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(72) Inventor: **Etesse, Patrick Jean-François**
1040 Etterbeek (BE)

(74) Representative: **Mather, Peter Geoffrey et al**
Procter & Gamble Services Company NV,
100 Temselaan
1853 Strombeek-Bever (BE)

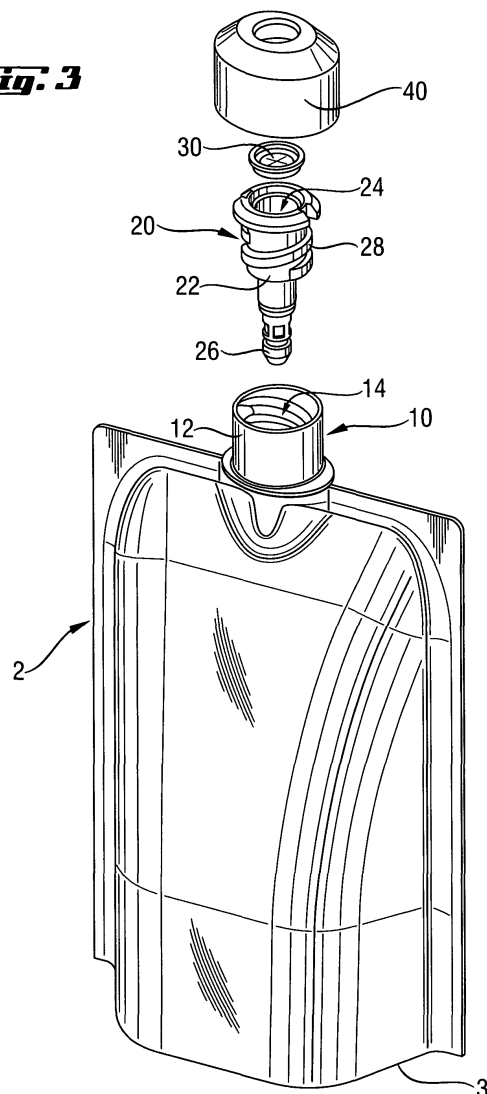
(71) Applicant: **THE PROCTER & GAMBLE COMPANY**
Cincinnati, Ohio 45202 (US)

(54) **Flexible container containing a liquid product, and a process for making a liquid-filled, flexible container**

(57) The present invention relates to a flexible container containing a liquid product, wherein the flexible container (2) comprises a closure having an inner end and an outer end, the closure being fixed through the wall of the flexible container (2) such that the inner end of the closure lies within the flexible container (2) and is in contact with the liquid product, and the outer end of the closure lies outside of the flexible container, wherein the closure has an open position and a closed position, and wherein the outer end of the closure is connected to a self-sealing valve (30) which opens when the closure is in the open position and when pressure is applied to the liquid product within the flexible container, and which closes when the pressure is released.

In another aspect the invention relates to a process of making a liquid-filled, flexible container.

Fig. 3



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Description

[0001] The present invention relates to a flexible container containing a liquid product, and to a process for making a liquid-filled, flexible container. The flexible container may be, for example, a pouch or bag, and it is preferably made from a plastic film.

[0002] Flexible pouches which comprise some sort of spout are useful as packaging for various sorts of products including drinks. In practice the spout may be closed by means of a screw cap, or a flip-top cap.

[0003] US 5,307,955, issued on May 3rd 1994, discloses a lightweight bottom delivery package for fluid products which incorporates a closure comprising a self-sealing valve and a flip-top cap.

[0004] However such a package may leak during packing or transport if too much pressure is applied to the bag which causes the self-sealing valve to open, and is sufficient to displace the flip-top cap.

[0005] Closures have been devised which resist externally applied pressure unless the closure is first manually opened by the user. US 4,445,551, issued on May 1st 1984, discloses a quick-disconnect coupling and valve assembly which consists of a single-service coupling and valve assembly and a connector for cooperating therewith.

[0006] However, it would be useful to provide a lightweight, flexible container, which resists leaking during packing and transportation, and which can be opened and reclosed so that it is suitable for multiple doses. Examples of products which are usually sold in packages containing multiple doses include, but are not limited to: dish washing liquids, fabric softeners, laundry cleaning liquids, shampoo, skin lotions, foodstuffs, and the like.

[0007] The flexible container according to the present invention contains a liquid product, wherein the flexible container comprises a closure having an inner end and an outer end, the closure being fixed through the wall of the flexible container such that the inner end of the closure lies within the flexible container and is in contact with the liquid product, and the outer end of the closure lies outside of the flexible container, wherein the closure has an open position and a closed position, and wherein the outer end of the closure is connected to a valve.

Summary of the Invention

[0008] According to the present invention the valve is a self-sealing valve which opens when the closure is in the open position and when pressure is applied to the liquid product within the flexible container, and which closes when the pressure is released.

[0009] The present invention further relates to a process for making such a flexible container.

Brief Description of Drawings

[0010]

Figure 1a shows cross-section, A-A, of a flexible container with a closure according to the present invention. The closure is shown in the open position. Figure 1b shows a top view of the flexible container and closure.

Figure 2a shows cross-section, A-A, of a flexible container with a closure according to the present invention. The closure is shown in the open position.

Figure 3 shows an assembly view of a flexible container and closure according to the present invention in perspective.

Figure 4 shows a perspective view of the liquid-filled, flexible container of the present invention.

Detailed Description of the Invention

[0011] In its simplest embodiment, the closure of the present invention may consist of two concentric cylinders: an outer female cylinder and an inner male cylinder. The inner male cylinder has a blind end, and has at least one hole in the curved cylinder wall. When the outer cylinder of this closure is fixed through the wall of a liquid-filled container, there is no passage for the liquid to pass through the closure as long as the inner cylinder is completely enclosed within the outer cylinder. However when the inner cylinder is displaced axially relative to the outer cylinder, towards the liquid-filled container, the hole in the inner cylinder wall becomes exposed, and liquid may pass through the hole and out of the closure by passing along the inner cylinder. Displacing the inner cylinder back to its original position closes the dispensing hole and prevents further liquid from leaving the container.

[0012] In an alternative embodiment, a closure as described in WO99/05446, published on February 4th 1999, may be used. In this embodiment the female part has an axial bore and a plug which closes off the bore. A cooperating male part is provided, and the plug and the male part are provided with cooperating connection devices which connect the plug with the male part when the male part is inserted into the bore and which maintain this connection when the male part is inserted further into the bore. The plug is provided with at least one hooking part which keeps the plug in the bore until the plug and the male part are connected to each other while the male part is inserted into the bore.

[0013] The male and female parts of the connecting device may cooperate by means of a simple push-pull action, or these two components may be connected by means of a screw thread. These variations are illustrated in Figures 2 and 4 of WO00/66448, published on November 9th 2000.

[0014] According to the present invention, the connecting device further comprises a self-sealing valve. A self-sealing valve is typically made from an elastomeric material such as silicone or thermoplastic elastomer (TPE).

The valve has one or more slits cut through the elastomeric material. For example, the valve may have two mutually orthogonal slits. The rate at which liquid product is dispensed under pressure from the container may be controlled by selecting the size and configuration of the slits in the self-sealing valve.

[0015] Self-sealing valves are commercially available, one example of such valves is sold under the Trade Name SimpliSqueeze, supplied by Seaquist Closures, of Mukwonago, Wisconsin, US.

[0016] By "flexible" it is meant herein that the container may be flexibly deformed, but that it is not resilient in the sense that it recovers its original shape when the deforming pressure is removed. Preferably flexible containers of the present invention are formed from plastic film or films which are sealed together at the edge in order to form a closed container. The container is provided with an opening which is sealed around the closure. Most preferably the plastic film is made from polyethylene, polypropylene, polyester or laminate thereof and has a thickness of from 50 to 250 micrometers.

[0017] The liquid which fills the liquid container may be of any type of liquid, including relatively viscous gels and pastes. The only limitation upon viscosity is that it should be possible to dispense the liquid under pressure through the self-sealing valve. Typical examples of suitable liquid products include detergent products, for example dish washing detergent liquid, and fabric treatment products, for example fabric softening liquid compositions.

[0018] Figure 1 illustrates a closure comprising a female part (10) which comprises a collar (12) which is secured within the opening of the flexible container (2). The female part (10) further comprises an axial bore (14) and a plug (16). The plug (16) is provided with at least one hooking part (18) which enables the plug (16) to be removably sealed within the axial bore (14).

[0019] The male part (20) comprises a cylindrical section (22) which fits within the axial bore (14) of the female part (10) and which can be moved axially therein. The end (26) of the cylindrical section (22) removably engages with the plug (16). The male part (20) and the female part (10) are mutually interconnected by means of a screw thread (28) so that the male part (20) moves axially within the bore (14) of the female part (10) when the screw thread (28) is engaged, thereby releasing the plug (16) from the bore (14), and moves axially in the opposite direction when the screw thread (28) is disengaged thereby closing bore (14) with the plug (16). The open position is illustrated by Figure 1; the closed position is illustrated by Figure 2.

[0020] The male part (20) comprises an axial bore (24). The axial bore (24) houses a self-sealing valve (30).

[0021] A cap (40) covers the closure assembly. The cap (40) may be clipped onto the male part (20) to facilitate the opening and closing of the closure.

[0022] The resulting assembly provides a one-way valve closure wherein the self-sealing valve (30) does

not permit air to be vented back into the flexible container (2). Furthermore the closure has a closed position (Figure 2) which is the position in which the plug (16) is engaged within the bore (14). In the closed position no liquid can be dispensed from the flexible container (2). The closed position prevents leakage or accidental dispensing during transport and during storage. The closure has an open position (Figure 1) which is the position in which the plug (16) is disengaged from the bore (14). In the open position no liquid is discharged until the liquid pressure exceeds the threshold pressure of the self-sealing valve (30). When the threshold pressure is exceeded, the self-sealing valve (30) opens and liquid is dispensed from the container (2) until the applied pressure is released and the self-sealing valve (30) recloses.

[0023] Preferably, the liquid within the flexible container (2) is free, or at least substantially free of any gas, for example the liquid is free, or at least substantially free of any air.

[0024] Figure 3 shows an assembly view of a flexible container and closure according to the present invention in perspective.

[0025] Figure 4 shows a perspective view of the liquid-filled, flexible container of the present invention, incorporating the closure described in detail above. The container shown in Figure 4 is self standing, wherein the closure is positioned at the top of the flexible container (2) when the container is self-standing on the base (3).

[0026] In one aspect of the present invention, the liquid-filled flexible container is formed and filled by the following process steps:

- (i) forming a closed flexible container (2) from a film material and fixing a female part (10) of a closure through the wall of the flexible container (2);
- (ii) filling the flexible container (2) with a liquid product by injecting the liquid product into the container (2) through the female part (10) of the closure;
- (iii) sealing the flexible container (2) by closing the female part (10) of the closure, preferably by means of a releasably fitted plug (16); and
- (iv) inserting a male part (20) of a closure into the female part (10) so that the female and male parts (10, 20) form a closure having an open and a closed position,

wherein the male part (20) of the closure comprises a self-sealing valve (30) which opens when the closure is in the open position and when pressure is applied to the liquid product within the flexible container (2), and which closes when the pressure is released.

[0027] Preferably the self-sealing valve (30) is integrally molded into the male part (20) of the closure. More preferably the self-sealing valve (30) is molded into the male part (20) of the closure by means of a co-injection process.

[0028] In one particular aspect of the process, the female part (10) of the closure is sealed by means of a

releasably fitted plug (16) such as is described in WO00/66448. This process facilitates the filling of the flexible bag with the exclusion of essentially any gas, in particular with the exclusion of essentially any air.

[0029] In a particularly preferred embodiment of the process the male and female parts of the closure are fitted together by means of a screw thread (28), and wherein the closure is opened by rotating the male part (20) relative to the female part (10), and wherein the closure is closed by counter-rotating the male part (20) relative to the female part (10).

[0030] The advantages of the closure of the present invention include the avoidance of leaking or accidental discharge which may occur when a self-sealing valve is used as the only closing means, or even when a self-sealing valve is used in combination with a flip-top cap. Further, since the closure is between the fluid and the valve, it eliminates concerns about long term product compatibility with the valve material since product contact with the valve only occurs at point of use.

[0031] A further advantage is that liquid-filled, flexible container which is made by the process described above may be made such that the liquid is substantially free of gas. The closure described avoids the ingress of any gas, such as air, into the liquid-filled container during normal use.

[0032] Furthermore the self-sealing valve avoids or minimizes dripping of liquid during use, and consequently the closure of the invention is mess-free.

[0033] The flexible container is light-weight and cheap to manufacture and transport.

[0034] A further advantage is that the present invention does not have any removable part, such as a screw cap, that consumer may lose after opening the package.

Claims

1. Flexible container containing a liquid product, wherein the flexible container (2) comprises a closure having an inner end and an outer end, the closure being fixed through the wall of the flexible container (2) such that the inner end of the closure lies within the flexible container (2) and is in contact with the liquid product, and the outer end of the closure lies outside of the flexible container (2), wherein the closure has an open position and a closed position, and wherein the outer end of the closure is connected to a valve, **characterized in that** the valve is a self-sealing valve (30) which opens when the closure is in the open position and when pressure is applied to the liquid product within the flexible container (2), and which closes when the pressure is released.
2. Flexible container according to claim 1, wherein the container is filled with the liquid product and is essentially free of any gas.

3. Flexible container according to claim 1, wherein the closure comprises male (20) and female (10) parts which are fitted together by means of a screw thread (28), and wherein the closure is opened by rotating the male part (20) relative to the female part (10), and wherein the closure is closed by counter-rotating the male part (20) relative to the female part (10).
4. Flexible container according to any of claims 1 to 3, wherein the container comprises a base (3), so that the liquid-filled, flexible container (2) is self standing upon the base (3), wherein the closure is positioned at the top of the flexible container when the container (2) is self-standing on the base (3).
5. Flexible container according to claim 1, wherein the closure in the closed position seals the flexible container (2) and prevents discharge of the liquid product.
6. A process of making a liquid-filled, flexible container by:
 - (i) forming a closed flexible container (2) from a film material and fixing a female part (10) of a closure through the wall of the flexible container (2);
 - (ii) filling the flexible container (2) with a liquid product by injecting the liquid product into the flexible container (2) through the female part (10) of the closure;
 - (iii) sealing the flexible container by closing the female part (10) of the closure; and
 - (iv) inserting a male part (20) of a closure into the female part (10) so that the male (20) and female (10) parts form a closure having an open and a closed position,**characterized in that** the male part (20) of the closure comprises a self-sealing valve (30) which opens when the closure is in the open position and when pressure is applied to the liquid product within the flexible container (2), and which closes when the pressure is released.
7. The process according to claim 6, wherein the self-sealing valve (30) is integrally molded into the male part (20) of the closure.
8. A process according to claim 7, wherein the self-sealing valve (30) is molded into the male part (20) of the closure by means of a co-injection process.
9. A process according to claim 6, wherein step (iii), the female part (10) of the closure is sealed by means of a releasably fitted plug (16).
10. A process according to claim 6, wherein the male

(20) and female (10) parts of the closure are fitted together by means of a screw thread (28), and wherein the closure is opened by rotating the male part (20) relative to the female part (10), and wherein the closure is closed by counter-rotating the male part (20) relative to the female part (10). 5

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Fig. 1a
SECTION A-A

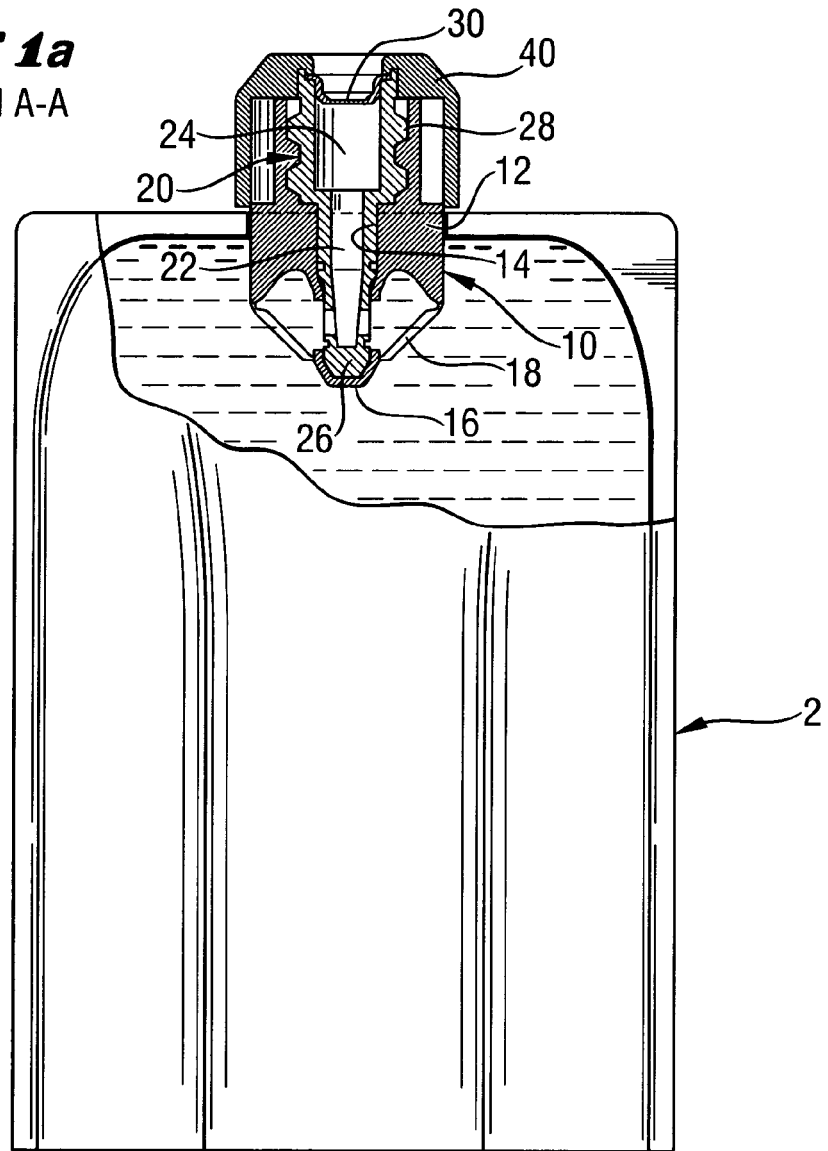
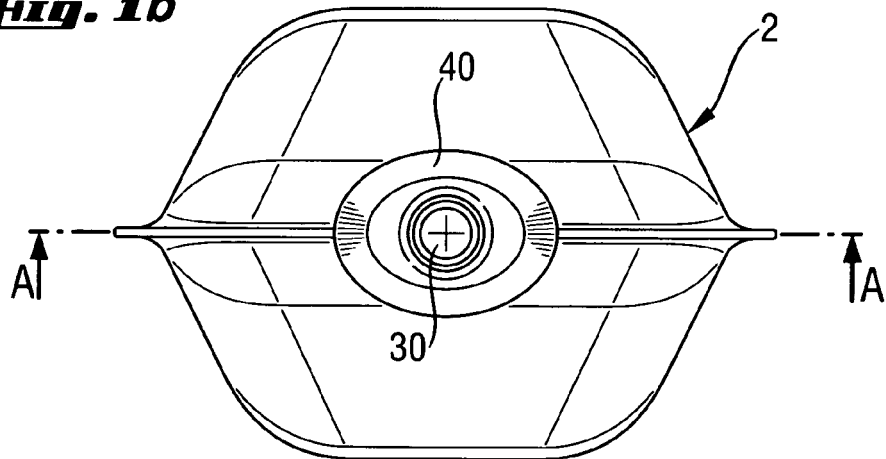


Fig. 1b



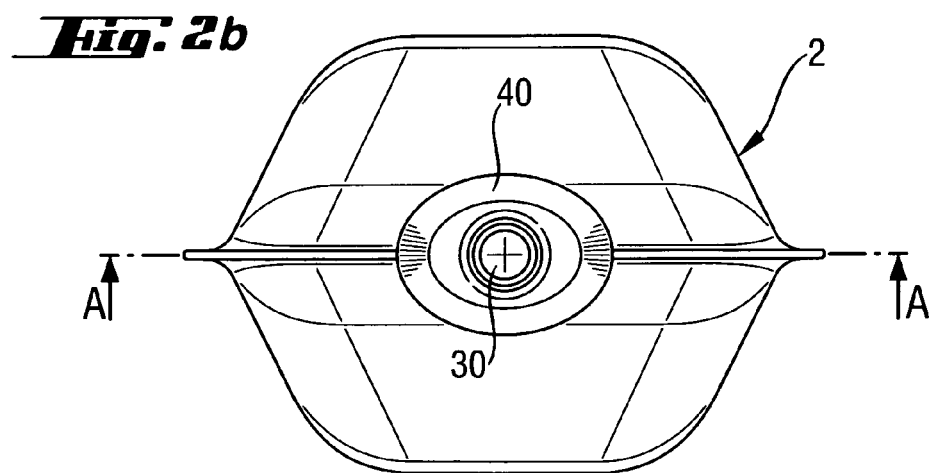
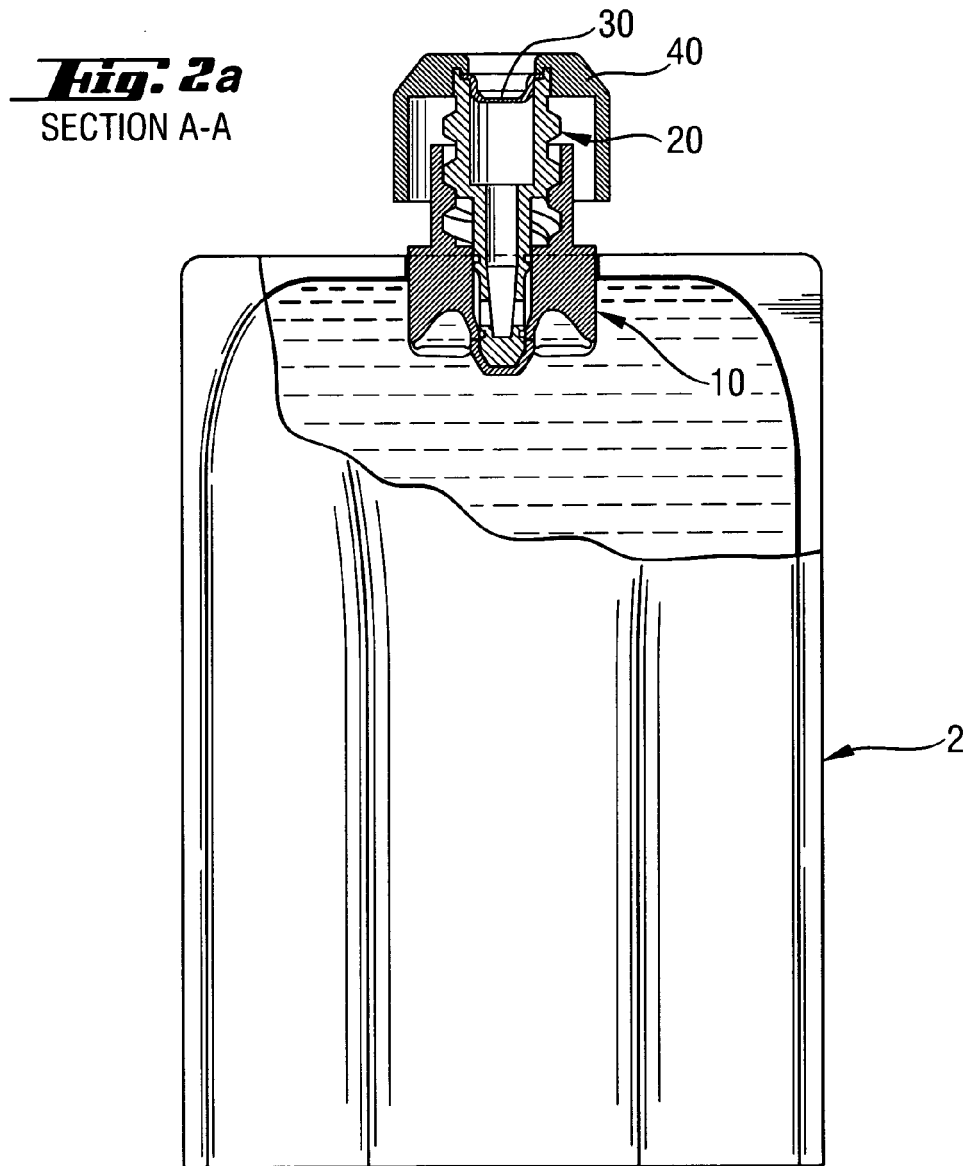


Fig. 3

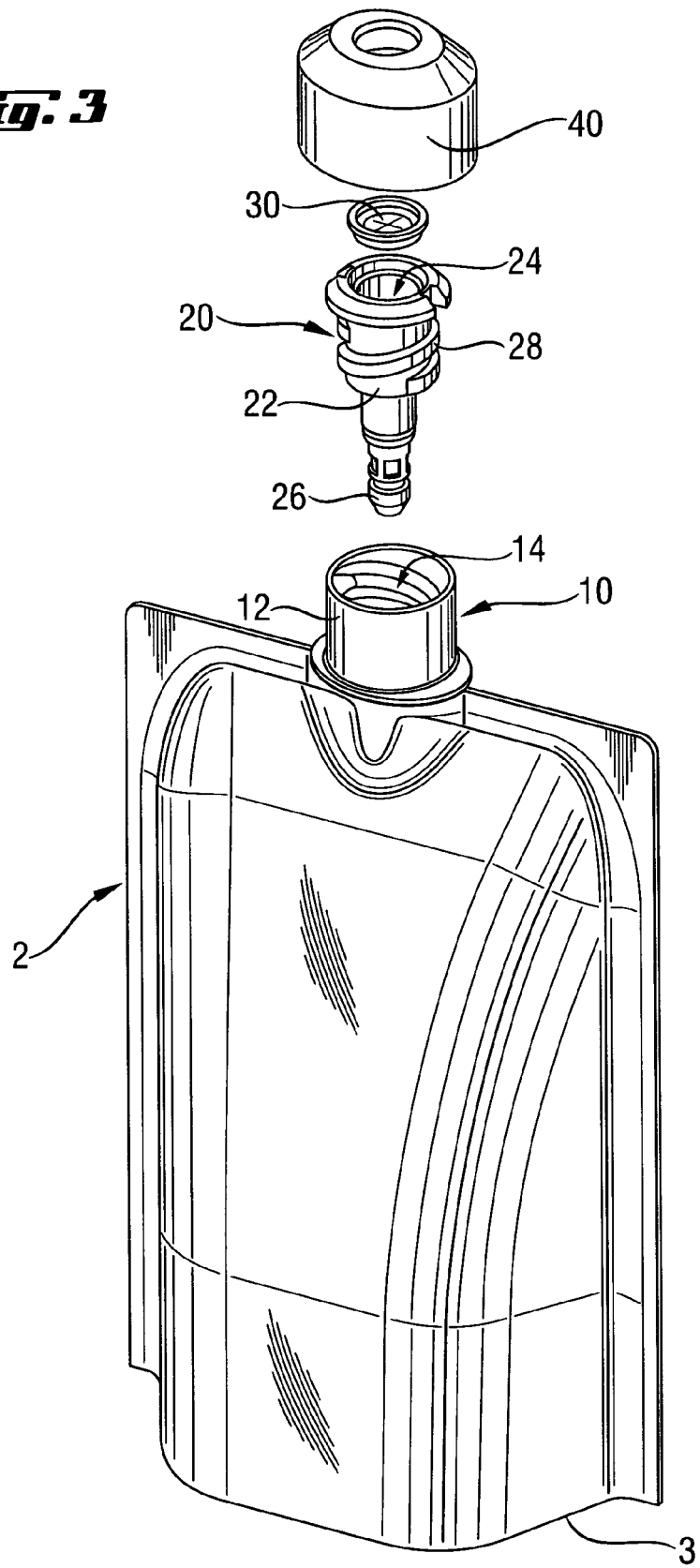
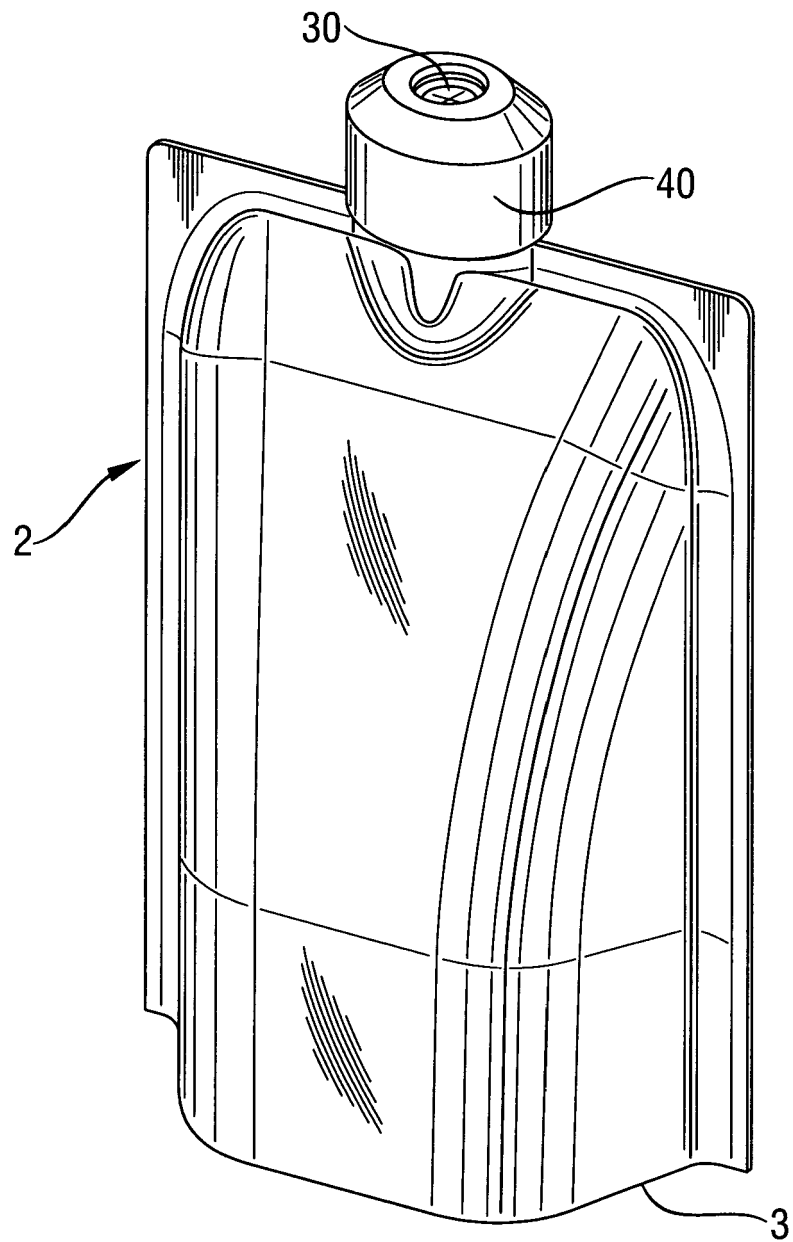


Fig. 4





European Patent
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Application Number
EP 04 07 8548

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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