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(54) Upright liquid containing system with self seal valve.

(57) The invention relates to a container system (1) for a liquid which has a viscosity below 1000 mPas. The container system (1) comprises a discharge (13) which is sealed by a retractive self seal valve (3). In particular, the invention relates to a standing plastic bottle for dishwashing liquids having a retractive self sealing valve (3) over its discharge orifice (13). When squeezing the bottle to discharge liquid the retractive self sealing valve (3) pops out first before a slit (25) in the top portion (4) of the self sealing valve (3) opens to squirt out liquid. Upon releasing pressure from the bottle the slit (25) closes and the valve (3) retracts. This provides improved separation between the liquid and the bottle cap such that a less messy discharging operation is achieved.

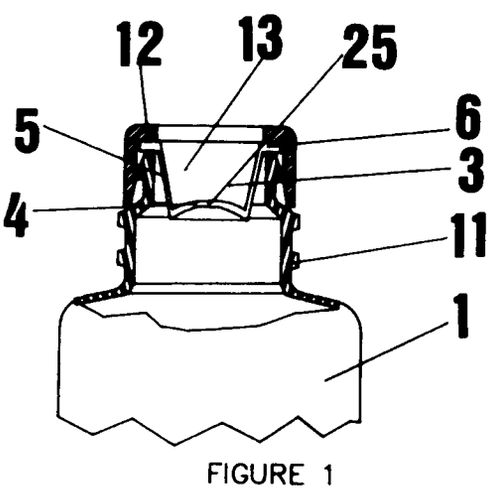

FIGURE 1

EP 0 586 778 A1

Field of the Invention

The invention relates to a container system for a liquid which has a viscosity below 1000 mPas. The container system comprises a discharge orifice which is sealed by a retractive self seal valve. In particular, the invention relates to a standing plastic bottle for dishwashing liquids having a retractive self sealing valve over its discharge orifice. When squeezing the bottle to discharge liquid the retractive self sealing valve pops out first before a slit in the top portion of the self sealing valve opens to squirt out liquid. Upon releasing pressure from the bottle the slit closes and the valve retracts. This provides improved separation between the liquid and the bottle cap such that a less messy discharging operation is achieved.

Background of the Invention

Self sealing and retractive self sealing valves are known in the art, for example, EP-A-395 380 discloses slit seal valves made of silicone rubber which are said to be useful in the context of pastes, shampoos or conditioners and especially for upside down positioned squeezable containers. This disclosure further shows retractive self seal valves for product shipment. Upon opening of a storage-screw-on-cap the self-seal valve held in position by the screw-on-cap pops out of the bottle. The liquids referred to in this disclosure have usually viscosities as low as 1200 mPas.

EP-A-419 420 discloses flexible squirt out bottles for flammable liquids having self seal valves. The self sealing function of the valves provide the benefit of preventing a backdraft of flames if the flammable liquid is squirted into open fire. This disclosure discusses low viscosity liquids like ethanol having a viscosity of 1.4 mPas, but also refers to thickened liquids in the range between 200 and 1000 mPas. This reference, however, does not disclose self seal valves having a retractive action.

EP-A-160 336 and EP-A-278 125 disclose non-retractive self seal valves for containers which are designed to be used in an upside down position. The desired benefit is drip-free self sealing of the containers in the upside down position. Liquids mentioned to be stored in these containers are high viscosity liquids like shampoos, conditioners, soaps or detergents.

The containers having self seal valves available or disclosed in the prior art appear not to satisfy the desires of the present invention. Liquids below 1000 mPas are too runny to be stored in available self seal valve containers designed for an upside down position. Furthermore, users of liquid products having a viscosity below 1000 mPas are used to upright squeezable containers and would need to change their habits substantially when supplied with the upside down positioned containers available. However, self seal valves have not been considered to close containers in an upright position, since the containing liquids, provided they are not dangerous when evaporating, do not require drip out or other confinement means.They are safely stored in the container and cannot leak out through the container discharge orifice even if it is open.

It has now been found that liquids having a viscosity below 1000 mPas like for example a dishwashing liquid, when being squirted out through a discharge orifice, tend to leave a small amount of liquid at the orifice. After several discharges they create a messy appearance of the vicinity of the discharge orifice. This is particularly undesirable for bottles in an upright position where drops of liquid remaining at the discharge orifice can run down the container side walls. Upon the following use the user would necessarily have to clean the bottle or accept to touch the soiled side wall.

It is therefore an objective of the present invention to provide a container system for liquids having a viscosity below 1000 mPas with reduced or eliminated messiness. It is another objective of the present invention to provide container systems that allow more accurate dosing and better directed squirting of the liquid.

A further objective of the present invention is to provide a container system which confines the liquid inside the container even when the container without a protective cap is accidentally tipped over and lies on its side.

An additional objective of the present invention is to provide container systems which are better accepted for domestic refilling due to the durability and cleanliness of the container system.

These and other objectives are satisfied by the present invention as will become apparent from the detailed description of the invention and the accompanying drawings.

Description of the invention

The container system according to the present invention comprises a container which is typically a plastic bottle containing a liquid. The liquid has a viscosity of less than 1000 mPas, preferably a viscosity from 20 to 800 mPas and most preferably from 200 to 500 mPas. The liquid can be any liquid of this viscosity range for which storage in and dispensing from this container system is desirable. In particular dishwashing liquids or household cleaners are beneficially contained in the container system of the present invention.

The container system of the present invention further comprises a sealing valve covering the discharge orifice of the container. The sealing valve according to the present invention is a retractive self sealing valve having a flexible top portion and a flexible flange portion from which the flexible top portion is suspended. The sealing valve has a storage and a discharge position. In the storage position the container system is relaxed and the retractive self sealing valve is not popped out. The discharge position is assumed by increasing internal pressure in the container and thereby evaginating the top portion of the retractive self sealing valve by deformation of the flange portion of the self sealing valve. The discharge position is reached when the pressure inside the container reaches or exceeds an evagination pressure.

When the sealing valve is in the discharge position the discharge of liquid from the container is achieved by further increasing the internal pressure beyond a discharge pressure, which is larger than the evagination pressure, and thereby forcing a slit in the top portion of the retractive self sealing valve to open. The self sealing is provided by material resiliency of the top portion of the sealing valve by forcing the slit in the top portion to return to its closed position upon releasing the pressure inside the container below the discharge pressure. In order to provide improved self sealing the top portion of the self sealing valve can have a concave aperture towards the inside of the container. Preferably the self sealing valve of the container system also allows venting of the container when the pressure inside the container is released and the container retracts from the deformation caused by the squeezing.

The retractive self sealing valve can be made of a variety of elastic materials such as various natural rubbers, elastic polymers, silicone rubber, polyvinyl clorid, polyurethan, ethylene vinyl acetate or styrene-butadien copolymers, but preferably it is made of silicone rubber which is well known in the art. Likewise the container can be made of a variety of materials which provide the container with the ability to deform when being squeezed such as plastic materials. In particular polyethylene, polypropylene, polyester, polyethyleneterephtalate or mixtures thereof are preferred container materials.

A preferred embodiment of the container system of the present invention is a plastic bottle with dishwashing liquid in it which is stored in an upright position and has a discharge orifice covered by a retractive silicone self seal valve. It is further preferred if such an embodiment has a protective cap which is covering the discharge orifice and provides protection against involuntary discharge during transport from said orifice. For transport discharge protection the protective cap preferably should be liquid tight for its contents but allow pressure compensation across the self seal valve in order to maintain the container in its normal shape. The protective cap may be screwed-on or clipped-on to the container system.

The container systems as described in the present invention fulfill the desired objectives while allowing the benefit of reusability for the container system especially well when the retractive self seal valve is part of a replaceable, preferably screw-on, transition member, preferably forming a liquid and gas tight seal to the container. This allows to open the container system of the present invention for easy refilling while providing a container system of no or reduced messiness which otherwise would diminish the reusability by initiating a soiling round the orifice of the container. The transition member can also be joined to the container by clipping it on. The transition member has the seal valve in a fixed position or replacably inserted. When replacably inserted the peripheral edge of the seal valve can also serve to seal the transition member to the container.

Brief description of the drawings

While the specification concludes with claims particularly pointing out and distinctly claiming the present invention it is believed the present invention would be better understood from the following description in conjunction with the accompanying drawings in which :

Figure 1 shows a partial cross section of a container system embodiment of the present invention having a sealing valve in the relaxed state.

Figure 2 shows the same partial cross section of a container system as Figure 1 at a pressure in the container between the evagination and the discharge pressure.

Figure 3 shows the same partial cross section of a container system as Figure 1 or 2 at a pressure in the container above the discharge pressure.

Figure 4 a-e show an embodiment of the present invention during discharge of liquid.

Detailed description of the invention

Figure 1 shows the upper part of a flexible container (1) such as a blow moulded plastic bottle comprised of any of the several materials providing the squeezability necessary for the present invention and in particular plastic material, preferably polyethylene, polypropylene, polyester, polyethyleneterephtalate or mixtures thereof. The particular material for construction of the container (1) chosen for any given application will in general

be determined by factors such as product compatibility, cost, permeability, flexibility and the like. For flexible containers the critical parameter is that the squeezable container (1) exhibits a flexibility sufficient to permit manual deformation of the container to extrude product through a sealing valve (3) and a sufficiently strong resiliency to return to its undeformed condition when external forces are removed.

Figure 1 further shows the discharge orifice (13) at the end of the neck (11) of container (1) and the sealing valve (3) covering the discharge orifice (13) in its relaxed position. The retractive self sealing valve (3) comprises a flexible top portion (4) and a flexible flange portion (5). As shown in Figure 1 the flexible flange portion (5) suspends the top portion (4) in a storage position while the internal pressure of the container (1) remains below an evagination pressure.

The self sealing value (3) is joined to the neck (11) of the container (1) by a clip-on collar (12). In this way the collar (12) together with the sealing flange (6) of the self seal value (3) form a liquid tight seal around the orifice (13) of the container (1). Other ways to join the self seal valve (3) to the container (1) may be by use of a srew-on collar, by welding or glueing along the sealing flange (6) of the self seal valve (3). Also the self seal valve (3) can be joined to a transition piece which is replacably joined to the neck (11) of the container (1) to facilitate easy refilling of the container (1).

The top portion (4) of the sealing valve (3) typically has a concave curvature towards the inside of the container (1). In less preferred embodiments of the present invention the top portion (4) can also have a flat or convex curvature.

The retractive self sealing valve can be made of a variety of materials in particular elastic materials like natural rubber elastic polymer, silicone rubber, polyvinyl clorid, polyurethan, ethylene vinyl acetat or styrene-butadien copolymers. Preferably it is made of silicone rubber. Good examples of self seal valves and their functional principles are disclosed in EP-A-395380 by Liquid Moulding Systems Inc. and EP-A- 160 336 by Procter & Gamble. Self sealing valves also of the retractive kind according to the present invention are available from Liquid Moulding Systems Inc., Midland, Michigan, USA.

The self sealing valve (3) may be protected during transport of the container system by a protective cap which is not shown in the Figures. The protective cap is placed over the self seal value (3). It can be joined to the container system by screwing or clipping it on to the neck (11). Preferred protective caps are shown in European Application 92870027.7 which allow venting of the container system during transport.

Figure 2 shows the same container as Figure 1 however under an internal pressure which is equal to or higher than the evagination pressure. At this pressure level the retractive self seal valve has popped out of the container and extends a distance, which is defined by the form of the flange portion (5), away from the container orifice (13). It is apparent that in order to move the top portion from its storage position as shown in Figure 1 to its discharge position as shown in Figure 2 a respective amount of deformation to the container 1 is required.

In Figure 3 the same embodiment of the container system of the present invention as in Figures 1 or 2 is shown but in its discharge position while the slit (25) in the top portion (4) is open for discharge of liquid. The slit (25) can be formed in a variety of ways like for example a single straight slit, a multitude of parallel slits or a slit in the form of a cross of perpendicular lines or several lines not perpendicular to each other. The top portion (4) of the sealing valve (3) has a material resiliency such that it opens only when the pressure on the inside of the container (1) is equal to or exceeds a critical pressure called discharge pressure. For the retractive self sealing valve (3) to be useful in the context of the present invention the discharge pressure must be higher than the evagination pressure.

The particular design of the retractive self sealing valve (3) of the present invention depends on the material characteristics of the valve material. In particular when using the same material for all parts of the sealing valve preferably silicone rubber, the flange portion (5) of the sealing valve (3) should be thinner than the top portion (4) which comprises the slit (25). The material wall thickness as well as other desired characteristics of the retractive self seal valve can be determined by those skilled in the art in simple trials.

Figure 4 a through e shows the retractive self seal valve in a sequence of its discharge operation. In particular it can be seen that upon reclosure of the slit (25) in the top portion (4) of the sealing valve (3) the separation between the container system and the discharged liquid is improved versus prior art systems by the combination of two movements in opposite directions, namely the squirting direction of the discharged liquid and the retracting direction of the sealing valve top portion.

The container system according to the present invention contains a liquid having a viscosity of less than 1000 mPas, preferably from 20 to 800 mPas, most preferably from 200 to 500 mPas. These viscosities are considered low relative to the prior art disclosures of liquids in connection with self sealing valves. In particular surfactant containing liquids and most preferably dishwashing liquids or household cleaners are beneficially contained in

the container system of the present invention. A typical dishwashing liquid, which was used in the following examples, is an aqueous solution comprising 10-90 percent of a surfactant, like for example amphoteric, nonionic or anionic surfactants, such as linear alkyl benzene sulphonate, optionally a builder and minor ingredients like suds control agent, perfume, dye, enzymes, viscosity control agents, other physical stabilizers and chemical stabilizers. Household cleaners of the present invention may further comprise a certain amount of abrasive particles. A good example of a dishwashing liquid according to the invention is Fairy Liquid (TM) or Fairy Excel (TM) by Procter & Gamble Co., Cincinnati.

EXAMPLES

A side by side test to verify the beneficial performance of the present invention was conducted using a squeezable 1000 ml circular polyethylene bottle. The bottle contained a commercially available dishwashing liquid having a viscosity of 330 ± 40 mPas at 21 °C.

The test was conducted having one bottle with a retractive self sealing valve according to the present invention and shown in Figure 1 versus a prior art open dispensing orifice comprising no self sealing valve. The self sealing valve was obtained from Liquid Molding Systems, Inc., Middland, Michigan , U.S.A., listed as type R13S/30/220. The retractive self sealing valve had a wall thickness of the flexible flange portion of 0.38 mm and a top portion thickness of 0.76 mm. The evagination pressure was 3738 Pa and the discharge pressure was 6229 Pa. The retractive self seal valve had a cross-type slit in the top portion having a slit length of 5.6 mm each and the material of the valve was silicone rubber.

The test procedure called for 50 alternating squeezes on each dishwashing bottle discharging the same amount each time. The bottle was taken from an upright standing position and moved into a downwardly directed position such that the discharge direction formed approximately a 30-60 ° angle versus horizontal. After 50 discharges each bottle was visually inspected for messiness.

The prior art container system showed severe drip building around the discharge orifice including drops running down the side wall of the dishwashing bottle. No visible drop building around the cross slit of the retractive self seal valve was detected. Therefore the present invention provides a substantially improved container system according to the objectives of the present invention.

Claims

1. A liquid containing container system comprising
   - a container (1) being squeezable to build an internal pressure and containing a liquid having a viscosity of less than 1000 mPas and said container (1) having a discharge orifice (13);
   - a sealing valve (3) covering said discharge orifice (13); said sealing valve (3) having a flexible top portion (4) and a flexible flange portion (5);
     said flange portion (5) maintaining said top portion (4) in a storage position at an internal pressure of said container (1) below an evagination pressure and said flange portion (5) moving said top portion (4) into a discharge - position if said internal pressure of said container (1) reaches or exceeds said evagination pressure;
     said top portion (4) having a slit (25) through said top portion (4) to allow discharge of said liquid out of said container (1), said slit (25) being openable when said internal pressure of said container (1) reaches or exceeds a discharge pressure;
     said discharge pressure being larger than said evagination pressure.

2. A container system according to claim 1 characterized in that said liquid has a viscosity from 20 to 800 mPas, preferably from 200 to 500 mPas.

3. A container system according to any of the preceding claims characterized in that said liquid is a dishwashing liquid or a household cleaner.

4. A container system according to any of the preceding claims characterized in that said container (1) has a storage position, said storage position being upright with said sealing valve (3) at the top of said container (1).

5. A container system according to any of the preceding claims characterized in that said container system further comprises a protective cap, said protective cap being disposed over said discharge orifice (13), preferably screwed or clipped to said container, and providing a liquid tight discharge protection of said discharge orifice (13) during transport.

6. A container system according to any of the preceding claims characterized in that said top portion (4) has a concave curvature towards the inside of said container (1).

7. A container system according to any of the preceding claims characterized in that said sealing valve (3) is comprised in a transition member, said transition member being replacable, preferably screwable, over said discharge orifice (13).

8. A container system according to any of the preceding claims characterized in that said sealing valve (3) allows venting of said container (1) under the pressure occurring when said container (1) retracts from the deformation caused by squeezing said container (1) during discharge.

9. A container system according to any of the preceding claims characterized in that said sealing valve (3) is made of natural rubber or an elastic polymer, preferably silicone rubber.

10. A container system according to any of the preceding claims characterized in that said container (1) is made of a plastic material, preferably polyethylene, polypropylene, polyester, polyethylene therepthalat or mixtures thereof.

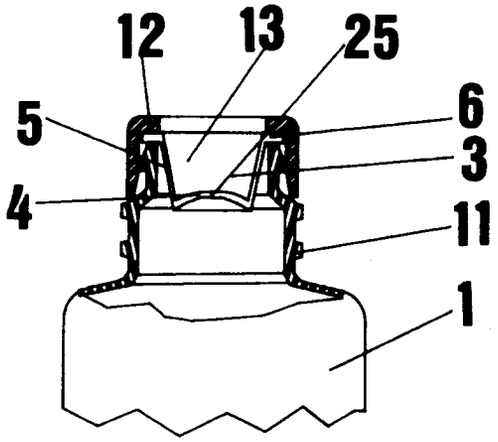

FIGURE 1

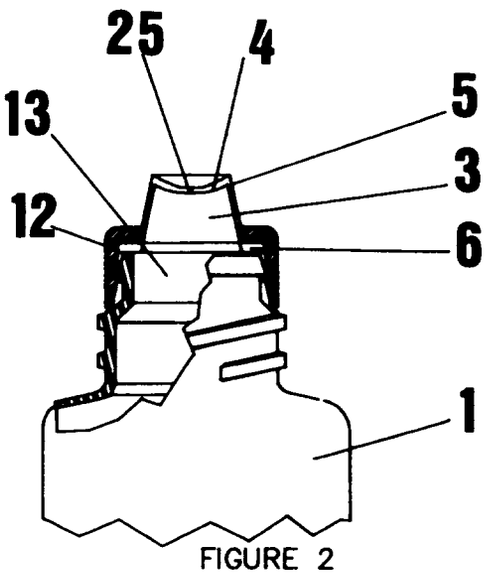

FIGURE 2

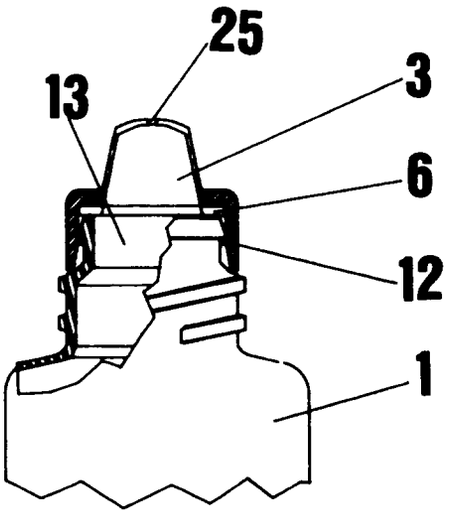

FIGURE 3

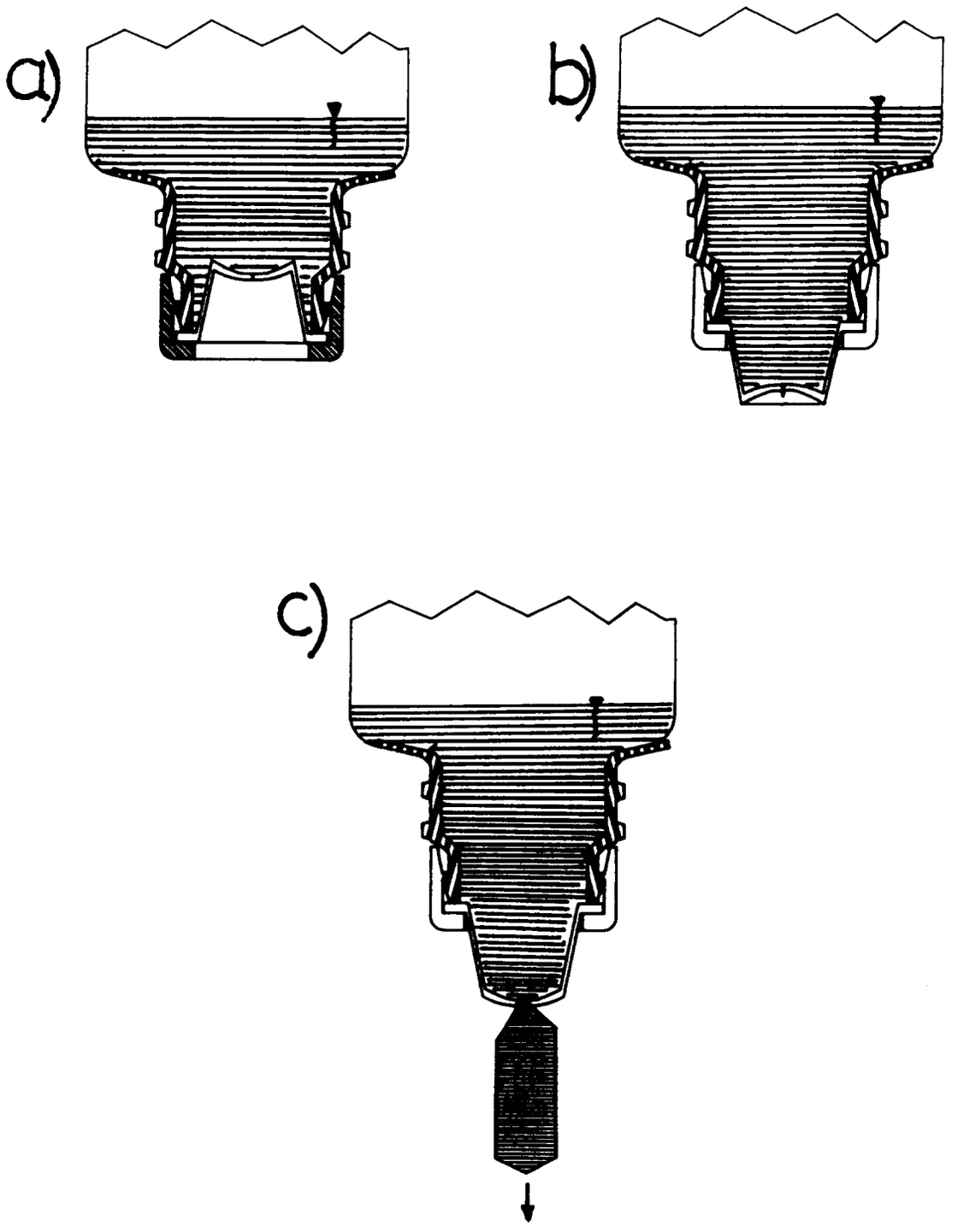

Figure 4 a) - c)

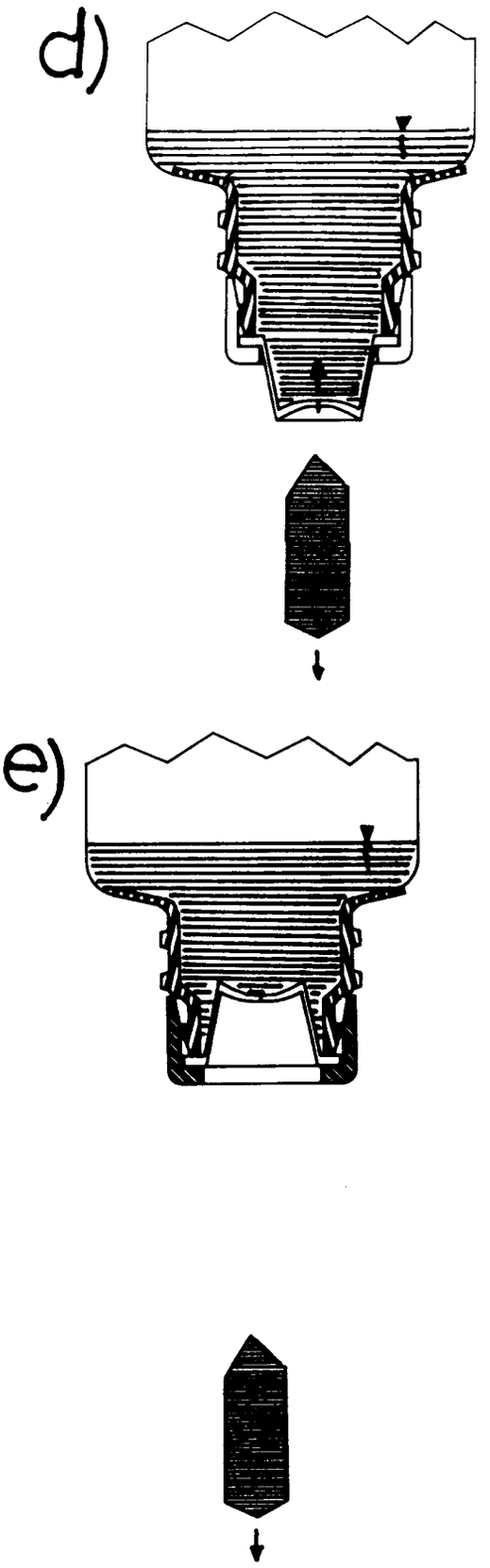

Figure 4 continued d) - e)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 87 0144

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-2 758 755 (SCHAFLER) * the whole document * ---	1,4	B65D47/20 B65D47/06
A	US-A-2 175 052 (BULL ET AL.) * page 1, right column, line 12 - page 2, left column, line 33; figures * -----	1,4,9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 APRIL 1993	GINO C.P.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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