deformations and eases the closing off of the liquid passageway. The flow path of the liquid is best seen on figure 5, which depicts a cross-sectional view of closure 1. Cylinder 43 is in fluid communication with passage 51 which provides a lateral discharge aperture 52 for the liquid. Discharge aperture 52 may be shaped in a determined way for accepting a connector plug of an extension hose to which a spray gun is connected at a distal end. It may alternatively be provided with a spray nozzle.

[0037] Cylinders 43 and 23, together with tabs 44 and the intermediate member 24 constitute a valve that opens or closes the liquid passage out of the container. The cylinders 43 and 23 are concentric with the axis of rotation 4 of cap 3. The liquid passageway through the valve is located in a close vicinity around the axis of rotation 4. Therefore, closure of the valve is ensured even when an unauthorized user, such as e.g. a child tries to deform cap 3 by squeezing it or by trying to tear cap 3 off from base 2.

[0038] Referring to figures 2a and 4, the rotation of cap 3 with reference to base 2 is guided by groove 21, rib 22 and cylinder 23. The cap’s angle of rotation is limited by skirt 28 to the arc in between closed position 5 and open position 6 (see fig. 1). This skirt 28 is provided onto face 200. The lateral ends of skirt 28 constitute end travels for the rotation of the body 48 of fluid passage 51.

[0039] In a preferred embodiment, the closure is equipped with a vent 26 (see figure 2b) providing a fluid communication between the internal volume of the container and the ambient air. Vent 26 is provided on face 200. In order to prevent the vent from spilling liquid when the closure is in a closed position, cap 3 is provided with a projection 46 having a bump 47. The projection 46 acts as a valve. Vent 26 accepts bump 47 when cap 3 is rotated in the closed position, thereby sealing the vent. When cap 3 is rotated to the open position, projection 46 travels to depression 27 in face 200 providing a seat for bump 47, thereby leaving vent 26 open. The projection 46 has the shape of an arc. Bump 47 is located substantially in the centre of the arc. Even if cap 3 is not fully rotated to the closed position 5, projection 46 will be on top of vent 26. Hence, vent 26 is closed liquid-tightly by bump 47 in the closed position. In between the closed and open position, the closing of vent 26 by projection...
46 is generally not liquid-tight (i.e. sealing liquids such as water or comparable to water). However, accidental spill of liquid through the vent when e.g. the container is turned over is considerably reduced in the latter case.

[0040] Figures 7 and 8 represent an alternative embodiment for the vent 26 and the skirt 28. In this embodiment, vent 261 is provided in the skirt 28. As can be seen in figure 7a, the vent 261 is an L-shaped tube between face 200 and the outer wall of skirt 28. At the outer wall of skirt 28, vent 261 is closed off by a projection 81 provided in cylinder 80. This cylinder also comprises rib 41 and groove 42. Projection 81 ensures closure of the vent 261 when the closure is in the closed position.

[0041] Referring to figure 7b, skirt 28 abuts in tags 71 and 72 at both ends of the arc. The tags 71 and 72 constitute the end travels for the rotation of the body 48 of fluid passage 51.

[0042] Cap 3 of closure 1 is provided with a child-resistant turning mechanism. Opening of the closure - i.e. turning cap 3 from the closed position to the open position - is made impossible for persons not having enough force or not knowing how to perform the non-obvious combination of actions, which are based on the "squeeze and turn" principle. In the closed position 5, the cap 3 is locked because lip 49 on cap 3 (fig. 4) engages with projection 29 of base 2 (fig. 2b). Hence, the cap can not be rotated in a direction towards the open position 6. In the closed position of cap 3, a rotation lock in the other direction is provided by skirt 28 as explained previously. The child-resistant locking mechanism resembles that of a ratchet mechanism. In order to rotate cap 3 from the closed position 5 to the open position 6, a pressure has to be applied onto cap 3 at the positions indicated by numeral 7 in figure 1. This pressure has to be directed towards the cap centre, such as tending to squeeze the cap in a direction indicated by arrows 8. The squeezing action causes the outer skirt 9 of the cap (see fig. 4) to move outwards in a perpendicular direction with reference to the squeezing direction 8. Lip 49 is located along this direction, at a 90 degree angle from where the squeezing force should be applied. Hence, the squeezing causes lip 49 to move outwards, which releases lip 49 from projection 29. Cap 3 is now enabled to rotate towards position 6. When cap 3 is rotated back from position 6 towards position 5, the lip 49 engages with projection 29 at side 291, which guides lip 49 radially outwards, thereby deforming cap 3 a little. Once lip 49 passes side 292, cap 3 reasumes its undeformed state and the engagement of lip 49 with projection 29 at side 292 ensures a rotation lock in the direction of opening the cap.

[0043] Referring to figures 2b and 4, base 2 may be provided with tabs 203 at the open position and optionally also at the closed position and cap 3 may be provided with flap 401. When turning cap 3, flap 401 engages with tabs 203 so as to produce a click-sound each time the cap has been turned in the open or closed position. Hence, the click-sound draws the user’s attention to the fact that the closure has reached either the open or the closed position. Referring to figure 7b, tab 203 is provided only at the open position. In the closed position, the engagement of lip 49 with projection 29 already serves as an acknowledgement of reaching the closed position of the cap 3.

[0044] At the open position, the engagement of flap 401 with tab 203 has the additional advantage of constituting a certain resistance against an accidental, unwanted rotation of cap 3. For example, supposing that a hose with spray gun is attached to the cap, and the user is in the action of spraying the container’s contents (e.g. insecticide, herbicide, etc.), the engagement of flap 401 with tab 203 reduces the risk that the cap is accidentally rotated a little towards the closed position thereby closing the valve element 44 a little, which would reduce pressure and cause a less optimal flow of liquid out of the container (and in this particular case a less optimal spraying).

[0045] The closure may additionally be equipped with a tamper evidence. In such case, cap 3 is provided with a tag 402, as depicted in figure 4. Tag 402 is connected to cap 3 at both lateral ends 403 and 404 with tooth-shaped links. The tag is removed from cap 3 at first use of closure 1 by tabs 201 and 202 provided on base 2 (see figure 2a). Tabs 201 and 202 engage with the tooth-shaped links 403 and 404 respectively when cap 3 is turned from the closed position 5 towards the open position 6, thereby destroying each link between tag 402 and cap 3. Hence, tag 402 need not be removed manually prior to first usage of the closure 1. Furthermore, the present configuration ensures that tag 402 will be completely removed from the closure at first usage of the closure (i.e. first turning from the closed to the open position).

[0046] Closure 1 is preferably mounted onto the discharge opening of a container in a sealed and non-removable way. This can be performed in a number of ways. According to a first embodiment, the base 2 is provided with internal thread, arranged for being screwed onto the discharge opening of a container, which is provided with external thread of the identical size. Liquid-tight sealing of the base onto the container can be achieved by state-of-the-art methods, such as providing a circular, tapered seal in the base that engages with the discharge opening of the container, such as is usual for sealing bottles with screw caps. In that case, removal of the base may be prevented by a ratchet mechanism such as the one described in document US 2004/0129728.

[0047] The present invention additionally proposes an alternative embodiment and method of sealing the closure 1 onto a container, said seal also preventing removal of the closure from the container. Referring to figure 5, a double-sided induction seal 53 is provided at the bottom of base 2, above the thread 31. This induction seal 53 comprises a metal, electrically conductive (e.g. aluminium) core layer, coated at both sides with a plastic foil (e.g. a PE-foil). When base 2 is screwed onto the container, the seal 53 is pressed between base 2 and the discharge opening of the container. Thereafter, an induc-
tive heating of seal 53 is performed, through which the plastic foils at both sides of the seal 53 melt thereby sealing at the lower face the seal 53 to the container and at the upper face the seal 53 to the base 2. Solidification of the plastic foils ensures a high-resistant fixation of closure base and container, making removal of the closure base from the container impossible. A large contact area between seal and base and between seal and container increases the sealing force.

[0048] Figure 6 depicts the closure base 2 viewed upside down with the induction seal 53 mounted in it. As is clear from figures 5 and 6, a clearance is provided between induction seal 53 and cylinder 23. The clearance ensures a fluid (air) passage between the container's internal volume and vent 26 or vent 261. Furthermore, in order to prevent that vent 26 or vent 261 is closed when the double-sided induction seal is heated, face 200 is provided at a distance from the double-sided induction seal 53.

[0049] An advantage of the closure according to the present invention is that it is leakage-free even when unauthorised persons try to deform the cap. As the valve element 44 of the valve for closing the liquid passageway is located near the axis of rotation of the cap, the valve will not deform when the cap 3 is accidentally squeezed. Therefore, the valve remains liquid-tightly closed when in closed position.

[0050] An alternative embodiment of the valve for closing the liquid passageway is shown in figure 9. Instead of having the liquid passageway 45 through the valve parallel to the axis of rotation 4, the embodiment of figure 9 has a valve with liquid passageway 90 through the valve perpendicular to the axis of rotation 94. In order to see the difference with the embodiments described above, the present embodiment has the valve for closing the liquid passageway located where the liquid passageway 51 of figure 5 is located. Hence, in the present embodiment, cylinder 43 and part of the body 48 are made part of a base 92. Onto base 92 a cap 93 is provided, arranged for rotating around an axis 94. Rotating cap 93 around axis 94 will open or close valve 90. Valve 90 may be advantageously provided as close as possible to the axis of rotation 94. Hence channel 91 may be made as short as possible.

[0051] Leakage through vent 26 or 261 is also unlikely to occur. The valve 46 for vent 26 closes the vent unless the closure is in an open position.

[0052] Alternative embodiments than the ones disclosed above are possible. Particularly, the thread 31 for screwing the base 2 onto a container may be substituted with a skirt comprising one or more grooves and/or ribs. These grooves and/or ribs are intended to mate with ribs and/or grooves provided on the neck of the container. Such a configuration is analogous to the rib/groove combination 21/22-41/42 for snapping the cap 3 onto the closure base 2. Alternatively it may be of the kind as described in patent document US 3874562.

Claims

1. A closure (1) for a container carrying a liquid, said closure comprising a first body (2), a second body (3) mounted onto said first body, a valve comprising a valve seat (23,24) and a valve element (43,44), and an outlet (52), wherein:

   - the first body comprises an upper face (200), a sidewall (210) and means (31) for mounting the first body onto a discharge opening of the container;
   - the first body comprises the valve seat (23,24);
   - the second body comprises the valve element (43,44);
   - the closure comprises means (21,22,41,42) for rotating the second body with reference to the first body between a position in which the valve is open (6) and a position in which the valve is closed (5) and
   - for opening and closing the valve, the second body is arranged to rotate around a main axis (4) essentially perpendicular to said upper face (200).

2. The closure according to claim 1, wherein said valve element and valve seat are arranged so that the passageway (25,45) through said valve is essentially parallel to said main axis (4).

3. The closure according to claim 1, wherein said valve element and valve seat are arranged so that the passageway (90) through said valve is essentially perpendicular to said main axis (94).

4. The closure according to claim 1 or 2, wherein the combination of said valve element (43,44) and valve seat (23,24) comprises a cylindrical extension (43) arranged to liquid-tightly fit inside a cylindrical opening (23) and to rotate with reference to said cylindrical opening.

5. The closure according to claim 4, wherein said cylindrical opening (23) comprises a transverse member (24), narrowing the cylindrical opening and the cylindrical extension (43) comprises at least one tab (44), said tab and member arranged for sliding over each other thereby closing or opening the valve.

6. The closure according to claim 5, wherein the transverse member comprises one or more apertures (25) for said narrowing the cylindrical opening.

7. The closure according to any one of the preceding claims, wherein the first body comprises a vent (26, 261) and the second body comprises a second valve (47, 81) arranged for closing said vent, the vent being closed when the closure is in a closed position and
said vent being open when the closure is in an open position.

8. The closure according to any one of the preceding claims, wherein said means (21,22,41,42) for rotating the second body with reference to the first body comprise a circular rib (22,41) provided on either one of the first and second bodies and a circular groove (21,42) provided on the other of the first and second bodies, the groove accepting said rib and the groove and rib guiding the rotation of the second body.

9. The closure according to any one of the preceding claims, wherein either one of the first and second bodies further comprises an arc-shaped skirt (28) and the other one of the first and second bodies further comprises a bar (48) arranged for engaging with the lateral ends (71,72) of said skirt.

10. The closure according to claim 9, wherein said bar (48) comprises a passageway (51) for the evacuation of liquid from the valve (44) to the outlet of the closure (52).

11. The closure according to any one of the preceding claims, wherein the first body further comprises a projection (29) and the second body comprises a lip (49), whereby the projection is arranged for engaging with the lip when the second body is in the closed position thereby preventing rotation of the second body towards the open position.

12. The closure according to claim 11, wherein the lip is arranged for being disengaged from the projection by application of a squeezing force on the second body at an essentially right angle with reference to the location of said projection and lip.

13. The closure according to any one of the preceding claims, wherein the first body comprises a tab (203) and the second body comprises a flap (401), the flap arranged for engaging with the tab at a position in which the valve is open, the action of said engaging producing a click-sound.

14. The closure according to any one of the preceding claims further comprising a double sided induction seal (53) which comprises an electrically conductive core layer coated at both sides with plastic.

15. A method of sealing a closure permanently onto a container, the method comprising the steps of:

- providing a closure according to any one of the preceding claims 1 to 14;
- providing a seal (53) between said first body and said container,
# DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document with indication, where appropriate, of relevant passages</th>
<th>Relevant to claim</th>
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The present search report has been drawn up for all claims.

Place of search: Munich  
Date of completion of the search: 11 June 2007  
Examiner: Appelt, Lothar
**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- [ ] Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

- [ ] No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

- see sheet B

- [ ] All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

- [ ] As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

- [x] Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

  1-13

- [ ] None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:
The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10
   Construction of the valve(s) in a closure for a container carrying a liquid where one of two closure parts is rotatable to open and close the valve
   ---

2. claims: 1,11-13
   Construction of the child-resistant features in a closure for a container carrying a liquid where one of two closure parts is rotatable to open and close the valve
   ---

3. claims: 1,14,15
   Use of a double sided induction seal between the first body of a closure and a container, the closure being a closure for a container carrying a liquid where one of two closure parts is rotatable to open and close the valve
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on the European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-06-2007

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