



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**05.10.2011 Bulletin 2011/40**

(51) Int Cl.:  
**B65D 47/24 (2006.01)** **B65D 47/20 (2006.01)**  
**B65D 35/50 (2006.01)**

(21) Application number: **10250667.2**

(22) Date of filing: **30.03.2010**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR**  
**HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL**  
**PT RO SE SI SK SM TR**  
Designated Extension States:  
**AL BA ME RS**

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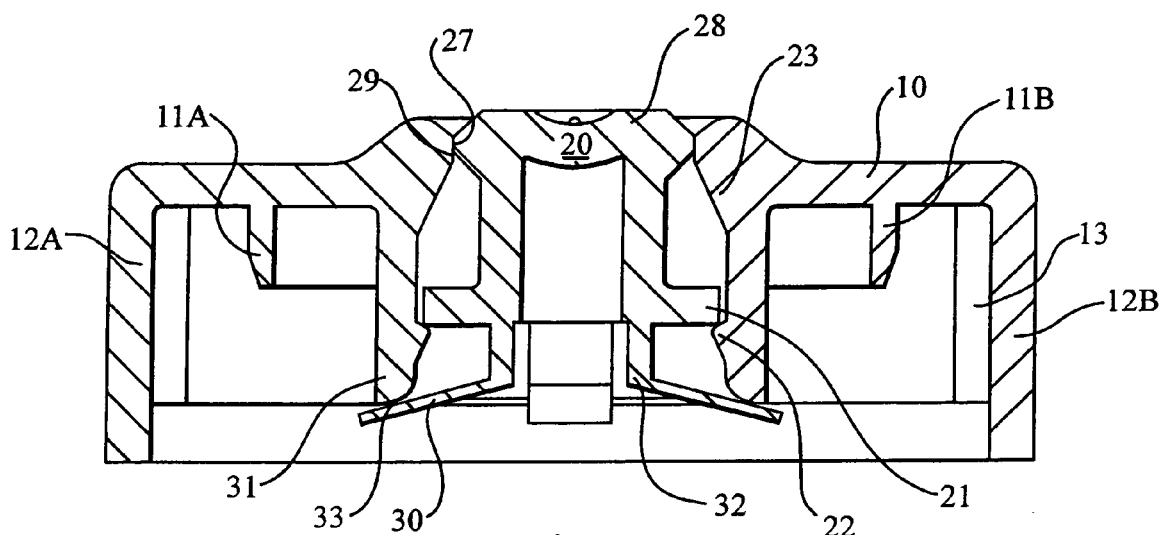
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(54) **A closure means comprising a spring biased valve**

(57) A closure valve for a container, the container having a cap region defining a substantially tubular channel through which contents of a container can exit, the valve having a body portion (20) housed within the channel and moveable between a closed position preventing flow of contents and an open position allowing flow, said movement to the open position being operable by increased internal pressure within a container, the body portion (20) including a head portion (28), sealing the outer aperture of the channel when in the closed

position, a flange (21) located within and spanning the channel excess pressure within the container acting on the flange (21) to move the body portion to an open position, the flange (21) including one or more apertures (26) allowing fluid contents to pass there- through, the closure valve including one or more resilient elements (30) operably connected to the valve body portion (20) and biased to retain the body portion (20) in the channel closing position.



*Fig. 1*

## Description

### Field of the Invention

[0001] The present invention relates to the closure for a container cap. In particular, the cap is suitable for use in a squeezable container such as bottles or tubes which self-seal on release of the pressure applied to squeeze the container.

### Background to the Invention

[0002] An increasing number of products, which previously would have been supplied in glass bottles, is now being supplied in plastic containers. This brings a number of advantages such as ease of manufacture, greater flexibility of container shape, reduced breakability of the container if dropped etc. In addition to this, where the plastics material is deformable, particularly as a result of pressure applied by hand, then the contents of the container can be squeezed out of the container, usually through a directable aperture. This facilitates bringing the contents more accurately to the desired location.

[0003] It is preferable for this latter use that the container material possess a "memory" of the original shape so that when pressure from the hand is released, air pressure is sufficient to push the container back to its original shape. This introduces a restriction on the materials which can be used as those materials having no shape memory are then excluded. Also should the material not recover its shape sufficiently then there is a risk of the aperture being left open and the contents flowing out of the container.

[0004] Known closure assemblies typically comprise three components made of different materials to suit the purpose of the component. As such, recycling of the materials from which the container is constructed is rendered more difficult. This is particularly the case where one of the components, usually a nozzle or aperture is formed of a silicone derivative in order to provide the required flexibility for closure characteristics. Moreover, the requirement for three components increases the number of moulds needed for manufacture and also the assembly time: both of which increase costs.

[0005] It is an objective of the present invention to provide a closure assembly to address the above problems.

### Summary of the Invention

[0006] According to the invention there is provided a closure valve for a container, the container having a cap region defining a substantially tubular channel through which contents of the container can exit, the valve having a body portion housed within the channel and moveable between the closed position preventing flow of contents and an open position allowing flow, said movement to the open position being operable by increased internal pressure within the container,

the body portion including a head portion, sealing the outer aperture of the channel when in the closed position, a flange located within and spanning the channel and orientated perpendicular to the longitudinal axis of the channel, excess pressure within the container acting on the flange to move the body portion to an open position, the flange including one or more apertures allowing fluid contents to pass therethrough, the closure valve including one or more resilient elements operably connected to the valve body portion and biased to retain the body portion in the channel closing position.

[0007] The above valve allows pressure within the container to open a pathway connecting the contents to the outside and allowing the contents of the container to be squeezed out. When pressure is released the valve shuts automatically due to the resilient elements.

[0008] Optionally, the channel includes a stop member to limit the inward travel of the body portion along the channel.

[0009] Conveniently, the body portion is hollow to minimise weight.

[0010] Preferably, the flange is integral with the valve body portion.

[0011] The or each resilient member is preferably integral with the body portion and so configured to undergo tension stress on movement of the body portion to open the valve. Further preferably, the or each resilient member is an elongate element engaging the end wall of the channel. Yet further preferably, the valve has four resilient members evenly spaced around the body portion to give even forces on the body portion.

[0012] The upper exterior facing the surface of the flange is curved or tapered to assist flow of unrequired material back into the container.

### Brief Description of the Drawings

[0013] The invention will now be described with reference to the accompanying drawings which show by way of example only two embodiments of a closure valve assembly. In the drawings:

Figure 1 is a sectional view through a cap including a valve in the closed position;

Figure 2 is a portion of the view of Figure 1 showing a valve in the open position;

Figure 3 is a partial section of a valve body portion;

Figure 4 is a top view of a valve body portion;

Figure 5 is a bottom view of a valve body portion;

Figure 6 is a side view of a second embodiment of a valve body portion.

### Detailed Description of the Invention

**[0014]** The valve as described herein is intended primarily, although not exclusively for use incorporated into a cap fitted onto the main container body of a container. Typically, the cap is of semi-rigid material such as a poly (propylene), poly(ethylene) or mixture thereof. One advantage of the present invention over certain sections of the prior art is the option to form all the elements from the same material thus facilitating recycling.

**[0015]** With the present invention only two mould tools are typically required as opposed to the more usual three of prior art closures, bringing material cost as well as assembly time advantages.

**[0016]** In order to achieve this, means need to be provided to enable the cap and the valve elements to be attached to each other, rather than using a third component to trap these two elements to each other. Moreover, the moveable elements need to move between a product retaining and a product dispensing position whilst remaining in contact with the cap and not becoming dislodged.

**[0017]** The closure assembly as shown in Figure 1 comprises a cap, generally referenced 10, which is attached to the main container body. To assist attachment of the container, sealing elements 11A, 11B are provided on the inside of the cap 10. For example, the sealing elements 11A, 11B can engage the inside of a container wall, the elements 11A, 11B co-operating with the outer walls 12A, 12B of the cap 10 to grip the wall. The outer walls 12A, 12B can be provided with a threaded region at 13 to reinforce the fitment. Alternatively, and without departing from the scope of the invention in any way, attachment means can be in the form of clips, friction fit or combination thereof.

**[0018]** Turning to the valve assembly in more detail, this is essentially in two parts. The first part is a valve housing for the moveable valve elements. The housing defines a channel in which the valve element can move, the walls of the channel being of the same material as that from which the cap is formed.

**[0019]** In order to ensure that the moveable valve element 20 does not fall from the cap, the element 20 includes a flange 21, which has a number of functions. With regard to retaining the valve element 20 in position, the diameter of the housing is narrowed to either side of the region in which the flange 21 is to be allowed to move. At a lower end therefore, a radial lug 22 constricts the diameter of the channel defined by the housing. The valve element 20 is thus prevented from falling into the product in the container.

**[0020]** Towards the mouth of the channel the walls also constrict at 23 to prevent the element from being pushed out of the cap. The flange 21, and therefore the valve element 20 is constrained to travel only within the region defined by the lug 22 and the wall constriction 23. In order to reduce the weight of the valve element 20, the element 20 can be hollow: product optionally being prevented

from entering the hollow 24 by a plug.

**[0021]** To enable the product to exit the container, the flange 21 has slots 26, as shown more clearly in Figures 4 and 5, which slots 26 are so sized to suit the viscosity of the product and the desired rate at which the product is to leave the container. As such although the slots 26 are shown as being four in number, this need not be the case.

**[0022]** When in the closed position, the outer edge 27 the element head 28 sealingly engages the corresponding surface 29 on the housing. As shown in Figures 1 and 2, the edge 27 and the surface 29 are orientated such that their surfaces are parallel to the axis of the channel. The two surfaces can however be orientated at any angle to said axis. Moreover, the conformation of these two surfaces can be other than being flat as long as the two surfaces 27, 29 sealingly co-operate with each other.

**[0023]** In order to provide sufficient force to draw the valve element 20 back into the closed position following product been squeezed out of the container, spring elements 30 extend away from the element 20 and pass under the bottom portion 31 of the housing. The spring 30 has an elbow 32 enabling the spring to pass more easily and engage the lower surface 33 of the channel. As the element 20 moves between the closed and the open configuration, energy is stored within the spring 30 which energy acts as a restoring force biasing the element 20 into the closed position.

**[0024]** The dimensions of the features are selected to enable sufficient product to be dispensed. The following example is with reference to a shower gel, having a viscosity typically higher than water. In general an exit having the equivalent of a circular hole of approximately 5mm diameter is required for such gels. This provides an area of around 19.64mm<sup>2</sup>. In the embodiments therefore shown herein, the diameter of the opening at the head is set to be 8mm and the diameter of the stem 34 of the valve body to be 6mm. This yields, in the open position, an opening of area approximately 22mm<sup>2</sup>. This is slightly greater than required to avoid internal restriction.

**[0025]** In addition, with four slots in the flange each of these is required to have an area of 5mm<sup>2</sup> or a diameter (if circular) of approximately 2.5mm.

**[0026]** In use therefore, the cap including the valve is fitted into a container holding a product such as a lotion, shower gel, tomato ketchup etc. The valve element 20 sealingly engages the housing and the configuration is that shown in Figure 1. When the user wishes to expel product from the container, the user directs the opening in the cap 10 and squeezes the container. The squeezing action increases the pressure within the container, which pressure acts against the lower surface 35 of the flange 21. A proportion of the pressure is released by flow of product through the slots 26, but sufficient pressure remains on the surface 35 to force the valve element 20 out of the housing, in the direction of the axis of the channel. Alignment of the element 20 within the channel is

maintained by the flange 21 and also by engagement of the spring elements with the edge 31 of the channel. The movement of the element 20 to the open position shown in Figure 2 opens a route shown by arrows A, by which product can exit the container. Motion of the element 20 continues until the flange 21 engages the sloping surface 23 of the wall.

**[0027]** As the element 20 moves the springs 30 are bent, their lower ends are constrained by the edge 33. The springs 30 are therefore in tension.

**[0028]** Once sufficient product has been expelled, the user releases the pressure on the container and the force on the flange 21 and that pressure therefore ceases. The tension in the springs 30 can then be released which acts to draw the element 20 back into the channel of the housing and the surfaces 27, 29 to once again sealingly engage.

**[0029]** In designing the flange, the area presented by the flange to the interior of the container needs to be kept at the correct area to ensure that the induced pressure exerts sufficient force thereon. As such therefore the shape of the slots can be as desired, such as round, oval or angular.

**[0030]** The shape of the springs is selected to give the appropriate restoring force on the element 20. An alternative embodiment of a spring is shown in Figure 6 in which the profile of the spring element 61 depending from the valve element 60 is a smooth curve. Such a profile can impart a longer life to the spring element 61 compared to that in the first embodiment as the discontinuity of the elbow 32 of the spring element 30 can be a source of weakness.

**[0031]** A number of further features can be included without departure from the scope of the invention. Firstly, with regard to the spring elements, these serve the main purposes of providing a restoring force on the valve element, to bring it to the closed position following dispensation of the product from the container. The number of springs included is selected depending on the force required and said number will therefore depend on the resilience of the material from which a spring is made and its thickness.

**[0032]** Alternatively, a spring can be located in the non-moving portion of the cap to engage the moveable valve element. As the valve element moves to an open position, the restoring force acting on the valve element from a spring element increases in the same manner as for the embodiment described above in relation to figures.

**[0033]** Further alternatively it will be recognised that springs acting under compression to restore the valve element to the close position can be used, although there is a greater tendency for said compressive springs to suffer a stress weakness with prolonged use.

## Claims

1. A closure valve for a container, the container having

a cap region defining a substantially tubular channel through which contents of a container can exit, the valve having a body portion (20) housed within the channel and moveable between a closed position preventing flow of contents and an open position allowing flow,

said movement to the open position being operable by increased internal pressure within a container, the body portion (20) including a head portion (28), sealing the outer aperture of the channel when in the closed position,

a flange (21) located within and spanning the channel, excess pressure within the container acting on the flange (21) to move the body portion to an open position,

the flange (21) including one or more apertures (26) allowing fluid contents to pass there- through, the closure valve including one or more resilient elements (30) operably connected to the valve body portion (20) and biased to retain the body portion (20) in the channel closing position.

2. A closure valve according to Claim 1, wherein the channel includes a stop member (22) to limit the extent of inward movement into a container of the body portion (20) along the channel.

3. A valve according to Claim 1 or Claim 2, wherein the channel narrows (23) to engage the flange (21) and prevent exit of the body portion from the channel.

4. A closure valve according to any of Claims 1-3, wherein the body portion (20) is hollow.

5. A closure valve according to any preceding claim, wherein the flange (21) is integral with the body portion.

6. A closure valve according to any preceding claim, wherein the or each resilient element (30) is integral with the body portion (20) and so configured to undergo tension stress on movement of the body portion to open the valve.

7. A closure valve according to any preceding claim, wherein the or each resilient member is an elongate element engaging the end wall of the channel.

8. A closure valve according to Claim 7, wherein the valve has four resilient members (30) evenly spaced around the body portion.

9. A valve according to Claims 6-8, wherein the or each resilient member (30) has an arcuate configuration.

10. A closure valve according to any preceding claim, wherein the upper exterior-facing the surface of the flange is curved or tapered to assist flow of unre-

quired material back into the container.

11. A closure valve according to any preceding claim, wherein the flange is orientated perpendicularly to the longitudinal axis of the channel.

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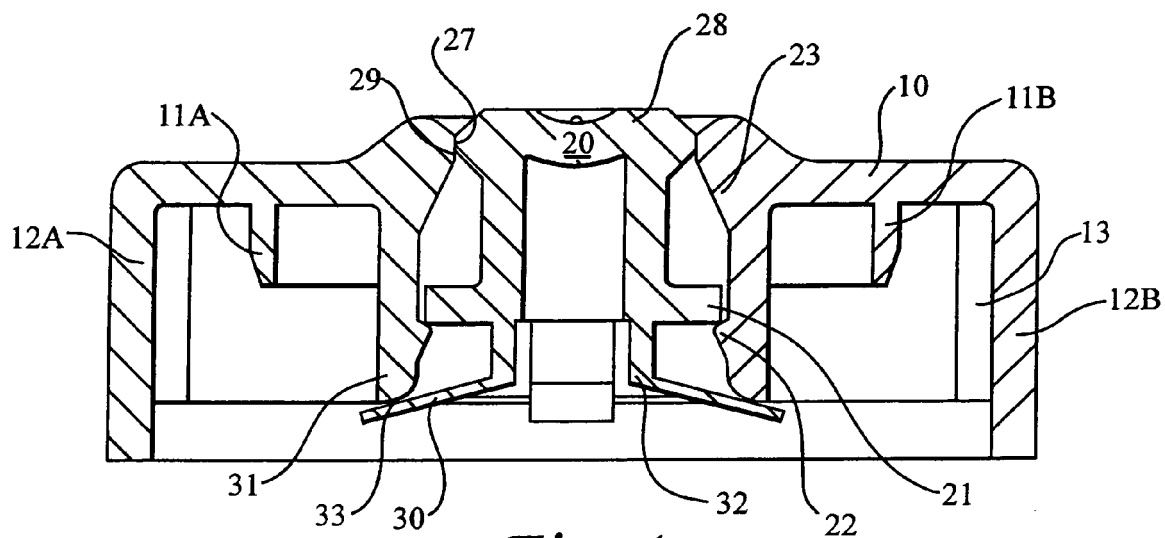
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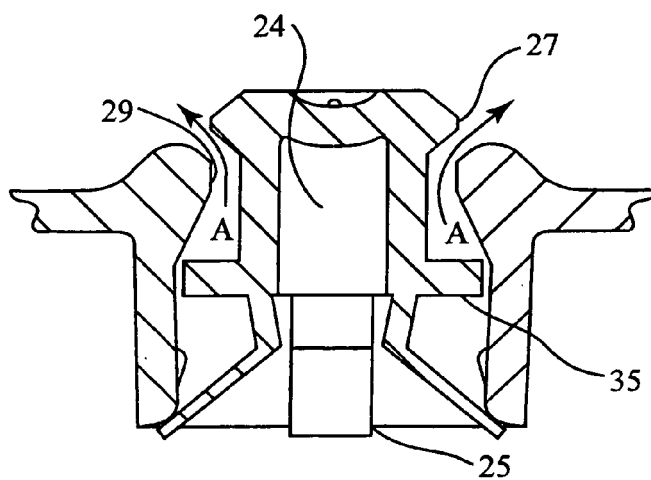
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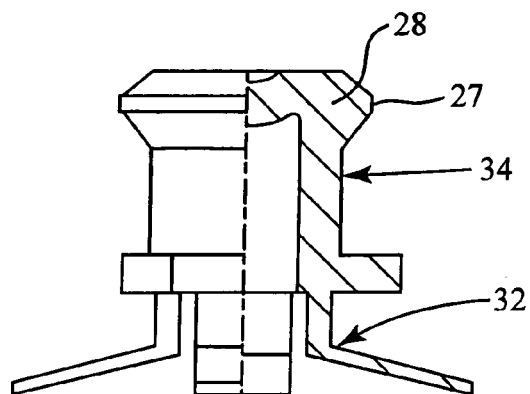
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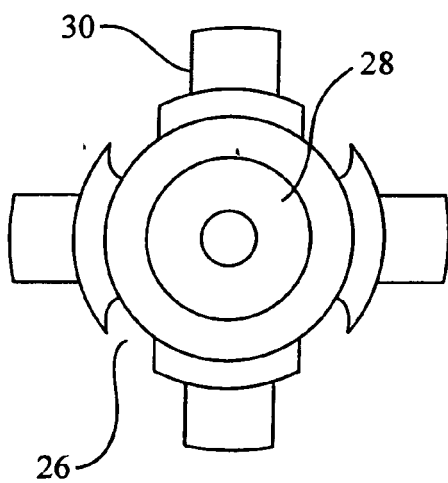
*Fig. 1*



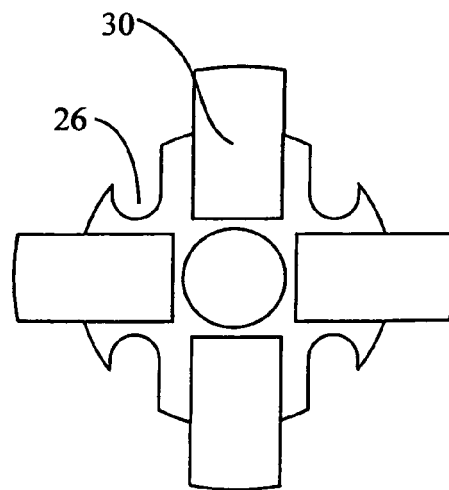
*Fig. 2*



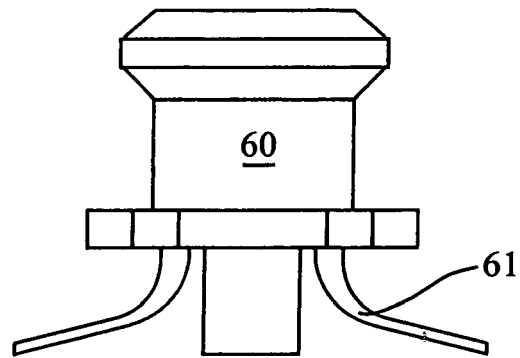
*Fig. 3*



*Fig. 4*



*Fig. 5*



*Fig. 6*



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Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                    |                                                                                                                                                                                                                                                                                       |                                             |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                    |                                                                                                                                                                                                                                                                                       |                                             |
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