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(54) **Dispensing closure having a vent valve**

Spenderverschluss mit Belüftungsventil

Fermeture de distribution munie d'une soupape de ventilation

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**US-A- 3 159 176** **US-A- 4 102 476**  
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## Description

**[0001]** The present invention relates to a dispensing closure for dispensing a liquid such as perfume from a container having an opening. A dispensing closure reflecting the preamble of claim 1 is disclosed by the document US 6,951,295.

**[0002]** The document US 7,681,750 describes a closure for a container that holds a free-flowing product. The container comprises a fixed lower part which can be fastened to a container neck that surrounds a container opening in order to seal the neck; a cover comprising a protruding connecting piece that forms a passage for the free-flowing product; a displaceable upper part which can be coaxially displaced on the lower part in and against the direction of the container between an outer resting position and an inner actuating position; a breaker or dish-shaped diaphragm valve which has a base consisting at least of a flexible elastic material and whose upper edge seals the underside of the upper part; perforations in the base of the diaphragm valve which are closed in the testing position of the upper part; and a diameter of the base that is greater than the inner cross section of the connecting piece. The outer end of the connecting piece continuously supports the base of the diaphragm valve, and the latter continuously pre-tensions the upper part in the direction of its resting position in such a way that, when axial pressure is exerted on the upper part in the direction of the container, the diaphragm valve is bent outwards, thus opening the perforations in the base.

**[0003]** However, if too much pressure is applied to the container in order to allow the fluid to eject the dispenser, air may enter the container through the fluid channel and any fluid may readily seep out as the pressure inside the fluid channel will then be different from the pressure outside the fluid channel, i.e. the atmospheric pressure.

**[0004]** In order to avoid such leakage, a cap may be provided, as also disclosed by the aforementioned document.

**[0005]** The document US 2007/0284397 also discloses a dispensing closure having a plurality of nozzles in a plate arranged above a valve. The plurality of nozzles allows for spraying a mist or the like. Again a cap is provided to prevent leakage.

**[0006]** Many other valve arrangements are known. For example, the document EP 1953432 shows an umbrella-type valve as a pressure relieve valve. In general, umbrella valves are elastomeric valve components that have a diaphragm shaped sealing disk or an umbrella shape. These elastomeric components are generally used as sealing elements in backflow prevention devices or one-way valves or the like. When mounted in a seat, the convex diaphragm flattens out against the valve seat and absorbs a certain amount of seat irregularities and creates a certain sealing force. The umbrella valve will allow forward flow once the head pressure creates enough force to lift the convex diaphragm from the seat and so it will allow flow at a predetermined pressure in one way

and prevent back flow immediately in the opposite way.

**[0007]** Such umbrella valves have a drawback of being large. For example, with a pressure of 5 mbar (0.5 kPa), the valve typically has a diameter of at least 8 cm.

**[0008]** The document US 4,102,476 discloses a squeeze bottle type dispenser having a resiliently collapsible container for liquid to be dispensed. A cover on the container has a flexible resilient central portion flexible outwardly of the cover away from the container. A dispensing valve member on the cover has a dispensing orifice therein, and an interior surface facing into the container. The dispenser has an air return flow path there-through and a valve therein opening the air return flow path when the pressure on the outside of the container is greater than the pressure on the inside of the container.

**[0009]** The present invention addresses the problems of the prior art and provides a compact dispensing closure as defined in the appended claims. The present dispensing closure ensures liquid tightness even without a cap and is small enough to be used in, for example, perfume bottles which have a standardized bottle neck diameter.

**[0010]** Other details and different variants of the invention are defined in the dependent claims.

**[0011]** The invention will be better understood with the help of the following detailed description and the accompanying drawings illustrating possible embodiments of the invention:

Figure 1 shows a general overview of a fluid container on which is mounted a dispensing closure according to the present invention,

Figure 2 shows a cross-section of the container with dispensing closure of Figure 1,

Figure 3 shows an exploded view of the main elements of the dispensing closure according to the present invention,

Figure 4 shows a top view and a cross-sectional view of the dispensing closure according to the present invention, and

Figure 5 shows a schematic representation of air and fluid flow through the dispensing closure.

**[0012]** A preferred embodiment of the dispensing closure according to the present invention will now be described with reference to the Figures.

**[0013]** Figures 1 and 2 shows fluid container 3 on which is mounted a dispensing closure 2 according to the present invention. The combination of container and fitted closure is referenced by general reference 1.

**[0014]** Container 3 may hold a free-flowing product such as lotions, creams, perfumes or the like and is typically provided with a neck having an outlet opening. The container may consist of a solid material, such as glass or ceramic, or also of plastic, whereby the walls of a plastic container may be rigid or flexible. The neck of container 3 may be provided with a thread allowing for a spray top to be fitted thereto in a manner well known in the art.

**[0015]** Dispensing closure 2 basically corresponds to a plug that may be fitted into the neck of container 3 to seal it in a liquid-tight manner.

**[0016]** Figure 3 shows in more detail the dispensing closure, also referred to as plug, 2. Plug 2 consists of three parts: a plug cap 21, a double-valve diaphragm 22 and a plug body 23. A tube or rod 24 may be fitted into the plug body so as to allow for transportation from liquid in container 3 to the plug for ejection from the plug. Plug body 23 has a top section for receiving double-valve diaphragm 22 and plug cap 21 is fitted on top of double-valve diaphragm 22 to seal the plug.

**[0017]** Figure 4 shows a top view of the plug cap 21 and a cross-sectional view of the plug.

**[0018]** As can be seen, plug cap 21 is disk-shaped and is provided with a central opening 21d with one or more air venting slots 21c surrounding the central opening. In between the air venting slots 21c and central opening 21d an internal ring seal 21a is provided for preventing leakage of liquid when a tube or cannula is inserted into a valve located below the plug cap, as will be explained in more detail hereafter.

**[0019]** Double-valve diaphragm 22 consists of a flexible elastic material, such as silicone, rubber or a plastic, such as polyethylene or a similar elastomeric material. Double-valve diaphragm 22 comprises a central valve section 22b which has a central slit-type orifice 22a surrounded by a valve seal 22c. A peripheral section constituting an umbrella-type valve 22d is further provided surrounding the valve seal 22c. Such slit-type orifice is known as such, for example from the document US 7,681,750 cited above. As shown, a plurality of slits extend in a cross- or star-shape diametrically through the centre of central valve section 22d at equal circumferential angular distances. The ends of the slits are located at an appropriate radial distance from the valve seal 22c.

**[0020]** Plug body 23 has a plug-shape with an elongated circular main body 23d for fitting into a neck of a container holding fluid and with a generally disc-shaped top section 23e that sits on top of the neck so as to seal it. Top section 23e has substantially the same external diameter as the neck of the container onto which the plug 2 is fitted. As an example, this diameter may be 15 mm which is a standard FEA 15 size for perfume bottles.

**[0021]** Main body 23d has an external elongated cylindrical portion for snugly fitting into the neck of a container 3. Ring seals 23a may be provided on the outer periphery of main body 23d to prevent leakage between the container and the plug. Main body 23d further has an internal elongated cylindrical portion, spaced apart from the external elongated cylindrical portion, which itself has a hollow dip tube seat 23c for receiving a dip-tube 24. One or more rings, in the example shown there are three rings, may be provided to prevent any air entrance from inside the container to the dip-tube.

**[0022]** Top section 23e is further provided on its top surface with a welding ring 23f to be fitted in a slot suitably arranged on the lower surface of plug cap 21, as shown,

so as to ensure a seal-tight assembly between these elements, for example by laser welding or the like, see also section C in Figure 5. It further is provided with a central recess 23h delimited by side walls 23g that align with a further slot suitably arranged on the lower surface of plug cap 21 to ensure air-tight assembly between these elements. Recess 23h is configured to receive double-valve diaphragm 22 and is provided with air venting slots that suitably align axially with the air venting slots 21c of diaphragm 22. The internal elongated portion of main body 23d extends into this recess and has an upper hollow section 23b constituting a diaphragm deflection chamber. This is a space that is used when a dip-tube 24 is inserted to prevent any collision between the diaphragm and the tube. The sidewalls of this hollow section 23b constitute shoulders for receiving aligned therewith valve seal 22c of diaphragm 22.

**[0023]** Diaphragm 22 is fitted into recess 23h such that when plug cap 21 is fitted to close the plug, the valve seal 22c is compressed between the sidewalls and the plug cap thus ensures liquid-tightness of deflection chamber 23b. As shown in Figure 4, these shoulders fix diaphragm 22 by dividing it into a circumferential valve section, an inner valve section constituting a normally closed valve having the slit-type orifice 22a which is closed when the inner valve section is in its resting position and an outer valve section constituting the umbrella-type valve 22b. The umbrella-style valve 22b is also a normally closed valve with the valve seat on the plug cap 21 and which closes the air venting slots of plug cap 21 when in its resting position. As can be understood from the above, umbrella-style valve 22b will then block the air venting slots 21c of plug cap 21.

**[0024]** The operation of the double-valve diaphragm according to the present invention will now be described with reference to Figure 5.

**[0025]** Double-valve diaphragm 22 has double concentric valves comprising a normally closed orifice with a self-closing slit-type valve 22a and a normally closed umbrella-type valve. When liquid is to be dispensed from the container, a suction is applied by a pump or by a pressure applied to the container through the slit-type orifice 22a. The slit-type orifice 22a opens so that liquid can flow outside of the container and the plug in the direction of arrow "way B" shown in Figure 5. Because of this, a depression is created inside the container and liquid will exit dip-tube 24, and the plug through the open orifice. This depression will be, for example when spraying perfume, around 5 to 10 mbar. Due to this depression, the umbrella-style valve will open thus allowing air to flow in through air venting slots 21c and the corresponding slots of plug cap 23 into container 3 in the direction of arrow "way A" shown in Figure 5. Thus, the depression inside the container is created when an amount of liquid is dispensed. The sprayed volume should be replaced by air in order to have an equilibrium pressure inside and outside the container which is obtained by the air flowing in by the umbrella-type valve being opened due to the

created depression.

**[0026]** Thus, when the valves are closed, liquid is retained in the reservoir by way of retention A and retention B, as shown in Figure 5. This prevents any liquid splashing when the bottle is not connected to the cannular system or when the bottle has not a lid.

**[0027]** Having described now the preferred embodiments of this invention, it will be apparent to one of skill in the art that other embodiments incorporating its concept may be used. It is felt, therefore, that this invention should not be limited to the disclosed embodiments, but rather should be limited only by the scope of the appended claims.

## Claims

1. A dispensing closure (1) for a container (3) that holds a fluid, which closure can be tightly fitted into a container neck to ensure liquid-tightness of the container, comprising:

a plug body (23) arranged to be inserted into the container neck and having a central fluid passage and having a peripheral air passage, a double-valve diaphragm (22) consisting of a flexible elastic material and arranged in a recess provided in an upper part of the plug body (23) to cover the fluid passage and the air passage, and

a plug cap (21) for sealing the double-valve diaphragm (22) within the plug body (23) having one or more venting slots (21c) arranged circularly and axially aligned with the air passage of the plug body (23) and having a central orifice (21d) axially aligned with the fluid passage of the plug body (23),

wherein

the double-valve diaphragm (22) comprises two concentric valve sections with:

a first valve section, and

a second valve section,

where the first valve section is a normally closed valve (22d) having a slit-type central orifice (22a) and which seals the central fluid passage of the plug body (23) when in its resting position, and

where the second valve section is an umbrella-type valve (22b) which is a normally closed valve and which seals the one or more venting slots of the plug cap (21) when in its resting position,

**characterised in that** the plug cap further has a ring seal (21a) provided between said venting slots (21c) and said central opening (21d) to prevent leakage of liquid when a tube or cannula is

inserted into the valve located below the plug cap.

2. A dispensing closure (1) according to claim 1, wherein said double-valve diaphragm (22) further comprises a valve seal (22c) arranged between said first valve section and said second valve section.
3. A dispensing closure (1) according to claim 1, wherein said double-valve diaphragm (22) further comprises a valve seal (22c) arranged concentrically between said first valve section and said second valve section.
4. A dispensing closure (1) according to anyone of the preceding claims, wherein said double-valve diaphragm (22) further comprises said first valve section for fluid dispensing and said second valve section for air venting.
5. A dispensing closure (1) according to claim 1, wherein the first valve section of said double-valve diaphragm (22) is arranged to open when a pressure is created in the central fluid passage of the plug body (23).
6. A dispensing closure (1) according to claim 1, wherein the first valve section of said double-valve diaphragm (22) is arranged to open when a depression is created in the central fluid passage (21d) of the plug cap (21).
7. A dispensing closure (1) according to anyone of the preceding claims, wherein the second valve section of said double-valve diaphragm (22) is arranged to open when a depression is created in the central fluid passage of the plug body (23).
8. A dispensing closure (1) according to anyone of the preceding claims, wherein said plug body has an inner cylindrical elongated portion axially aligned with the central fluid passage for receiving a dip-tube (24).
9. A dispensing closure (1) according to anyone of the preceding claims, wherein said plug body (23) has a plug-shape with an elongated circular main body (23d) for fitting into a neck of the container when assembled thereto and a disc-shaped top section (23e) that is formed to sit on top of the neck so as to seal it.
10. A dispensing closure (1) according to claim 9, wherein said top section (23e) has a welding ring (23f) on its upper surface, and said plug cap (21) has a slot arranged in its lower surface for receiving said welding ring.
11. A combination of a dispensing closure (1) according

to anyone of the preceding claims and a container for holding fluid.

12. The combination of claim 11, wherein said container holds perfume.

## Patentansprüche

1. Spenderverschluss (1) für einen Behälter (3), der ein Fluid aufnimmt, wobei der Verschluss fest in einen Behälterhals eingepasst werden kann, um Flüssigkeitsdichtheit des Behälters zu gewährleisten, umfassend:

einen Steckerkörper (23), der so ausgelegt ist, dass er in den Behälterhals eingeführt wird und einen mittigen Fluiddurchgang aufweist und einen peripheren Luftdurchgang aufweist, eine Doppelventilmembran (22), die aus einem flexiblen elastischen Material besteht und in einer Aussparung angeordnet ist, die in einem oberen Teil des Steckerkörpers (23) vorgesehen ist, um den Fluiddurchgang und den Luftdurchgang abzudecken, und eine Steckerkappe (21) zum Abdichten der Doppelventilmembran (22) innerhalb des Steckerkörpers (23) mit einem oder mehreren Belüftungsschlitzen (21c), die kreisförmig angeordnet und mit dem Luftdurchgang des Steckerkörpers (23) axial ausgerichtet sind, und mit einer mittigen Öffnung (21d), die mit dem Fluiddurchgang des Steckerkörpers (23) axial ausgerichtet ist, wobei die Doppelventilmembran (22) zwei konzentrische Ventilabschnitte umfasst mit:

einem ersten Ventilabschnitt und einem zweiten Ventilabschnitt, wobei der erste Ventilabschnitt ein normalerweise geschlossenes Ventil (22d) ist, das eine schlitzzartige mittige Öffnung (22a) aufweist und das den mittigen Fluiddurchgang des Steckerkörpers (23) abdichtet, wenn in seiner Ruhestellung, und wobei der zweite Ventilabschnitt ein schirmartiges Ventil (22b) ist, das ein normalerweise geschlossenes Ventil ist und das den einen oder die mehreren Belüftungsschlitze der Steckerkappe (21) abdichtet, wenn in seiner Ruhestellung,

**dadurch gekennzeichnet, dass** die Steckerkappe ferner eine Ringdichtung (21a) aufweist, die zwischen den Belüftungsschlitzen (21c) und der mittigen Öffnung (21d) vorgesehen ist, um Ausströmen von Flüssigkeit zu verhindern,

wenn ein Rohr oder eine Kanüle in das Ventil eingeführt wird, das sich unter der Steckerkappe befindet.

2. Spenderverschluss (1) nach Anspruch 1, wobei die Doppelventilmembran (22) ferner eine Ventildichtung (22c) umfasst, die zwischen dem ersten Ventilabschnitt und dem zweiten Ventilabschnitt angeordnet ist.
3. Spenderverschluss (1) nach Anspruch 1, wobei die Doppelventilmembran (22) ferner eine Ventildichtung (22c) umfasst, die konzentrisch zwischen dem ersten Ventilabschnitt und dem zweiten Ventilabschnitt angeordnet ist.
4. Spenderverschluss (1) nach einem der vorhergehenden Ansprüche, wobei die Doppelventilmembran (22) ferner den ersten Ventilabschnitt zum Spenden von Fluid und den zweiten Ventilabschnitt zum Belüften umfasst.
5. Spenderverschluss (1) nach Anspruch 1, wobei der erste Ventilabschnitt der Doppelventilmembran (22) so ausgelegt ist, dass er sich öffnet, wenn ein Druck im mittigen Fluiddurchgang des Steckerkörpers (23) erzeugt wird.
6. Spenderverschluss (1) nach Anspruch 1, wobei der erste Ventilabschnitt der Doppelventilmembran (22) so ausgelegt ist, dass er sich öffnet, wenn ein Unterdruck im mittigen Fluiddurchgang (21d) der Steckerkappe (21) erzeugt wird.
7. Spenderverschluss (1) nach einem der vorhergehenden Ansprüche, wobei der zweite Ventilabschnitt der Doppelventilmembran (22) so ausgelegt ist, dass er sich öffnet, wenn ein Unterdruck im mittigen Fluiddurchgang des Steckerkörpers (23) erzeugt wird.
8. Spenderverschluss (1) nach einem der vorhergehenden Ansprüche, wobei der Steckerkörper einen inneren, zylindrischen, länglichen Abschnitt zum Aufnehmen eines Tauchrohrs (24) aufweist, der mit dem mittigen Fluiddurchgang ausgerichtet ist.
9. Spenderverschluss (1) nach einem der vorhergehenden Ansprüche, wobei der Steckerkörper (23) eine Steckerform mit einem länglichen kreisförmigen Hauptkörper (23d) zum Einpassen in einen Hals des Behälters, wenn damit zusammengebaut, und einen scheibenförmigen oberen Abschnitt (23e) aufweist, der so ausgebildet ist, dass er auf dem oberen Ende des Halses sitzt, um ihn abzudichten.
10. Spenderverschluss (1) nach Anspruch 9, wobei der obere Abschnitt (23e) einen Schweißring (23f) auf

seiner oberen Oberfläche aufweist, und die Stecker-  
kappe (21) einen Schlitz zum Aufnehmen des  
Schweißrings aufweist, der in ihrer unteren Oberflä-  
che angeordnet ist.

11. Kombination eines Spenderverschlusses (1) nach  
einem der vorhergehenden Ansprüche und eines  
Behälters zum Aufnehmen von Fluid.
12. Kombination nach Anspruch 11, wobei der Behälter  
Parfüm aufnimmt.

## Revendications

1. Fermeture de distribution (1) pour un récipient (3)  
qui renferme un fluide, laquelle fermeture peut être  
étroitement ajustée dans un col de récipient pour  
assurer l'étanchéité aux liquides du récipient,  
comprenant :

un corps de bouchon (23) agencé pour être in-  
séré dans le col de récipient et ayant un passage  
de fluide central et ayant un passage d'air péri-  
phérique,

un diaphragme à double soupape (22) constitué  
d'un matériau élastique souple et agencé dans  
un évidement prévu dans une partie supérieure  
du corps de bouchon (23) pour couvrir le pas-  
sage de fluide et le passage d'air, et

un capuchon de bouchon (21) pour sceller le  
diaphragme à double soupape (22) dans le  
corps de bouchon (23) ayant une ou plusieurs  
fente(s) d'évacuation (21c) agencée(s) de ma-  
nière circulaire et alignée(s) axialement avec le  
passage d'air du corps de bouchon (23) et ayant  
un orifice central (21d) aligné axialement avec  
le passage de fluide du corps de bouchon (23),  
dans laquelle

le diaphragme à double soupape (22) comprend  
deux sections de soupape concentriques avec :

une première section de soupape, et  
une deuxième section de soupape,  
où la première section de soupape est une  
soupape normalement fermée (22) ayant  
un orifice central de type fente (22a) et qui  
scelle le passage de fluide central du corps  
de bouchon (23) lorsqu'elle est dans sa po-  
sition de repos, et

où la deuxième section de soupape est une  
soupape de type parapluie (22b) qui est une  
soupape normalement fermée et qui scelle  
la ou les plusieurs fentes d'évacuation du  
capuchon de bouchon (21) lorsqu'elle est  
dans sa position de repos,

**caractérisée en ce que** le capuchon de  
bouchon a en outre un joint annulaire (21a)

prévu entre lesdites fentes d'évacuation  
(21c) et ladite ouverture centrale (21d) pour  
empêcher la fuite du liquide lorsqu'un tube  
ou une canule est insérée dans la soupape  
située sous le capuchon de bouchon.

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2. Fermeture de distribution (1) selon la revendication  
1, dans laquelle ledit diaphragme à double soupape  
(22) comprend en outre un joint de soupape (22c)  
agencé entre ladite première section de soupape et  
ladite deuxième section de soupape.

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3. Fermeture de distribution (1) selon la revendication  
1, dans laquelle ledit diaphragme à double soupape  
(22) comprend en outre un joint de soupape (22c)  
agencé de manière concentrique entre ladite pre-  
mière section de soupape et ladite deuxième section  
de soupape.

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4. Fermeture de distribution (1) selon l'une quelconque  
des revendications précédentes, dans laquelle ledit  
diaphragme à double soupape (22) comprend en  
outre ladite première section de soupape pour la dis-  
tribution de fluide et ladite deuxième section de sou-  
pape pour l'évacuation de l'air.

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5. Fermeture de distribution (1) selon la revendication  
1, dans laquelle la première section de soupape du-  
dit diaphragme à double soupape (22) est agencée  
pour s'ouvrir lorsqu'une pression est créée dans le  
passage de fluide central du corps de bouchon (23).

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6. Fermeture de distribution (1) selon la revendication  
1, dans laquelle la première section de soupape du-  
dit diaphragme à double soupape (22) est agencée  
pour s'ouvrir lorsqu'une dépression est créée dans  
le passage de fluide central (21d) du capuchon de  
bouchon (21).

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7. Fermeture de distribution (1) selon l'une quelconque  
des revendications précédentes, dans laquelle la  
deuxième section de soupape dudit diaphragme à  
double soupape (22) est agencée pour s'ouvrir lors-  
qu'une dépression est créée dans le passage de flui-  
de central du corps de bouchon (23).

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8. Fermeture de distribution (1) selon l'une quelconque  
des revendications précédentes, dans laquelle ledit  
corps de bouchon a une partie allongée cylindrique  
intérieure alignée axialement avec le passage de  
fluide central pour recevoir un tube plongeur (24).

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9. Fermeture de distribution (1) selon l'une quelconque  
des revendications précédentes, dans laquelle ledit  
corps de bouchon (23) a une forme de bouchon avec  
un corps principal circulaire allongé (23d) pour un  
montage dans un col du récipient lorsqu'il est as-  
semblé à celui-ci et une section supérieure en forme

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de disque (23e) qui est formée pour se poser sur le sommet du col de manière à le sceller.

10. Fermeture de distribution selon la revendication 9, dans laquelle ladite section supérieure (23e) a un anneau de soudage (23f) sur sa surface supérieure, et ledit capuchon de bouchon (21) a une fente agencée dans sa surface inférieure pour recevoir ledit anneau de soudage. 5
- 10
11. Combinaison d'une fermeture de distribution (1) selon l'une quelconque des revendications précédentes et d'un récipient pour renfermer un fluide. 10
12. Combinaison de la revendication 11, dans laquelle ledit récipient renferme du parfum. 15

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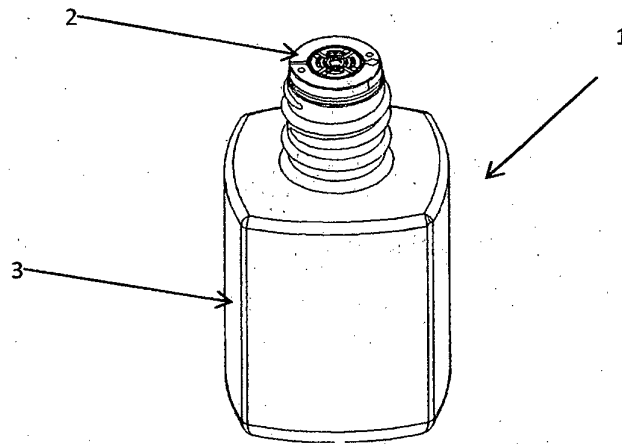


Figure 1

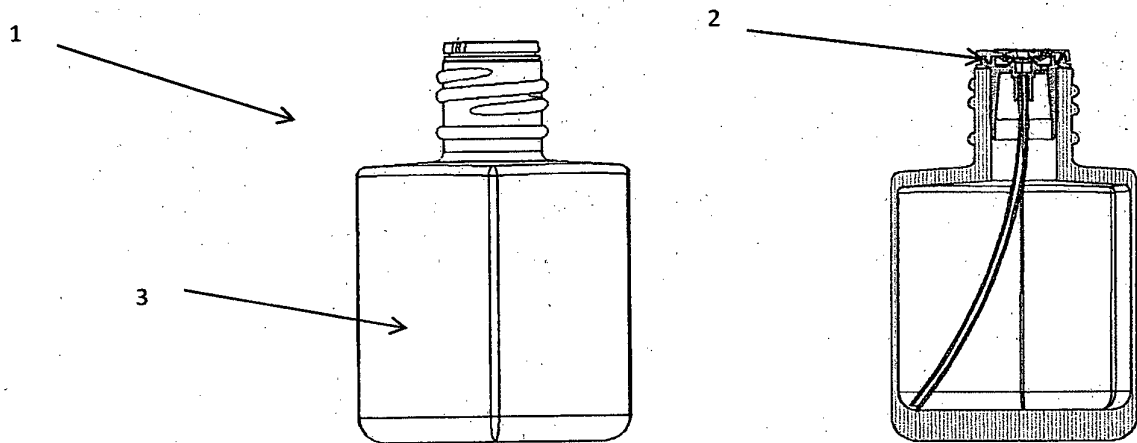


Figure 2

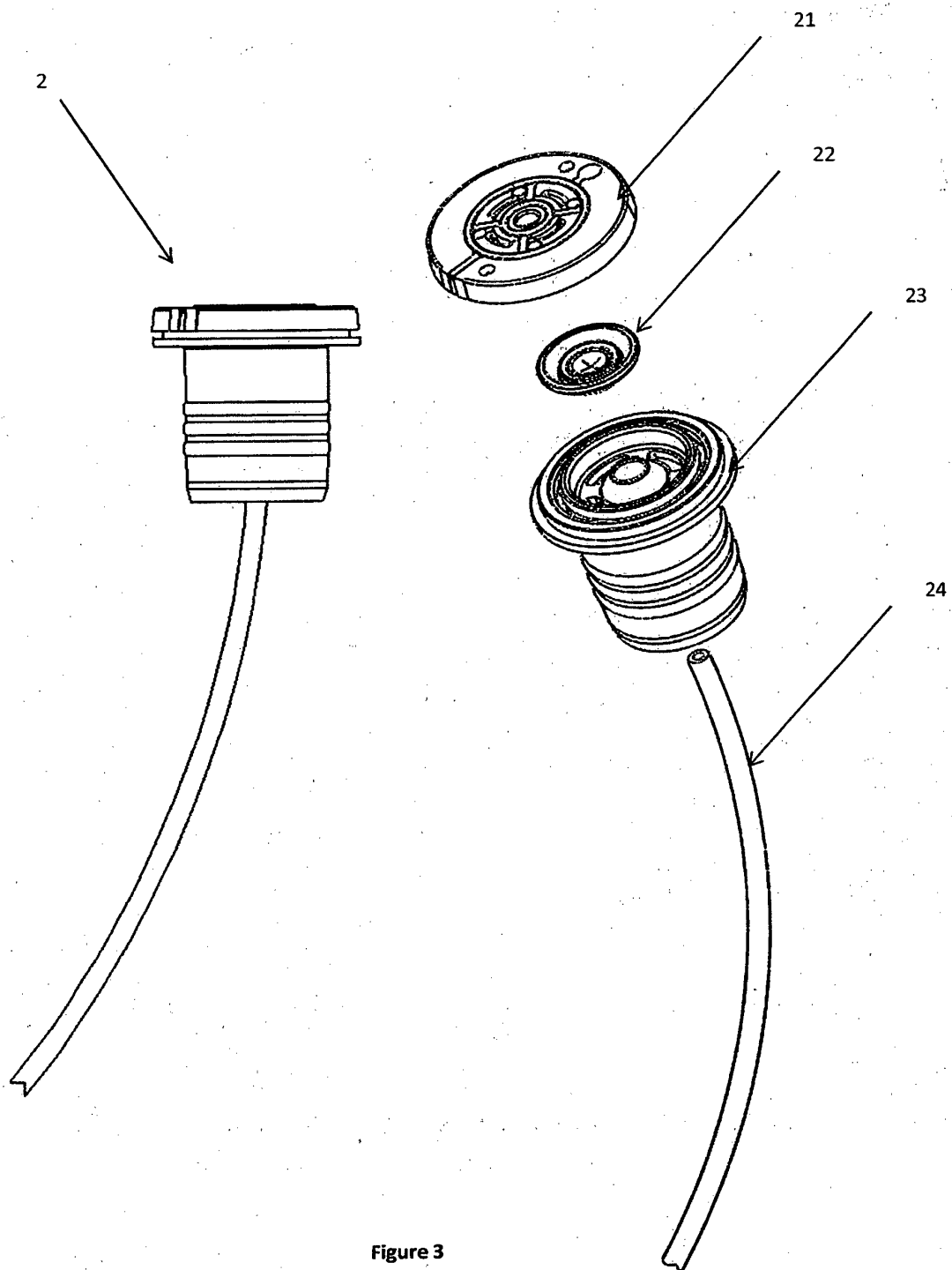


Figure 3

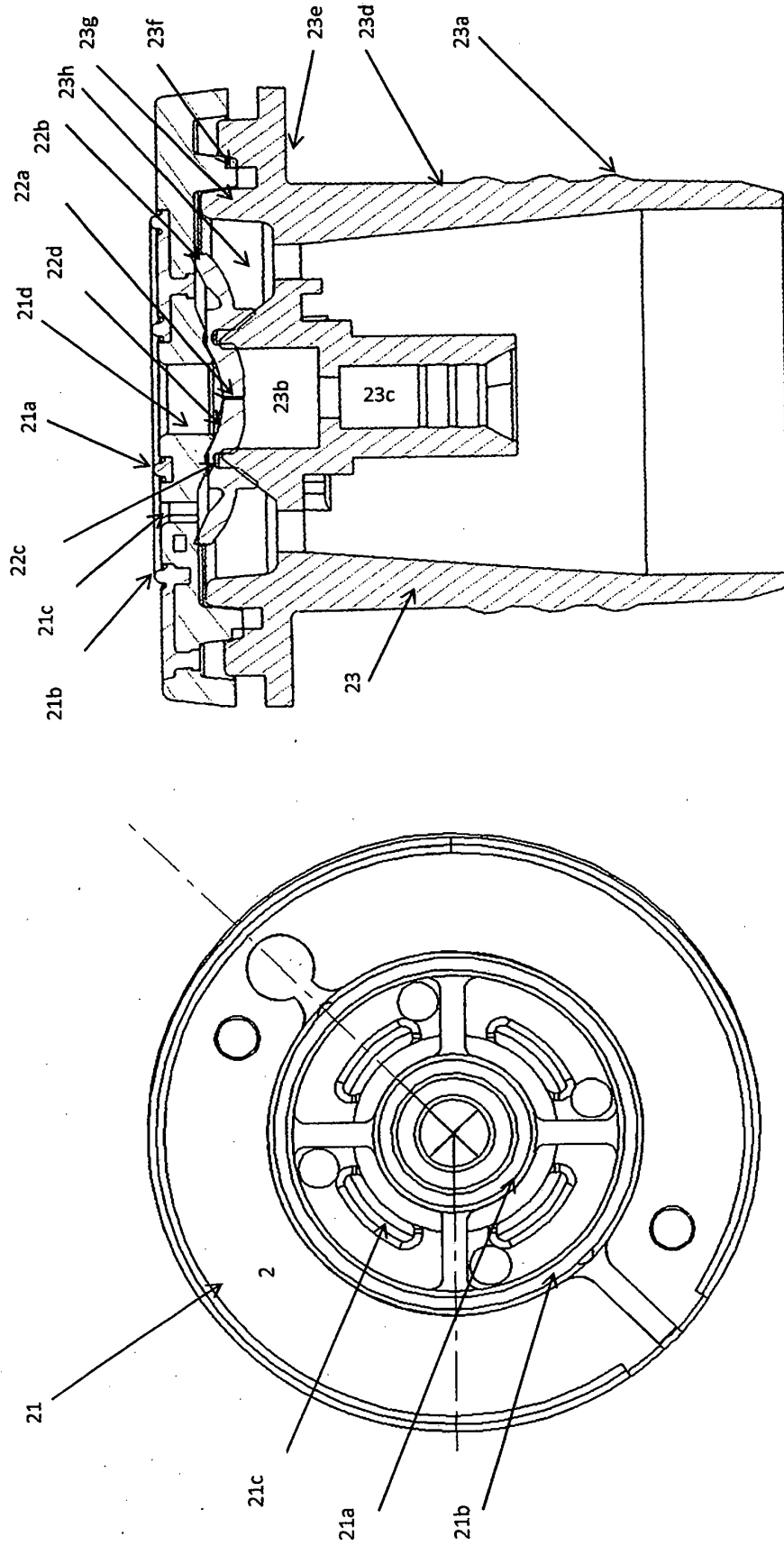
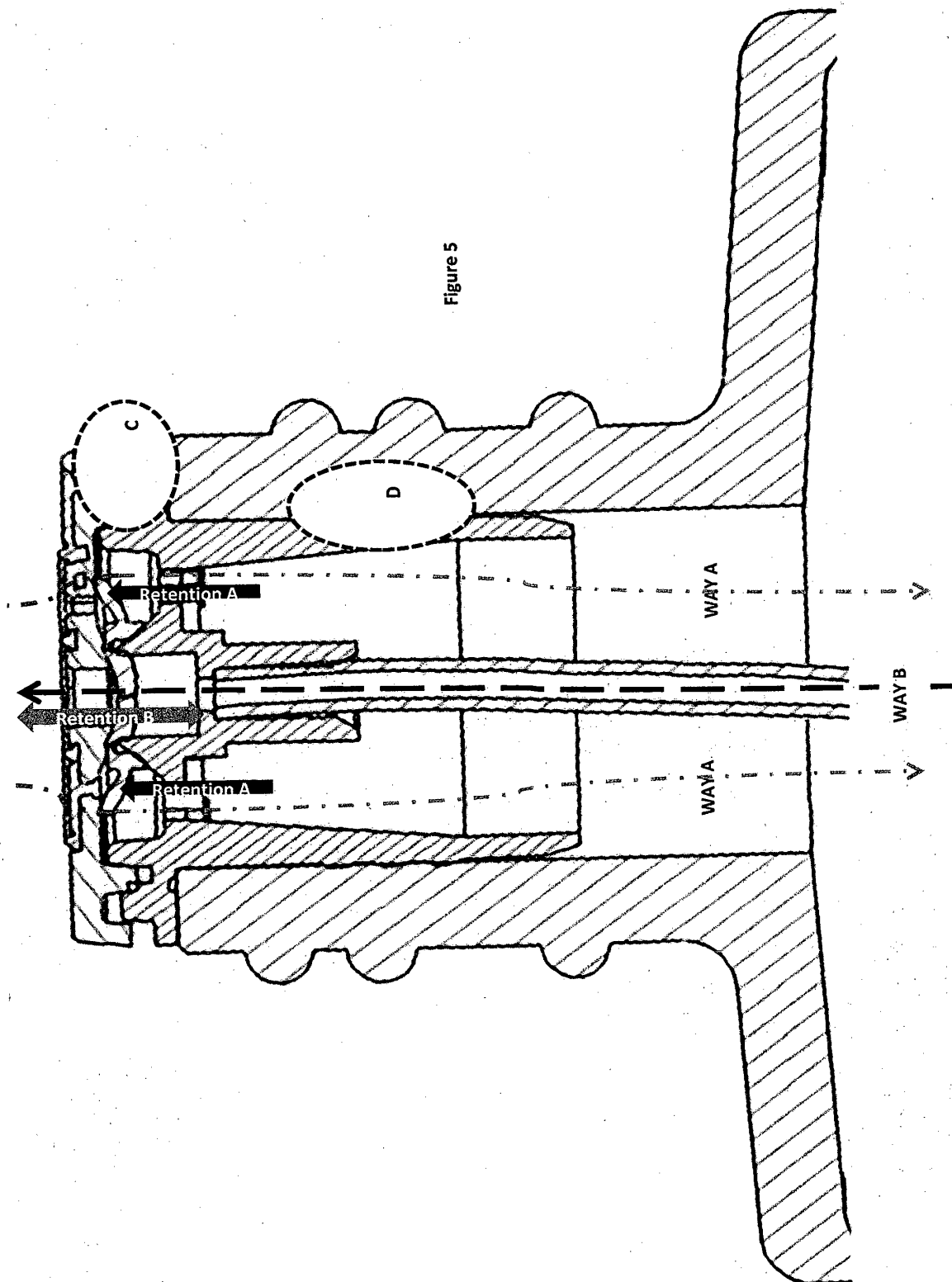


Figure 4

Figure 5



**REFERENCES CITED IN THE DESCRIPTION**

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