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(54) **Dispensing aerosol valve for pressurized container, dispensing adapter therefor, and assembly of a pressurized container with an adapter**

(57) The present invention concerns a pressurized aerosol container comprising a specific valve and a dispensing adapter to be used therewith for dispensing a pressurized liquid contained in said container, the liquid being preferably a moisture reactive composition. The

valve comprises a valve stem (1) provided with a central bore (1C) having an internal threaded portion (1F), allowing the fixing and connection of a disposable dispensing adapter (5), comprising a connecting end provided with a mating outer threaded portion (5F).

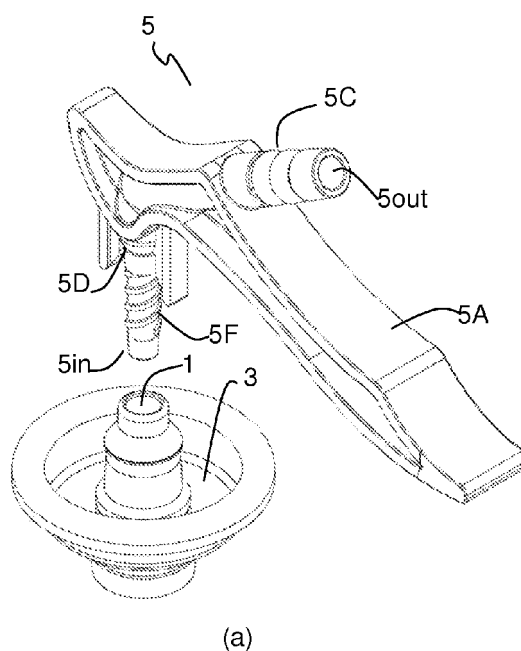


FIGURE 2

Description

Technical Field

[0001] The present invention relates to pressurized aerosol containers comprising a specific valve of the type operated to dispense moisture reactive composition in aerosol form, such as polyurethane foams. In particular it concerns a combination of an aerosol can with a valve and a dispensing adapter for easing the dispensing of the liquid contained in the can, said combination allowing the adapter to be connected to the valve very easily, thus ensuring a gas tight connection and without spilling any liquid upon fixing the dispenser to the valve.

Background for the invention

[0002] Typically, aerosol valves for dispensing a moisture reactive composition in aerosol form such as a polyurethane foam precursor are fixed to a pressurized can by a cup closing the top opening by means of a peripheral annular channel encasing a peripheral can bead defining the perimeter of the can top opening. The cup comprises a central bore through which a tubular resilient grommet extends both above and below the cup (the expressions "below" and "above" the cup refer herein to facing inside and outside the can, respectively). The grommet is roughly a hollow cylindrical tube which central bore opens at both ends and which comprises at its end located below the cup a substantially annular flange radially extending outwards and which upper surface contacts the lower (inner) surface of the cup and is suitable for sealing against the latter.

[0003] A rigid valve stem is engaged snugly in the central bore of the grommet extending both below and above said grommet and is held in place by appropriate means (generally annular flanges sandwiching the upper and lower portions of the grommet). The valve stem is formed by a hollow tube closed at a first end by an annular base forming a flange of diameter greater than the one of the inner bore of the grommet and which upper surface of the base flange is suitable for sealing against the lower surface of the grommet flange. The lateral wall of the tubular portion of the stem generally comprise openings bringing in fluid communication the inner bore of the stem with the interface between the stem base and the grommet flange.

[0004] By tilting and/or pressing down the portion of the valve stem extending out of the grommet the sealing interface between the grommet flange and the valve base is disrupted thus bringing in fluid communication the inner bore of the valve stem with the composition contained in the can. Since the can is pressurized, the content of the can is dispensed through the valve. When closed, the valve must ensure that no moisture from the outside contacts the content of the can, in particular if the composition is reactive to moisture. Examples of valve designs suitable for dispensing a pressurized composition reactive

to moisture, such as a polyurethane foam can be found in WO2006/032061, US6.425.503, US4.765.516, EP0.102.797, WO2009/042206, WO96/17795.

[0005] This type of cans and valve systems is for example, widely used for polyurethane foam compositions. They are generally sold in rather small format, typically 1 litre cans or less and are disposable. For storage reasons, and in order to keep the packaging of such pressurized cans as compact as possible, the valve stem is usually straight and rather short in length. This renders such cans quite impractical for use as such because actuation is difficult on a short valve stem, and accuracy of dispensing in intricate places is quite insufficient. For this reason, these cans are often provided with a separate dispensing adapter comprising, on the one hand, actuating means to facilitate the actuation of the valve and, on the other hand, a longer, sometimes orientable dispensing duct, allowing a more accurate and localised dispensing of the liquid. Different types of such dispensing adapters are available; in particular disposable dispensing adapters, which are sold together with a can and are particularly suitable for DIY users, which should be distinguished from reusable dispensing guns, usually used by professional workers, which are sometimes equipped with their own pressure supply means.

[0006] Cheap, disposable dispensing adapters for DIY applications are usually fixed directly onto the valve stem. Snap-fit systems, bayonet systems and the like are often used, but these connection systems have the disadvantage that they require the application of a pressure onto the valve stem to fix the dispensing adapter, which often results in undesired spillage of some of the content of the pressurized can upon fixing the adapter. This problem can be solved by providing the valve stem with an external threaded portion and fixing the dispensing adapter with a mating internal threaded portion on the valve, as disclosed e.g., in Figure 5 of WO9617795.

[0007] Dispensing guns, on the other hand, are often screwed in place onto a threaded portion on the can itself, on an insert, or directly on the cup - not on the valve stem - in order to guarantee a greater stability thereof, and the dispensing duct of the dispensing gun is brought in fluid communication with the valve stem through a connecting end. Sealing means are provided either on the valve itself (e.g., the grommet) or on the skirt forming the gun connecting end, such as an O-ring or a gasket. One embodiment of such geometry is illustrated in Figure 4 of WO9617795, wherein the sealing means are formed by the valve grommet comprising a number of rubber flanges.

[0008] This means that a valve stem having an external threaded portion suitable for fixing a disposable dispensing adapter cannot be used for fixing a dispensing gun which is to be screwed directly onto the can, because a tight seal cannot be formed between a connecting end of the dispensing gun and the valve stem comprising an external threaded portion. This apparently trivial problem is a major issue for valve manufacturers which must run separate production lines, storage and distribution facil-

ities depending on the type of application: cans to be used with a disposable adapter wherein the valve stem comprises an external threaded portion and those to be used with a dispensing gun for more professional applications, which require a smooth valve stem to ensure gas tightness.

[0009] The present application proposes a solution to this problem, allowing the same valve stem to be optimally suitable for both types of dispensing cans, used by DIY users with disposable dispensing adapters, and by professionals using dispensing guns. This and other advantages will be explained in the next sections.

Summary of the invention

[0010] The present invention is defined in the appended independent claims. Preferred embodiments are defined in the dependent claims. In particular, the present invention concerns a solution for easily connecting a dispensing adapter to the valve of a pressurized container without inadvertently spilling any of the content thereof and ensuring a tight joint between the two. In particular, the present invention concerns a valve stem for use in an aerosol type dispensing valve, said valve stem comprising:

- (a) a hollow tubular portion defining a central bore, with a first open end opening to ambient and a second, opposite end being closed by
- (b) a circular end base of diameter greater than the diameter of the valve stem, and
- (c) at least one opening located on a wall of the tubular portion adjacent the end base and connecting the central bore with ambient,

Characterized in that, the central bore comprises an internal thread at least in the portion adjacent the first end opening.

[0011] In order to optimize collaboration and tightness with a grommet and an external dispensing adapter when mounted on a pressurized can, it is preferred that the tubular portion of the valve stem further comprises an external trunco-conical flange with the sloping face thereof facing towards the first open end.

[0012] The present invention also concerns a pressurized container comprising a dispensing valve, said valve comprising:

- (a) a grommet made of a resilient material, forming a seal between the container and,
- (b) a valve stem as defined supra,

wherein the seal between grommet and valve stem can be disrupted by tilting and/or pressing the valve stem.

[0013] With valve stems provided with an external trunco-conical flange, it is preferred that the top of the grommet rests on the flat, lower side of the flange to ensure gas tightness. The pressurized containers according to

the present invention are particularly suitable for containing under pressure and dispensing a liquid reactive with moisture, such as a polyurethane precursor.

[0014] The present invention also concerns a dispensing adapter suitable for being connected to the dispensing valve of a pressurized container as discussed above, said adapter comprising:

- (a) A hollow dispensing tube with a first, dispensing end and a second, connecting end,
- (b) Actuating means fixed at one end to the dispensing tube and allowing the actuation of the valve when in place,

wherein the second, connecting end of the dispensing tube comprises an external thread.

[0015] In order to apply a compressive force component onto the valve upon actuating the actuating means and to enjoy a high couple, it is preferred that the dispensing adapter of the present invention further comprises a gripping means fixed at one end to the dispensing tube substantially opposite the actuating means, a second end of said gripping means being suitable for gripping a flange of a pressurized container while the second connecting end of the dispensing tube is screwed on the dispensing valve of said container. Note that in the absence of said gripping means, a flexural strain is mostly applied to the valve upon actuation of the actuating means.

[0016] The dispensing tube of the dispensing adapter is generally not straight and the orientation of the first, dispensing end is preferably variable to enhance the comfort and precision of use.

[0017] The present application also concerns the combination of a pressurized container with a dispensing adapter as discussed above, in the form of a kit of parts for dispensing a liquid out of a pressurized container comprising:

- (a) A pressurized container as discussed above;
- (b) A dispensing adapter as discussed above;

[0018] Such that the internal thread of the valve stem mates the external thread of the second connecting end of the adapter.

[0019] With stem valves provided with an external trunco-conical flange, it is preferred that the dispensing adapter comprises a mating surface allowing the formation of a tight seal with the stem valve when the second connecting end of the adapter's dispensing tube is screwed in the stem valve.

[0020] With an adapter provided with gripping means as discussed supra, said gripping means is advantageously used to form a lever to facilitate actuation of the valve, said lever consisting of a fixed point formed by the gripping point between the container's flange and the adapter's gripping means and extending to the actuating means, with the second, connecting end of the dispensing

ing tube being located between these two points.

[0021] The present invention also concerns a method for dispensing a liquid out of a pressurized can, comprising the following steps,

- (a) Providing a kit of parts as discussed in the foregoing;
- (b) Screwing the external thread of the dispensing adapter onto the internal thread of the valve stem,
- (c) Press with the fingers the actuating means of the dispensing adapter by hand with the dispensing end thereof oriented towards a target, and
- (d) Dispensing the liquid onto the target.

[0022] The present invention allows the fixing of a dispensing adapter to a pressurized can in view of a more accurate dispensing, said fixing being gas tight, easy to achieve, and reducing substantially the risk of inadvertent spraying of the content of the can upon fixing the adapter. These and other advantages of the present invention are described in more details in the next sections.

Brief description of the Figures

[0023] For a fuller understanding of the nature of the present invention, reference is made to the following detailed description taken in conjunction with the accompanying drawings in which:

Figure 1: shows an embodiment of a valve according to the present invention

Figure 2: shows an embodiment of a disposable dispensing adapter according to the present invention: (a) separate from the valve, and (b) connected to the valve.

Figure 3: shows an embodiment of a disposable dispensing adapter according to the present invention comprising gripping means: (a) 3D view, and (b) 2D cut.

Figure 4: shows side views of two embodiments of disposable dispensing adapters connected to the valve stem of a can (a) without and (b) with gripping means.

Detailed description of the invention

[0024] The present invention concerns a valve stem for use in a valve of a pressurized container, preferably a tilt valve, actuated mostly by tilting, or a gun valve, actuated mostly by pressing down. Preferably the valve is used for dispensing a moisture reactive liquid composition, such as one or two component polyurethane foam compositions. As illustrated in the embodiments of Figures 1, a valve of the present invention is of the type comprising a valve stem (1), a grommet (2), and a valve cup (3)

Valve stem (1)

[0025] A valve stem (1) comprising a hollow tubular portion (1A) defining a central bore (1 C), said valve stem with a first end opening to ambient and a second, opposite end being closed by a substantially circular end base (1B). The tubular portion of the valve stem (1) preferably comprises a flange (1 D) for holding the grommet (2) in place (defined below) and for forming a tight seal with a disposable dispensing adapter (5). The upper side of the flange, i.e., looking away from the can, is preferably of trunco-conical geometry to enhance the seal with the dispensing adapter.

[0026] The central bore (1C) of the valve stem comprises at least one lateral opening (1 E) on the tubular portion (1A) adjacent the end base (1B), remote from the first end opening, thus creating a fluid communication between the two ends of the valve stem.

[0027] According to the present invention, the central bore (1C) of the valve stem comprises an internal threaded portion for fixing a disposable dispensing adapter directly onto the valve, without having to press the valve down in order to snap fit it into place.

Grommet (2)

[0028] The valve of the present invention comprises a grommet (2) made of a resilient material such as an elastomer. It serves to ensure gas tightness of the valve forming a seal with, on the one hand, the valve stem (1) and, on the other hand, with the cup opening (defined below). The grommet has a hollow tubular portion (2A) defining a central through bore that snugly and tightly surrounds the portion of the tubular section of the valve stem (1A) comprised between the stem flange (1 D) and the stem end base (1B), and at a first end facing the interior of the container it comprises an annular flange portion (2B) of diameter greater than the diameter of the valve stem base (1 B), the lower surface of the flange portion (2B) sealing against the top surface of the valve stem flange (1 B).

[0029] The grommet (2) can be made of any elastomer having the required mechanical and chemical resistance, such as neoprene or thermoplastic elastomer (TPE).

[0030] The bottom section of the central bore of the grommet (2) may comprise a recess to clear the at least one opening (1 E) of the valve stem (1).

Valve cup (3)

[0031] The valve of the present invention comprises a cup (3) for tightly closing the container. The cup is made of a thin, generally circular, plate comprising a first, inner surface (3in) and a second, outer surface (3out). The cup is provided with a through opening located substantially at the centre of the cup. The grommet protrudes on both sides of said through opening and ensures gas tightness of the system. The opening of the cup preferably comprises a rounded edge in order to substantially reduce

wear of the grommet (2) against said edge upon use of the valve.

[0032] As illustrated in Figure 4, the peripheral edge (3B) of the cup is suitable for sealingly fixing to the top opening of a container. The cup (3) may be made of stainless steel, aluminium, a lower grade steel or other material, possibly coated against oxidation and for aesthetic reasons, such as a steel plate coated with tin.

[0033] The container preferably comprises a flange (7G) suitable for gripping the gripping means (5G) of the dispensing adapter (5). The flange (7G) may be provided directly on the cup, e.g., where it is connected to the can opening, or it may be part of an insert (7) fixed to the cup, as illustrated in Figure 4. Preferably, the insert (7) also comprises an external threaded portion suitable for fixing a dispensing gun directly onto the can and not onto the valve.

[0034] In order to reduce the ratio of the height to the volume of the container, H/V it is preferred that the cup (3) comprises a substantially flat section (3A) between the central through bore and the peripheral edge (3B), so as to not intrude deep into the volume of the container.

Use of a tilting valve or gun valve

[0035] At rest, the valve when mounted on a pressure vessel such as an aerosol can, is gas tight. All interfaces between grommet and cup, and between grommet and valve stem are sealed, such that there is no fluid communication between the interior of the can and ambient. The internal pressure of the container ensures that the base (1B) of the valve stem is pressed tight against the lower surface of the flange (2B) of the grommet, which in turn is in sealing contact with the inner surface (3in) of the cup. Upon tilting and/or pressing down the valve stem (1), the grommet (2) is bent and compressed as illustrated in Figure 1(b) and the seal between the base (1B) of the valve stem and the lower surface of the flange (2B) of the grommet is disrupted allowing the liquid contained in the container to flow out through the stem openings (1E) and through the bore (1C) to reach ambient at the valve stem outlet (see black arrow).

[0036] Tilting and/or pressing down the valve stem is impractical with such short and straight valve stem as illustrated in Figure 1. For this reason, a dispensing adapter is often used, comprising actuating means to facilitate actuation of the valve (i.e., by tilting and/or pressing down) and a dispensing duct to increase the dispensing accuracy and allowing dispensing in more intricate places. Two main types of such dispensing adapters can be distinguished: (a) disposable dispensing adapters which are delivered together with each can, and (b) dispensing guns which can be reused and are more suitable for professional users. The valves and pressurized cans of the present application can be used indifferently with both types of dispensing adapters.

Disposable dispensing adapter.

[0037] A dispensing adapter according to the present invention comprises:

- (a) A hollow dispensing tube (5C) with a first, dispensing end (5out) and a second, connecting end (5in),
- (b) Actuating means (5A) fixed transverse to the dispensing tube and allowing the actuation of the valve when in place,

[0038] The second, connecting end (5in) of the dispensing tube (5C) of a dispensing adapter according to the present invention comprises an external thread (5F), mating the internal threaded portion (1F) of the valve stem it is to be connected to. This configuration is advantageous in many aspects.

[0039] First, it is easier for non-professional users, not necessarily used to handle such pressurized cans, to connect the disposable dispenser (5) to the valve without inadvertently actuating the valve during the process. This is clearly an advantage over snap fit or bayonet systems. The present invention is also advantageous over screwing systems consisting of a valve stem comprising an external threaded portion and a dispensing duct end (5in) comprising an inner thread for the following reasons.

[0040] Second, the connecting end of a corresponding dispensing adapter must comprise a skirt comprising an inner threaded portion to fit the outer threaded portion of the valve stem. This skirt may limit the tilting and/or pressing freedom of the valve, in particular if the cup is deep or an insert (7) is used.

[0041] Third, in order to have a satisfactory connection between the dispensing adapter and the valve stem, the threaded portion must have a minimal length, which may disadvantageously increase the length of the valve stem in case the threaded portion is external to the valve stem, whilst this is not an issue when the threaded portion is internal since the through bore is longer than the valve stem portion extending beyond the grommet outside the container.

[0042] Fourth, the same valve stem can be used indifferently with a disposable adapter and with a dispensing gun, the former requiring a threaded portion to fix the disposable adapter to the valve, and the latter requiring a smooth valve stem outer wall for creating a sealing contact between gun and valve.

[0043] The actuating means (5A) of the dispensing adapter (5) is preferably in the shape of a handle extending transversally from the dispensing tube and adapted for being grabbed by the fingers while the thumb and hand palm hold the can. By pressing down the actuating means by closing the fist, the valve is tilted with little effort in view of the substantial leverage offered by the actuating means (5A). To this effect, the actuating means may be provided with an ergonomic handle to ensure good grip and prevent slippage of the fingers, in particular fore-

finger and middle finger.

[0044] In a preferred embodiment, the dispensing adapter of the present invention further comprises a gripping means (5B, 5G) fixed transverse to the dispensing tube substantially opposite the actuating means (5A), a second gripping end (5G) of said gripping means being suitable for gripping a flange (7G) of a pressurized container while the second connecting end (5in) of the dispensing tube is screwed on the dispensing valve of said container (6). The gripping end (5G) of the gripping means (5B) may consist of a hook like structure suitable for being hooked onto a recess located below a flange (7G) of the can structure. For example, the can structure may comprise an annular insert (7) as illustrated in Figure 4, fixed on the can cup (3) and comprising a flange (7G) preferably provided with a recess to allow good grip by the gripping end (5G) of the gripping means (5B) of the dispensing adapter. The insert (7) may also comprise an external threaded portion (7F) for allowing the fixing of a dispensing gun as used by professionals. When the gripping means are in gripping position a fixed hinge point is formed at the level where the gripping end (5G) is engaged into the flange (7G) of the can structure and actuation of the actuating means will create a cantilever bending of the adapter which applies a combination of flexing and compression forces onto the valve. The application of a compressive force component onto the valve upon actuating a tilting valve has the advantage of relieving the stress applied by the valve stem end (1 B) onto the grommet flange (2B) upon tilting the valve stem (1).

[0045] In an advantageous embodiment, the orientation of the dispensing duct (5C) of the dispensing adapter (5) can be varied, such as by allowing some bending of the duct, e.g., with a bellow as in straws for sodas, or by allowing some rotation of the dispensing duct with respect to the container.

[0046] The combination in a same package of a pressurized can comprising a valve with a valve stem (1) provided with an internal threaded portion (1 F) as discussed above and a dispensing adapter with a connecting end provided with a mating internal threaded portion (5F) as discussed supra is advantageous in that the same package can be sold to occasional DIY consumers who can use the pressurized can with the disposable adapter supplied therewith, and to professionals who prefer to use a more sophisticated dispensing gun for carrying out their work. Such package or kit, is particularly suited for dispensing liquids reactive to moisture, such as a polyurethane precursor.

[0047] The tubular portion (1 A) of the valve stem (1) preferably comprises a flange (1 D) for holding the grommet (2) in place. In a preferred embodiment, the top surface of said flange (1D) -i.e., the surface facing the dispensing outlet side- is trunco-conical. This geometry enhances the gas tightness of the connection between the valve stem and the dispensing adapter (5) if the connecting end (5in) of the latter is provided with a mating trunco-

conical recess, which can be brought in sealing contact with the top surface of the valve stem flange (1 D) upon screwing the adapter onto the valve stem.

[0048] The present kit can be very easily used for dispensing a liquid out of the container, by simply:

- (a) Providing a kit of parts as discussed above;
- (b) Screwing the external thread of the dispensing adapter (5) onto the internal thread of the valve stem (1),
- (c) Press with the fingers the actuating means of the dispensing adapter by hand with the dispensing end thereof oriented towards a target, and
- (d) Dispensing the liquid onto the target.

[0049] The screwing of the external thread of the dispensing adapter (5) onto the internal thread of the valve stem (1) reduces the risk of any undesired spillage of the can content since no pressure is required to connect it, and the user keeps a good view throughout the connecting operation on the inlet of the valve stem central bore (1C) and on the relative alignment of the dispensing adapter (5) with the valve stem. Conversely, if a user desires to connect a dispensing gun onto the valve, it can do so as is usual with no sealing issues at the valve level due to uneven walls of the valve stem. This way, all consumers, amateur DIY and professionals can purchase the same can and use it as best fits them, either with a disposable dispensing adapter supplied with the can, or with a separate dispensing gun.

Claims

1. Valve stem (1) for a tilting valve or gun valve in an aerosol type dispensing can, said valve stem comprising:

- (a) a hollow tubular portion (1A) defining a central bore (1C), with a first open end opening to ambient and a second, opposite end being closed by
- (b) a circular end base (1 B) of diameter greater than the diameter of the valve stem (1), and
- (c) at least one opening (1 E) located on a wall of the tubular portion (1 A) adjacent the end base (1 B) and connecting the central bore (1 C) with ambient,

Characterized in that, the central bore (1 C) comprises an internal thread (1 F).

2. Valve stem according to claim 1, wherein the tubular portion (1A) further comprises an external trunco-conical flange with the sloping face thereof facing towards the first open end.

3. Pressurized container (6) comprising a dispensing

valve, said valve comprising:

- (a) a grommet (2) made of a resilient material, forming a seal between the container and,
- (b) a valve stem (1) according to claim 1 or 2,

Wherein the seal between grommet (2) and valve stem (1) can be disrupted by tilting and/or pressing the valve stem (1).

4. Pressurized container (6) according to the preceding claim, further comprising an external threaded portion on the can structure suitable for fixing thereon a dispensing gun, said threaded portion being preferably provided on an insert fixed to the can cup (3).
5. Pressurized container (6) according to claim 3 or 4, containing a liquid reactive with moisture, such as a polyurethane precursor.
6. Dispensing adapter (5) suitable for being connected to the dispensing valve of a pressurized container (6) according to any of claims 3 to 5, said adapter comprising:
 - (a) A hollow dispensing tube (5C) with a first, dispensing end (5out) and a second, connecting end (5in),
 - (b) Actuating means (5A) fixed transverse to the dispensing tube and allowing the actuation of the valve when in place,

Characterized in that, the second, connecting end (5in) of the dispensing tube comprises an external thread (5F).

7. Dispensing adapter according to the preceding claim, further comprising a gripping means (5B, 5G) fixed transverse to the dispensing tube substantially opposite the actuating means (5A), a second end (5G) of said gripping means being suitable for gripping a flange (7G) of a pressurized container while the second connecting end (5in) of the dispensing tube is screwed on the dispensing valve of said container (6).
8. Dispensing adapter according to claim 6 or 7, wherein the dispensing tube is not straight and the orientation of the first, dispensing end can preferably be varied.
9. Kit of parts for dispensing a liquid out of a pressurized container comprising:
 - (a) A pressurized container according to any of claims 3 to 5;
 - (b) A dispensing adapter according to any of claims 6 to 8;

Such that the internal thread of the valve stem (1) mates the external thread of the second connecting end of the adapter (5).

10. Kit of parts according to the preceding claim, wherein the tubular portion (1A) of the valve stem (1) further comprises an external trunco-conical flange with the sloping face thereof facing towards the first open end and the dispensing adapter comprises a mating surface allowing the formation of a tight seal with the stem valve when the second connecting end of the adapter's dispensing tube is screwed on the stem valve.
11. Kit of parts according to claim 9 or 10, wherein the adapter is according to claim 6 and a lever is formed to facilitate actuation of the valve, said lever consisting of a fixed point formed by the gripping point between the container's flange and the adapter's gripping means and extending to the actuating means, with the second, connecting end of the dispensing tube being located between these two points.
12. Kit of parts according to any of claims 9 to 11, wherein the container contains a liquid reactive to moisture, such as a polyurethane precursor.
13. Method for dispensing a liquid out of a pressurized can, comprising the following steps,
 - (a) Providing a kit of parts according to any of claims 9 to 12;
 - (b) Screwing the external thread of the dispensing adapter onto the internal thread of the valve stem (1),
 - (c) Press with the fingers the actuating means of the dispensing adapter by hand with the dispensing end thereof oriented towards a target, and
 - (d) Dispensing the liquid onto the target.

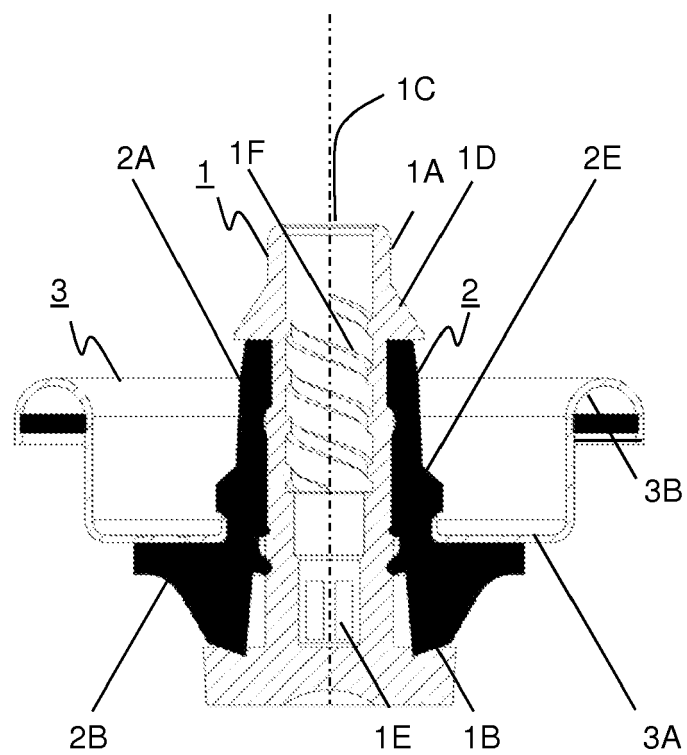


FIGURE 1

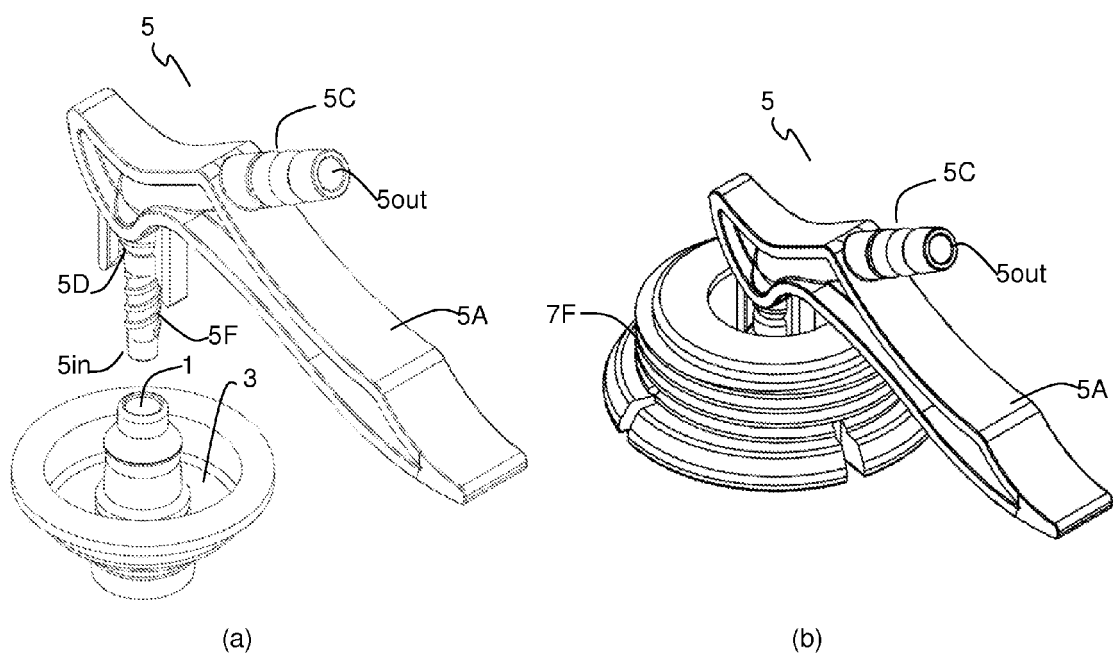


FIGURE 2

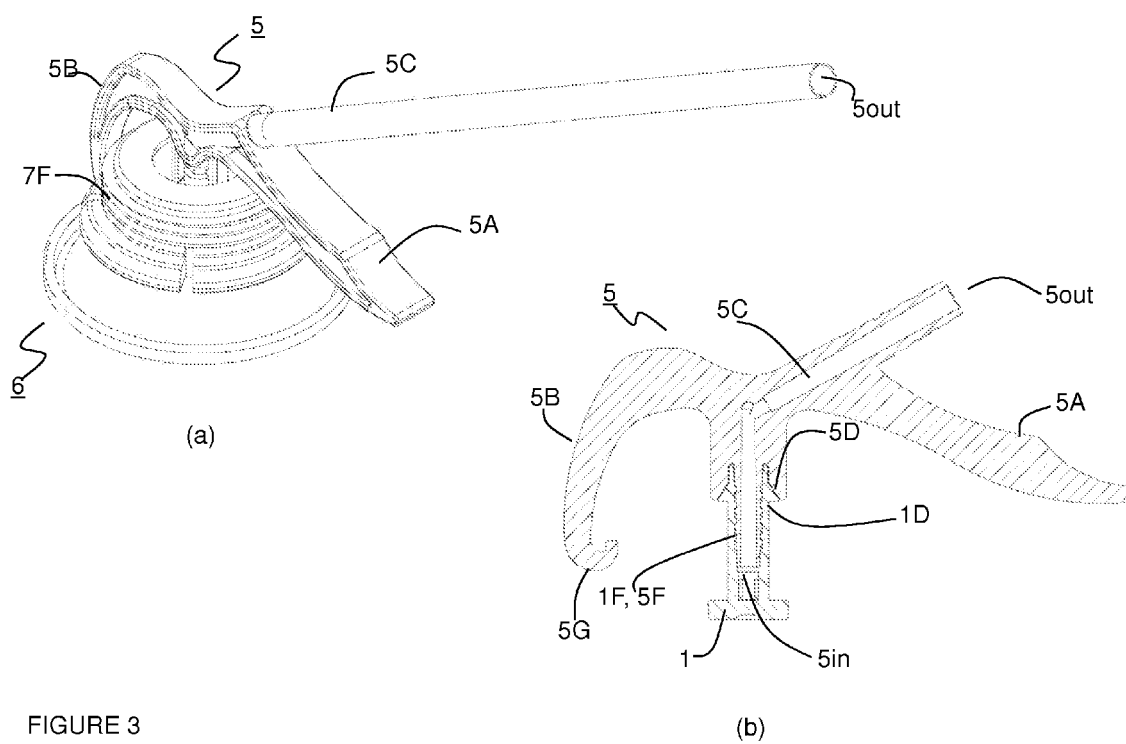


FIGURE 3

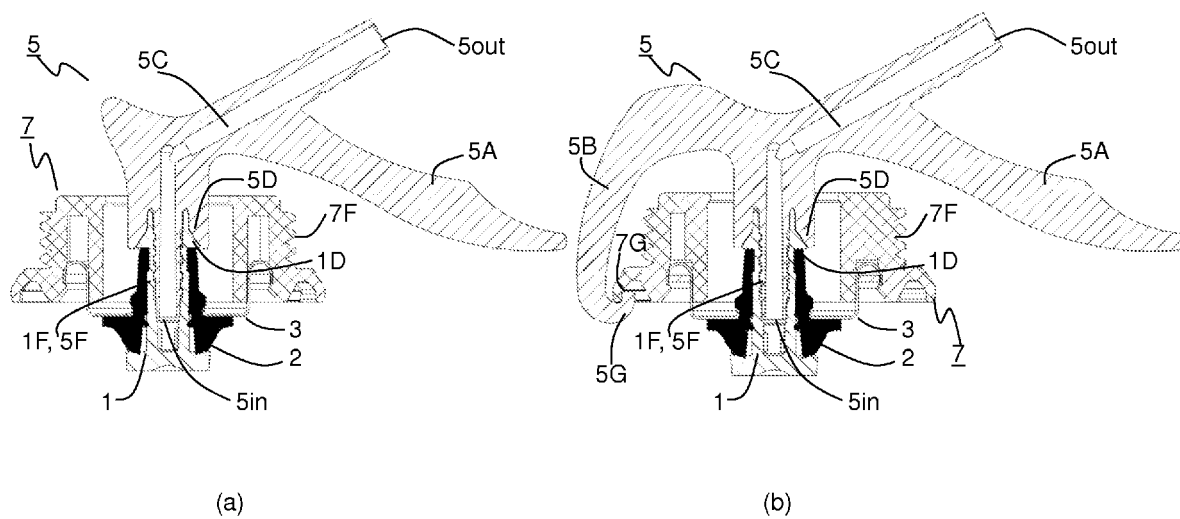


FIGURE 4



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 4068

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/048843 A1 (YERBY PATRICK T [US] ET AL YERBY PATRICK TIMOTHY [US] ET AL) 9 March 2006 (2006-03-09)	1,3,5	INV. B65D83/14 B65D83/16
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 May 2011	Examiner Lostetter, Yorick
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