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(54) Valve stem comprising a sealing layer

Ventilschaft mit Dichtungsschicht

Tige de vanne comprenant une couche d'étanchéité

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(56) References cited:
WO-A1-2005/102867 **WO-A1-2009/042206**
JP-U- 58 124 257

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a new valve stem for a pressurized fluid container, more particularly for one and two component polyurethane foam applications.

BACKGROUND OF THE INVENTION

[0002] Pressurized fluids stored in containers (cans or vessels) are used in a wide field of applications. Sprayable foams are used for several industrial applications as well as by hobbyists. One well known example of sprayable foam is polyurethane foam. Polyurethanes are used in high resiliency flexible foam seating, rigid foam insulation panels, microcellular foam seals and gaskets, durable elastomeric wheels and tires, electrical potting compounds, high performance adhesives and sealants, Spandex fibres, seals, gaskets, carpet underlay, hard plastic parts, etcetera.

[0003] The elaborate use of the pressurized fluids brings along some practical concerns. When the user wishes to dispense the product from the aerosol can, the upstanding valve stem is tilted or may be vertically depressed, thus having a portion of the stem base upper surface separate from sealing the bottom surface of the grommet. The polyurethane product is then forced by propellant pressure in the aerosol can to flow between the separated surfaces through the valve stem side lateral openings and up through the stem central bore to exit the aerosol valve to the area where the polyurethane foam is being applied.

[0004] Aerosol valves have been widely adopted, but many are known to have a problem of occasional valve sticking when used to dispense polyurethane aerosol foam. Polyurethane foam after it is dispensed from the can and valve will of course desirably cure and harden. However, small amounts of product which rests between the grommet and the stem base is also subject to curing and hardening and results in sticking of the stem base to the grommet and hence in failure of the valve operation. Furthermore, if moisture is present in the can, this curing will begin to occur in the can itself and can result in a stuck aerosol valve such as to render the purchased product useless to the consumer. A source of moisture occurring in the aerosol can of the polyurethane product is believed to be environmental moisture in the air outside the can. This moisture can permeate the grommet seal due to the portion of the grommet extending into the environment outside the can and mounting cup. Since a portion of the grommet seal also extends inside the can under the mounting cup, the permeated moisture can egress from the grommet inside the can to come in contact with the active ingredient of the polyurethane product inside the can. Thus, curing and hardening may begin inside the can resulting in the stuck aerosol valve and the failed product.

[0005] Thus, it is to be avoided that small amounts of product which rests between the grommet and the stem base and being subject to curing and hardening results in sticking of the stem base to the grommet and hence in failure of the valve operation. When the product comes into contact with the stem material, often the stem material is subject to swelling. This will eventually cause failure in proper sealing and causes gas loss. The shelf life of the product is hence decreased.

[0006] Further, it is known that water diffusion through the grommet is responsible for the stickiness/blocking of the valve stem, when moisture reactive products, such as OCF (one component foam), are stored in these types of containers. It is of utmost importance that the sealing between the grommet and the stem is perfect and thus does not allow moisture to enter the container. Even the smallest amount of moisture entering the container via the grommet must be prevented by the sealing between the stem and the grommet.

[0007] Various attempts have been made to overcome the above problem, such as by a mechanical structure or by using at least in part a grommet material which is not susceptible to moisture ingress and egress. These attempts are not particularly successful and/or costly to use in manufacturing the aerosol valve, etc.

[0008] Stem protection in a valve for a container has already been disclosed in W02009/042206. The invention is intended to provide a solution to the above problem of environmental moisture permeating the grommet seal and entering the can of polyurethane product. The invention discloses an aerosol valve for dispensing polyurethane foam including a plastic liner shield to prevent environmental moisture permeating through the sealing grommet into the aerosol can to harden product and disable the valve. The liner has an annular upper portion in the mounting cup channel for sealing to the can bead, an intermediate portion surrounding the grommet in the can, and a lower annular flange extending between the valve stem base and lower grommet surface.

[0009] Although W02009/042206 prevents moisture to enter the container, the problem of small amounts of product resting between the grommet and the stem base and subject to curing and hardening still results in sticking of the stem base to the grommet and hence in failure of the valve operation. Another drawback is that it is difficult to produce the valve in a simple and cost efficient manner when the liner needs to be incorporated in the valve member.

[0010] In WO2006032061, which discloses the features of the preamble of claims 1 and 13, an improved valve member is presented, whereby said valve member is made of a glass filled polyolefin. The polyolefin is preferably a polyethylene. The valve stem is made of PEGF. Although glass-filled polyethylene valve stems show superior resistance to sticking over valve stems of other material, the production of a valve stem which additionally comprises glass fiber over the traditional stem ma-

terial requires an additional amount of energy and is thus not ecological and more expensive. Another drawback of a stem which is reinforced with glass fiber is that the production is not healthy, as glass fiber is harmful by inhalation or ingestion, and also via skin contact. Health effects from exposure to glass fibers can be different depending on the fiber size and type of exposure. Glass fibers have been found to cause skin, eye and upper respiratory tract irritation. There are other possible health effects such as rash, redness and irritation of eyes, soreness in the nose and throat can result when fibers are inhaled, asthma and bronchitis can be aggravated by exposure to glass fibers, and there is a chance of temporary stomach irritation may occur if fibers are swallowed. Further, smaller fibers have the ability to reach the lower part of the lungs increasing the chance of adverse health effects. People who work with fiberglass or who have worn-out duct work lined with glass fibers in their homes or workplace may have long-term exposure to fiberglass. It is thus advised not to produce stems for valves which are reinforced with glass fibers.

[0011] Given the above drawbacks, it is now an objective of the present invention to provide a valve stem with sticking resistance properties for a container dispensing a pressurized fluid.

[0012] It is a further objective to provide a valve stem for a container dispensing pressurized fluids that provides sufficient dimensional stability by reducing the swelling of the stem material causing gas loss. By minimizing the gas loss, the shelf life of the product is increased. Further, it is an objective of the present invention to produce the stem in a manner that does not compromise a person's health.

[0013] It is yet another objective to provide a valve comprising a valve stem which maximizes closure between the valve stem and the grommet in order to minimize the water diffusion that is causing stickiness and blockage of the valve.

[0014] None of the prior art discloses the valve stem according to the present invention nor do these documents suggest the presently obtained benefits associated therefrom.

SUMMARY OF THE INVENTION

[0015] The present invention is directed to a stem for a valve for dispensing pressurized fluids. The valve stem comprises a hollow stem body having a first open end, and a second end closed by a stem base forming a flange, wherein at least the face of the flange adjacent said stem body comprises an additional layer.

[0016] The present invention is also directed to a valve comprising said stem and towards a container for dispensing a pressurized fluid comprising a valve with said valve stem.

[0017] The present invention is further directed to a method for producing said stem for valve by means of dual injection molding.

DESCRIPTION OF THE INVENTION

[0018] The present invention is directed to a valve stem comprising a hollow stem body having a first open end, and a second end closed by a stem base forming a flange, **characterized in that** at least the face of the flange adjacent said stem body comprises an additional layer.

[0019] It is an objective of the present invention to provide a mechanism for preventing the valve stem in a pressurized dispensing container from sticking. The problem arises in pressurized dispensing containers where the product dispensed, such as PU foam, gets between the grommet and the valve stem, particularly the stem base. The product dries or cures and creates a seal or adhesion between the outside of the valve stem and the grommet. When that occurs, it becomes difficult to displace the stem relative to the cup. Such displacement of the stem is needed to allow the product inside the container to enter the orifices of the stem and thus for product dispensing. Further, when moisture enters the container through the grommet, the foam can harden against the stem base, which also causes failure of the valve function. Further, the stem base material is subject to swelling when it comes into contact with the product, causing loss of dimensional stability, gas loss and thus a decreased product shelf life.

[0020] It has now been surprisingly found that in order to prevent stickiness/blocking of the valve stem, the valve stem base can be protected with an additional layer. The additional layer covers at least the face of the flange adjacent the stem body, which is in close contact with the grommet, whereby sticking of the product between the grommet and stem base is avoided. The additional layer thus prevents sticking of the stem base when the PU foam cures or hardens between the stem base and the grommet which makes activation of the valve impossible.

[0021] The additional layer offers more resistance to stickiness than all other stems lacking an additional layer. The additional layer further provides dimensional stability as the stem base is less prone to swelling. Dimensional stability and good closure between the stem base and the grommet reduces gas loss and thus increases the shelf life of the container containing the product to be dispensed.

[0022] More preferably, the stem base further comprises an additional layer at the face of the stem base opposite the stem body to further prevent curing of the product against the stem base. In another preferred embodiment of the present invention, the stem base comprises an additional layer covering the whole surface of the stem base external of the stem body, so that all contact of the stem base with the product is avoided. In this way, it is not possible that the foam cures out between the face of the flange of the stem base and the grommet and around the stem base, whereby activating the stem is made impossible.

[0023] The additional layer is preferably made of any of polyethylene (PE). This is a soft material but has good

stickiness resistance qualities. Further, the stem base is preferably made of thermoplastic materials such as polyoxymethylene (POM), polybutylene terephthalate (PBT) or polyolefin material, such as polyethylene (PE) or polypropylene (PP). It is known that the adhesion between PE and PP is very good, so no moisture ingress is possible and thus the product can not stick between the different materials.

[0024] The present invention is also directed to a valve comprising said stem and towards a container for dispensing a pressurized fluid comprising a valve with said valve stem. The present invention is further directed to a method for producing said stem for valve by means of dual injection molding.

[0025] It is a related purpose of this invention to achieve the main object in an inexpensive fashion with a design which does not modify or compromise the dispensing operation of the container. Further, because no glass fiber is needed to avoid sticking and blocking of the valve function, the stem can be produced in a safe and healthy manner.

[0026] An advantage of the valve stem according to the present invention is that the valve stem and the additional layer can be integrally molded, preferably dual injection molded. The additional layer therefore eliminates the problem of valve sticking in a simple manner. In addition, it has been found that the stem base protects the valve longer times to initial sticking and thus longer times to valve failure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Figure 1 schematically represents a valve for a container dispensing a pressurized fluid comprising a valve stem according the present invention;

Figure 2 schematically represents a valve stem comprising an additional layer molded over the stem base;

Figure 3 schematically represents a valve stem body;

Figure 4 schematically represents a container for dispensing a pressurized product through a valve engaged in a valve cup;

Figure 5 schematically represents a detailed view of a valve engaged in a valve cup mounted on a container;

Figure 6 schematically represents another embodiment of the present invention;

Figure 7 schematically represents another embodiment of the present invention;

Figure 8 schematically represents a foam applicator mounted onto the valve;

DESCRIPTION OF A PREFERRED EMBODIMENT

[0028] Referring to figure 1 and 2, and in accordance with the present invention, a stem (5) for a valve (3) is presented, the stem (5) comprising a hollow stem body (6) having a first open end, and a second end closed by a stem base (7) forming a flange, **characterized in that** at least the face of the flange adjacent said stem body (6) comprises an additional layer (8).

[0029] According to the present invention, and referring to figures 4 and 5, the valve (3) is designed to be clinched in the opening of the container dome (2) for controlled dispensing of a fluid from said container (1). The valve (3) comprises a grommet (4) defining a channel with an inlet end and an outlet end, whereby the stem (5) is slideably arranged in the channel. The valve (3) can be a tilting and/or a gun valve.

[0030] As illustrated in detail in figure 2 and 3, the stem (5) comprises a disk-shaped base (7) and an elongated conical protrusion extending therefrom, referred to as the hollow stem body (6). The conical shape of the stem body (6) enhances the strength of the stem (5). Said stem body (6) defines a dispensing channel (13) with an first open end, the outlet end (11) at the distal end of the body (6) and a second end, the inlet (12) closed by the flange of the stem base (7). The inlet (12) is defined by at least one hole or orifice (12') in the elongated conical protrusion adjacent the disk-shaped base (7). The stem (5) comprises a disk-shaped additional layer (8), provided at the face of the flange adjacent the stem body (6). The additional layer (8) preferably comprises protrusions in the stem base (7), as illustrated in detail in figure 2, to increase the sealing surface between the stem base (7) and the additional layer (8). The stem (6) further comprises a circular sealing lip (10) located near the distal end and preferably at least one tread (9) providing a way of sealing in case an adaptor or foam applicator (15) is mounted on the valve (3), as illustrated in figure 6.

[0031] In an assembled composition, the stem (5) is inserted into the channel of the grommet (4) whereby the grommet (4) is clamped between circular sealing lip (10) at the outlet end (11) and the disk-shaped base (7) at the inlet end (12) with orifices (12') of the channel. The stem (5) is hereby in sealing contact with the inner walls of the channel, which sealing is ascertained by, on the one hand the additional layer (8) abutting the shoulder portion of the grommet (4), and on the other hand the annular extending protrusion (14) abutting the hollow stem body (6) of the stem (5). It is noticed that when assembled, the orifices (12') defining the inlet (12) of the dispensing channel (13) are arranged opposite the grommet (4).

[0032] The additional layer (8) provides a mechanism for preventing the valve stem in a pressurized dispensing container from sticking. The product dispensed, such as PU foam, is avoided to stick between the grommet and the valve stem, particularly the stem base. When the product dries or cures, it is prevented from creating a seal or adhesion between the outside of the valve stem and the grommet. Further, the additional layer (8) prevents the foam from hardening against the stem base (7) when moisture enters the container (1) through the grom-

met (4), which also causes failure of the valve function.

[0033] In a preferred embodiment, the additional layer (8) is molded, preferably dual injection molded, on face of the flange adjacent the stem body (6). This is an inexpensive and efficient production method. Further, by covering the flange of the stem base (7), curing of the foam between the stem base (7) and the grommet (4), which makes the activation of the valve impossible, is avoided. The present invention is therefore directed to a method for producing a stem (5) for a valve (3)-comprising the steps of producing an elongated, hollow stem body (6) closed at one end by a stem base (7) forming a flange; and applying an additional layer (8) at least to the surface of the flange of the stem base (7) adjacent the stem body (6), **characterized in that** said steps (a) and (b) is performed by the technique of dual injection molding.

[0034] Further, the stem base material is subject to swelling when it comes into contact with the product, causing loss of dimensional stability, gas loss and thus a decreased product shelf life. As the additional layer (8) avoids curing of the foam, the stem base (7) is less prone to swelling. The additional layer (8) further provides dimensional stability between the grommet (4) and the stem base (7). Dimensional stability and good closure between the stem base (7) and the grommet (4) reduces gas loss and thus increases the shelf life of the container (1) containing the product to be dispensed. Use of polyethylene (PE) as layer material offers more resistance to stickiness than all other materials commonly used for stems. The additional layer (8) is thus an additional sealing between the grommet (4) and the stem base (7).

[0035] Further, the stem body (6) and/or stem base (7) are made of a hydrophobic thermoplastic material, such as polyoxymethylene (POM), polybutylene terephthalate (PBT) or polyolefin material, such as polyethylene (PE) or polypropylene (PP). These materials could additionally be strengthened by reinforcing additives. Natural fibers, such as wood fibers, can be used. Also synthetics fibers, such as cellulose, polymer or mineral fibers, such as glass fiber, can be used. The PE additional layer (8) assures good adhesion quality with the stem body material, preferably PP, so no moisture ingress is possible and thus the product can not stick between the different materials. Further, the additional layer (8) preferably comprises protrusions in the stem base (7), as illustrated in detail in figure 2 and 6, to increase the sealing surface, and thus the adhesion, between the stem base (7) and the additional layer (8).

[0036] As represented in figure 1, the valve (3) is meant to be incorporated in the opening of a container (2) whereby the inner wall portion of cup's (20) opening is fixedly clamped between the ring form and the annular extending protrusion (14) of the grommet (4), thereby providing a sealing function. It is further noticed that part of the grommet (4) preferably has an outer diameter larger than the inner diameter of the cup's opening, in order to help preventing the valve (3) from accidentally detaching from the cup (20).

[0037] In another preferred embodiment according to the invention, and as illustrated in figure 6, an additional layer (88) can be provided at the face of the stem base (7) opposite the stem body (6). Further, in another preferred embodiment of the present invention, and as illustrated in figure 7, the disk-shaped additional layer (888) covers the whole surface of the stem base (7) external of the stem body (6). Further, by covering the whole surface of the stem base (7), all contact between product and stem base is avoided. The additional layer thus prevents sticking of the stem base when the PU foam cures or hardens between the stem base and the grommet and also around the stem base, which could make the activation of the valve impossible.

[0038] The additional layer (8) enhances the stem strength without the need for additional reinforcement by glass fiber. Further, incorporation of glass fiber is an ecological demanding step, which does not only require an additional amount of energy, but also an additional cost. Further, the production of valves with materials incorporating glass fiber is not advised for the health.

[0039] In operation, the stem (5) can be slided between an open and closed position of the valve (3). In rest, the valve (3) is closed due to the resilience of the elongated hollow conical stem body (6), pressing the additional layer (8) molded on or around the disk-shaped part (7) of the stem (5) against the shoulder portion of the grommet (4). To open the valve (1), the stem (5) is pushed in a direction towards the container (1) whereby the inlet (12) of the dispensing channel (13) is in fluid communication with the container's inner space. Once the pressure on the stem (5) is released, it will be forced in a closed position again due to the snappy-ness of the grommet (4) and by the internal pressure of the container (1).

[0040] A foam applicator (15) for manual tilting is illustrated in figure 8. The foam applicator (15) comprises a conical adaptor valve base (17) with fitting onto the stem (5) by means of treads (9) on the stem body (6). The foam applicator (15) comprises a tilting concept having a body (18) and a lever (19) around the dispensing channel (13) of the stem (5). The foam applicator (15) further comprises a dispensing tube (16).

[0041] A person skilled in the art will understand that the examples described above are merely illustrative in accordance with the present invention and not limiting the intended scope of the invention. Other applications of the present invention may also be considered.

Claims

1. A stem (5) for a valve (3) comprising:

- a hollow stem body (6) having a first open end, and a second end closed by;
- a stem base (7) forming a flange;

characterized in that at least the face of the flange

adjacent said stem body (6) comprises an additional layer (8).

2. A stem (5) according to claim 1, wherein the face of the stem base (7) opposite said stem body (6) is also covered by an additional layer (8).

3. A stem (5) according to claim 2, wherein the additional layer (8) covers the whole surface of the stem base (7) external of the stem body (6).

4. A stem (5) according to any of the preceding claims, wherein the additional layer (8) is made of any of PE.

5. A stem (5) according to claim 1, wherein the stem body (6) and/or the stem base (7) is made of any of POM, PBT or polyolefins.

6. A stem (5) according to any of the preceding claims, wherein the stem body (6) and/or the stem base (7) is reinforced by natural or synthetic fibres.

7. A stem (5) according to any of the preceding claims, obtained by dual injection molding.

8. A stem (5) according to any of the preceding claims, further **characterized in that** said stem (5) is a tilting or gun stem.

9. A stem (5) according to any of the preceding claims, wherein the stem body (6) comprises at least one thread (9).

10. A stem (5) according to any of the preceding claims, further **characterized in that** said stem body (6) is conically shaped.

11. A valve (3) comprising a stem (5) according to any of the preceding claims.

12. A container (1) for dispensing a pressurized fluid comprising a valve (3) according to the preceding claim.

13. A method for producing a stem (5) for a valve (3)-comprising the steps of:

    a. Producing an elongated, hollow stem body (6) closed at one end by a stem base (7) forming a flange; **characterised by**
    b. applying an additional layer (8) at least to the surface of the flange of the stem base (7) adjacent the stem body (6);

wherein said steps (a) and (b) are performed by the technique of dual injection molding.

Patentansprüche

1. Schaft (5) für ein Ventil (3), umfassend:

    - einen hohlen Schaftkörper (6) mit einem ersten offenen Ende und einem zweiten Ende, das geschlossen wird durch:
    - einen Ventilfuß (7), der einen Flansch bildet;

dadurch gekennzeichnet, dass mindestens die Vorderseite des Flansches neben dem Ventilfuß (7) eine zusätzliche Schicht (8) umfasst.

2. Schaft (5) nach Anspruch 1, wobei die Vorderseite des Ventilfußes (7) gegenüber dem Schaftkörper (6) ebenfalls mit einer zusätzlichen Schicht (8) bedeckt ist.

3. Schaft (5) nach Anspruch 2, wobei die zusätzliche Schicht (8) die ganze Oberfläche des Ventilfußes (7) außerhalb des Schaftkörpers (6) bedeckt.

4. Schaft (5) nach einem der vorhergehenden Ansprüche, wobei die zusätzliche Schicht (8) aus einem beliebigen PE hergestellt wird.

5. Schaft (5) nach Anspruch 1, wobei der Schaftkörper (6) und/oder der Ventilfuß (7) aus einem von POM, PBT oder Polyolefin hergestellt wird.

6. Schaft (5) nach einem der vorhergehenden Ansprüche, wobei der Schaftkörper (6) und/oder der Ventilfuß (7) durch natürliche oder synthetische Fasern verstärkt wird bzw. werden.

7. Schaft (5) nach einem der vorhergehenden Ansprüche, der durch Doppelspritzgießen erzielt wird.

8. Schaft (5) nach einem der vorhergehenden Ansprüche, ferner **dadurch gekennzeichnet, dass** der Schaft (5) ein Kippschaft oder ein Spritzschaft ist.

9. Schaft (5) nach einem der vorhergehenden Ansprüche, wobei der Schaftkörper (6) mindestens ein Gewinde (9) umfasst.

10. Schaft (5) nach einem der vorhergehenden Ansprüche, ferner **dadurch gekennzeichnet, dass** der Schaftkörper (6) konisch geformt ist.

11. Ventil (3), umfassend einen Schaft (5) nach einem der vorhergehenden Ansprüche.

12. Behälter (1) zum Abgeben eines unter Druck stehenden Fluids, umfassend ein Ventil (3) gemäß dem vorhergehenden Anspruch.

13. Verfahren zum Herstellen eines Schafts (5) für ein

Ventil (3), umfassend folgenden Schritt:

a) Herstellen eines länglichen, hohlen Schaftkörpers (6), der an einem Ende durch einen Ventilfuß (7) geschlossen ist, der einen Flansch bildet;

gekennzeichnet durch:

b) Auftragen mindestens einer zusätzlichen Schicht (8) auf die Oberfläche des Flansches des Ventilfußes (7) neben dem Schaftkörper (6);

wobei die Schritte a) und b) **durch** die Technik des Doppelspritzgießens ausgeführt werden.

Revendications

1. Tige (5) pour une soupape (3) comprenant :

- un corps de tige creux (6) ayant une première extrémité ouverte et une seconde extrémité fermée par
- une base de tige (7) formant une bride ; **caractérisée en ce qu'**au moins la face de la bride adjacente à ladite base de tige (7) comprend une couche supplémentaire (8).

2. Tige (5) selon la revendication 1, dans laquelle la face de la base de tige (7) opposée audit corps de tige (6) est également recouverte d'une couche supplémentaire (8).

3. Tige (5) selon la revendication 2, dans laquelle la couche supplémentaire (8) recouvre toute la surface de la base de tige (7) extérieure du corps de tige (6).

4. Tige (5) selon l'une quelconque des revendications précédentes, dans laquelle la couche supplémentaire (8) est constituée d'un PE quelconque.

5. Tige (5) selon la revendication 1, dans laquelle le corps de tige (6) et/ou la base de tige (7) est constitué (e) d'un matériau quelconque parmi le POM, le PBT ou les polyoléfines.

6. Tige (5) selon l'une quelconque des revendications précédentes, dans laquelle le corps de tige (6) et/ou la base de tige (7) est renforcé(e) par des fibres naturelles ou synthétiques.

7. Tige (5) selon l'une quelconque des revendications précédentes, obtenue par un moulage à double injection.

8. Tige (5) selon l'une quelconque des revendications précédentes, ultérieurement **caractérisée en ce que** ladite tige (5) est une tige d'inclinaison ou de pistolet.

9. Tige (5) selon l'une quelconque des revendications précédentes, dans laquelle le corps de tige (6) comprend au moins un filetage (9).

10. Tige (5) selon l'une quelconque des revendications précédentes, ultérieurement **caractérisée en ce que** ledit corps de tige (6) est de forme conique.

11. Soupape (3) comprenant une tige (5) selon l'une quelconque des revendications précédentes.

12. Récipient (1) pour distribuer un fluide pressurisé comprenant une soupape (3) selon la revendication précédente.

13. Procédé de production d'une tige (5) pour une soupape (3) comprenant les étapes consistant à :

a. produire un corps de tige creux, allongé (6), fermé à une extrémité par une base de tige (7) formant une bride ; **caractérisé par**
b. l'application d'une couche supplémentaire (8) au moins sur la surface de la bride de la base de tige (7) adjacente au corps de tige (6) ;

dans lequel lesdites étapes (a) et (b) sont réalisées par la technique de moulage à double injection.

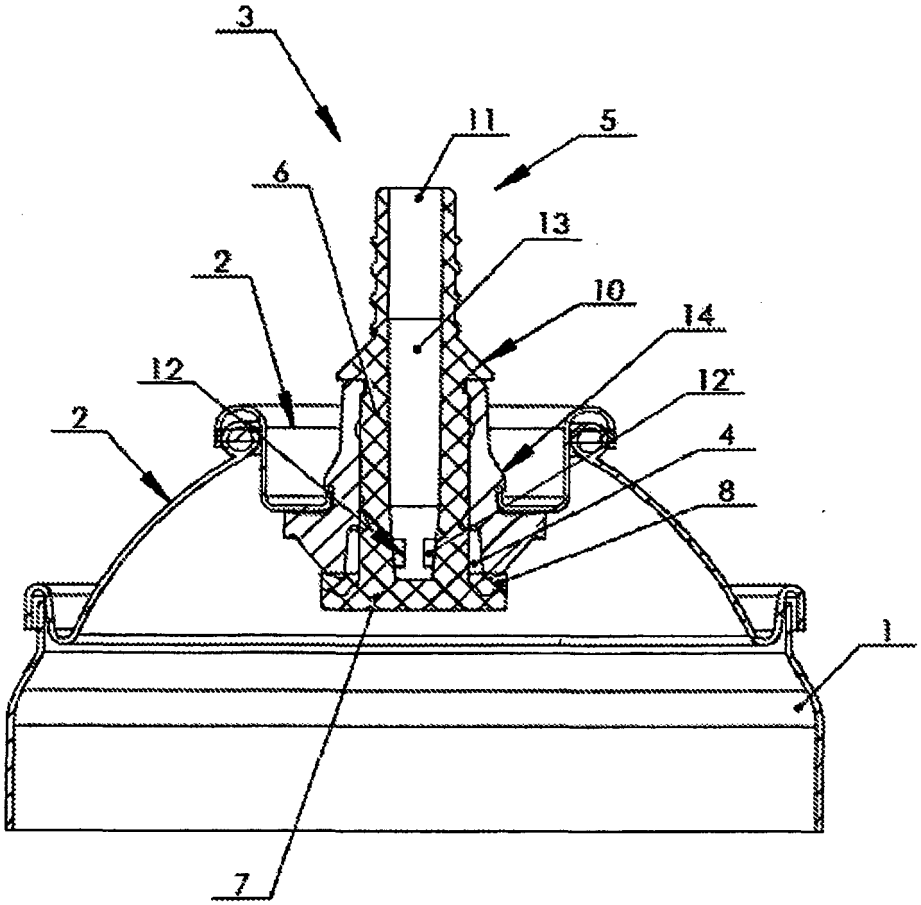

FIG. 1

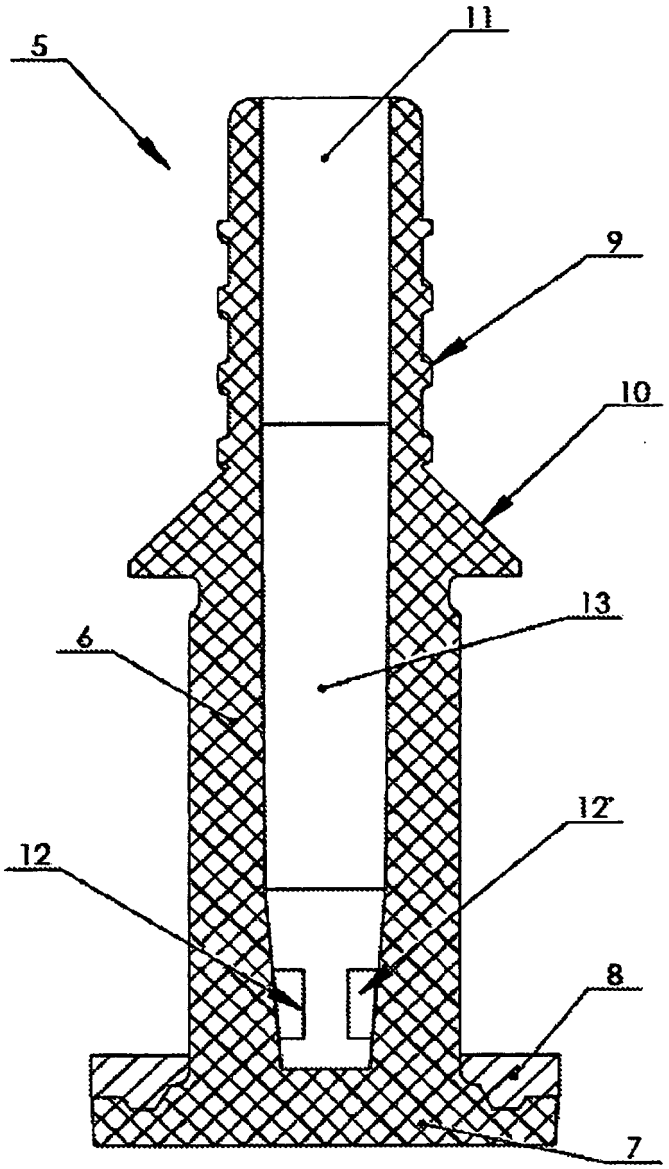

FIG. 2

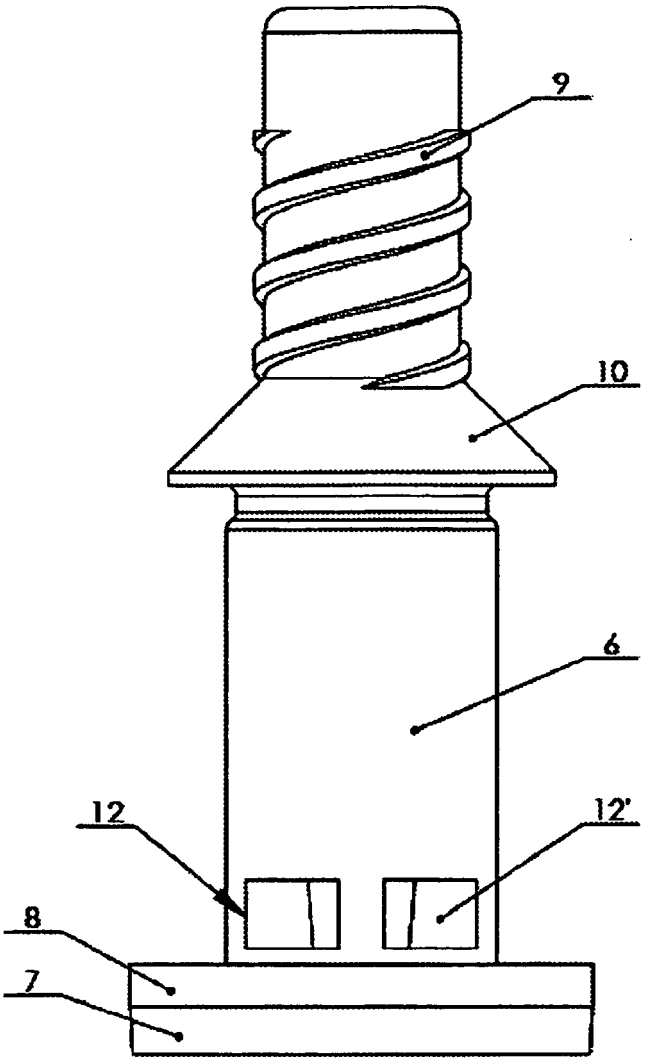

FIG. 3

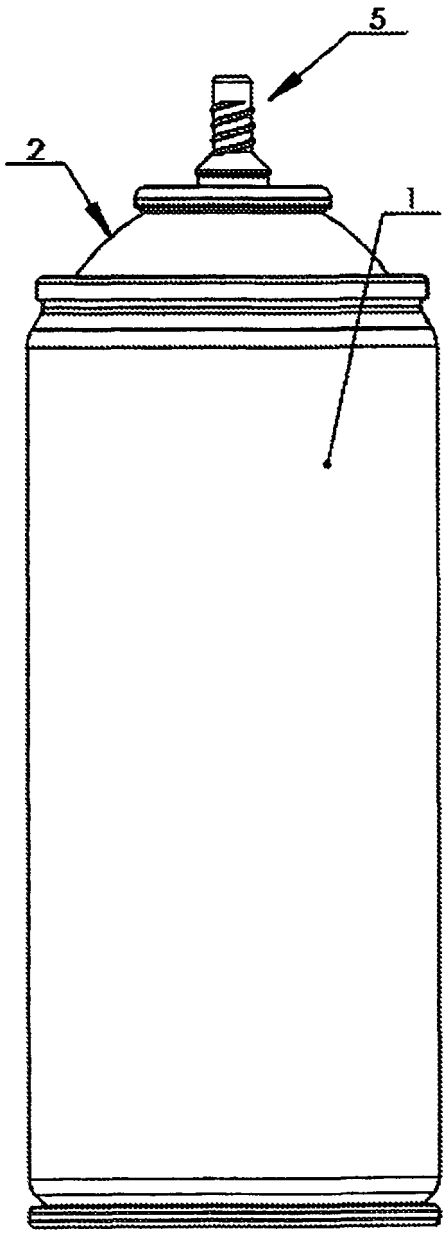

FIG. 4

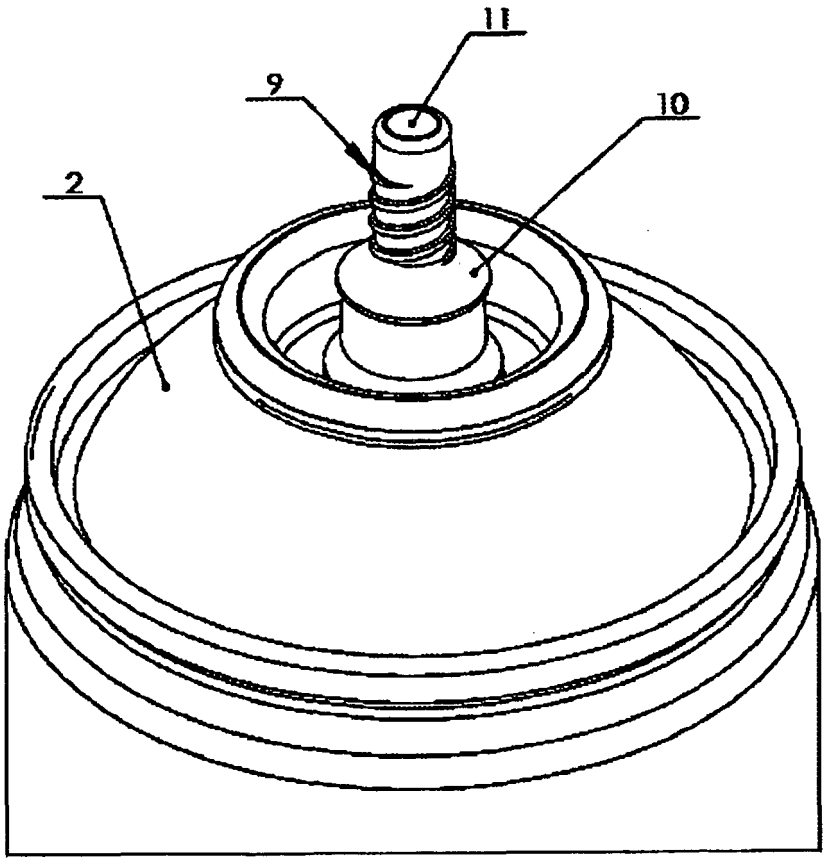

FIG. 5

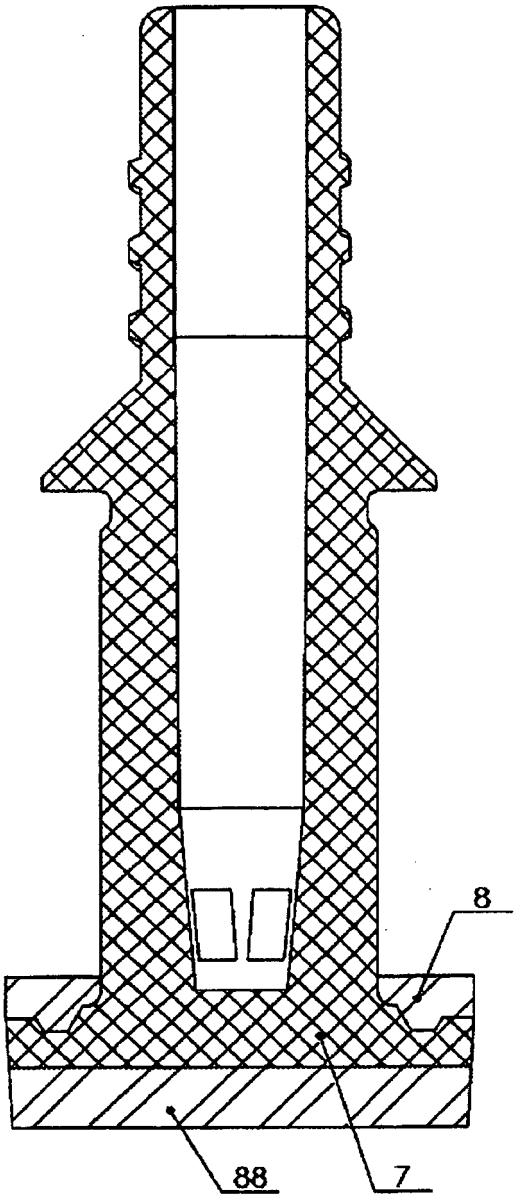

FIG. 6

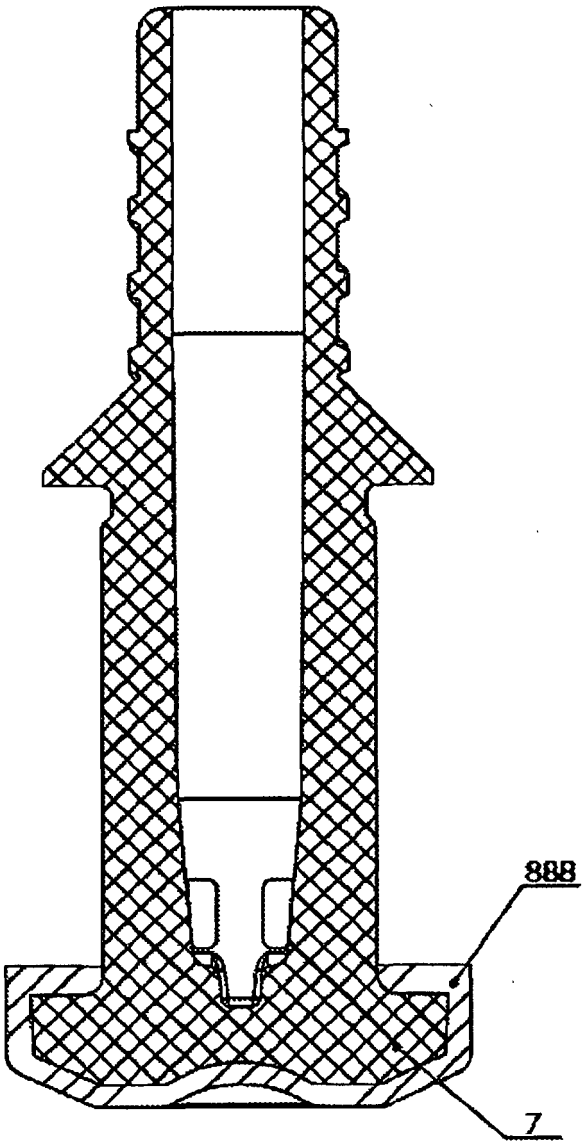

FIG. 7

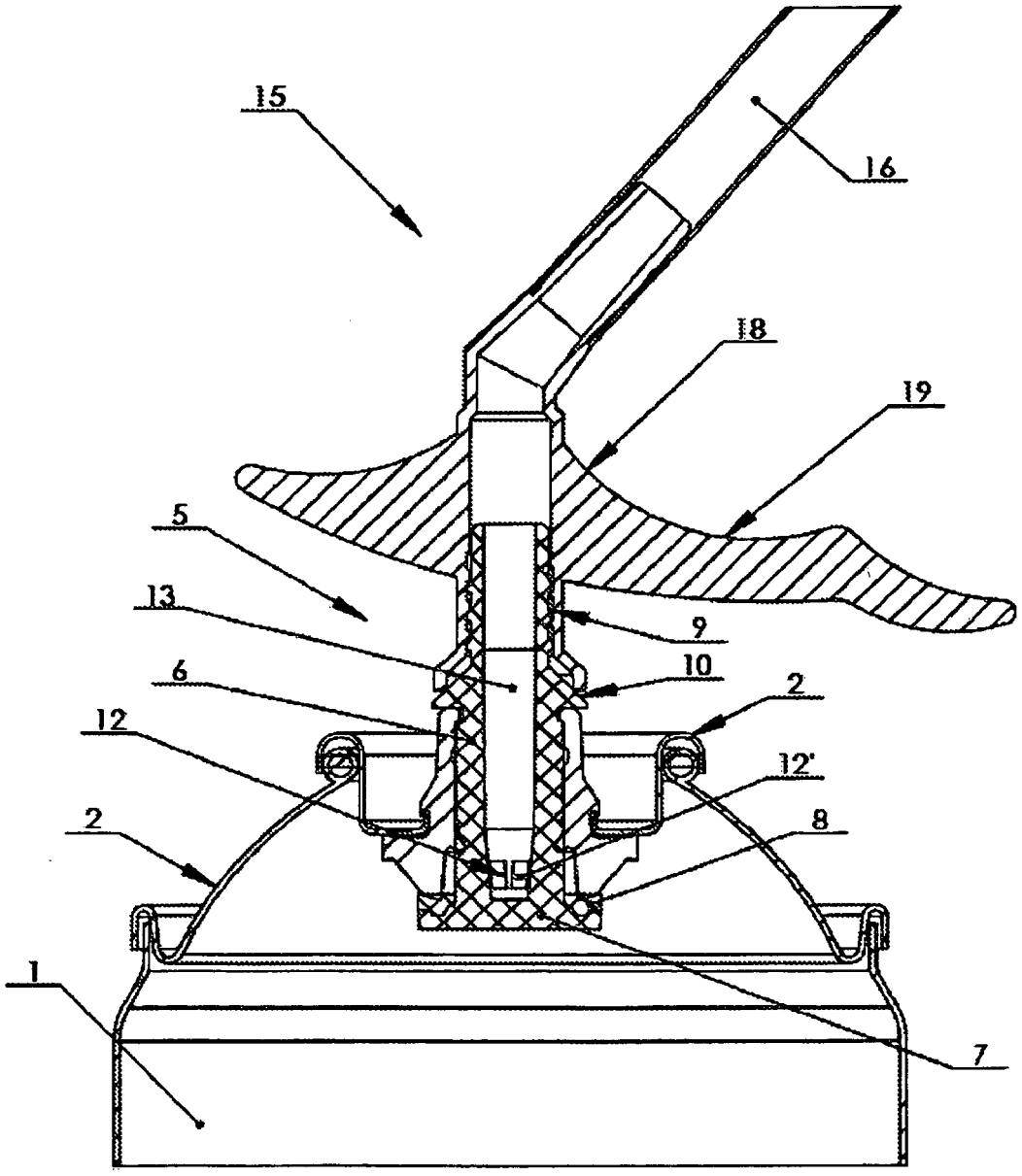

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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