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(54) **Valve**

(57) The invention concerns a valve (1) for a fluid dispensing container, comprising:

• a valve cup (2) for tightly closing the container with a through opening,
• a resilient grommet (3) comprising a central bore and a flange and extending on both sides of the valve cup (2) through the opening of the valve cup (2), and
• a valve stem (4) comprising a hollow tubular portion defining a central bore, said valve stem (4) snugly fitting in the central bore of the grommet and extending on both sides of the grommet (3), with a first opening to ambient and a second, opposite end being closed by a circular flange (6) of diameter greater than the diameter of the central bore of the grommet (3), the central bore of the valve stem (4) being in fluid communication with the interface between the circular flange (6) of the valve stem (4) and the flange of the grommet (3) via at least one lateral opening (7).

In order to provide a cheap and simple solution for preventing environmental moisture from entering into contact with the product in the container, it is proposed according to the present invention that the flange (6) of the valve stem (4) covers at least partially the grommet.

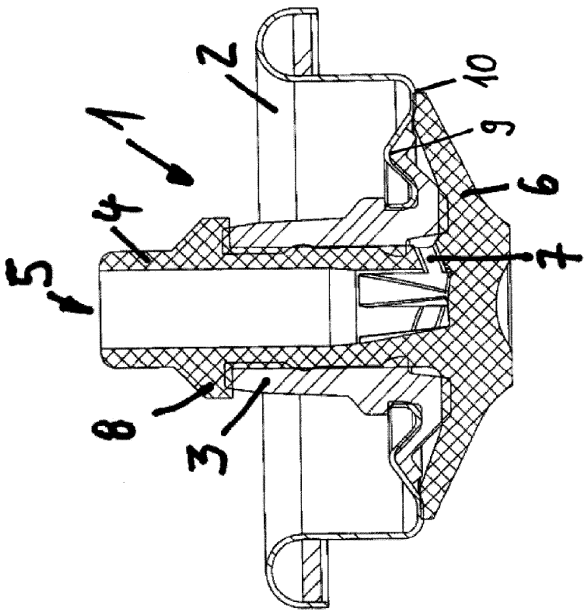

FIGURE 1

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Description

[0001] The invention concerns a valve for a fluid dispensing container, comprising

- a valve cup for tightly closing the container comprising a through opening,
- a resilient grommet extending on both sides of the valve cup through the opening of the valve cup, and
- a valve stem comprising a hollow tubular portion defining a central bore, said valve stem snugly fitting in the central bore of the grommet and extending on both sides of the grommet, with a first opening to ambient and a second, opposite end being closed by a circular flange of diameter greater than the diameter of the central bore of the grommet, the central bore of the valve stem being in fluid communication with the interface between base of the valve stem and the flange of the grommet via at least one lateral opening.

[0002] Such valves are known from WO 2012/101061 A1 and are used for dispensing fluids of various natures, among other for dispensing one and two component polyurethane foam. The valve cup has an annular wall terminating in an outer annular channel portion which is crimped in conventional way on the cylindrical wall of the container.

[0003] When the user wishes to dispense the product from the container, the valve can be actuated by tilting or pushing down the valve stem which disrupts the seal at the interface between the valve stem base and the grommet flange to bring the interior of the container in fluid communication with the central bore of the stem a with ambient.

[0004] The above described form of valves has been widely adopted, but it is known to have a problem of occasional valve sticking when used to dispense polyurethane foam. Polyurethane foam will cure and harden after having been dispensed from the container. However, if moisture is present in the container, this curing will begin to occur in the can itself and can result in skin formation in the can and a stuck valve such as to render the container useless to the consumer.

[0005] The major source of moisture occurring in the container is environmental moisture in the air outside the container. This moisture can permeate the inner gasket due to the portion of the grommet extending into the environment outside the container and valve cup. Since a portion of the inner gasket also extends inside the container under the valve cup, the permeated moisture can leave the grommet inside the container to come into contact with the polyurethane product inside the container. Thus, curing and hardening of the polyurethane product may begin inside the container resulting in the stuck valve and the failed product.

[0006] Various attempts have been made to overcome the above problem, such as by mechanical structure or by using at least in part a grommet material which is not susceptible to moisture diffusion. WO 2009/042206 A1 is concerned with an aerosol valve for dispensing polyurethane foam including a plastic liner shield to prevent environmental moisture permeating through the sealing grommet into the aerosol container to harden product and disable the valve. The liner has an annular upper portion in the valve cup channel for sealing the container bed, an intermediate portion surrounding the grommet in the can and a lower annular flange extending between the valve stem base and lower grommet surface. While environmental moisture may still enter the grommet through its upper portion extending above the valve cup panel, that moisture is prevented from egressing from the grommet line into the product in the aerosol container due to the liner shield. The liner therefore eliminates the problem of valve sticking in a simple manner. However, the liner as a supplementary part of the valve increases the production costs and the manufacturing difficulty.

[0007] EP 2 354 037 B1 describes a stem for a valve comprising 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. The additional layer provides a mechanism for preventing the valve stem in a pressurized dispensing container from sticking. The product dispensed, such as polyurethane 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 prevents the foam from hardening against the stem base when moisture enters the container through the grommet which also causes failure of the valve function.

[0008] Since the hardening of the product influences the shelf life and quality of the foam, a competitive alternative for preventing moisture from hardening the product in the container is requested by the market.

[0009] The objective of the present invention is to provide a qualitative and reliable solution for preventing environmental moisture from entering into contact with the product in the container.

[0010] This objective is achieved according to the present invention in that the flange of the stem covers at least partially the grommet.

[0011] The flange of the stem is designed in order to cover at least partially the grommet. This means that the flange of the stem is designed to form a protection screen between the grommet and the product contained in the container. It may be preferable that the flange of the stem is at least partially or fully in sealing contact with the inner wall of the valve cup, thereby sealing at least partially or fully the grommet from the product in the container.

[0012] The invention is based on the idea that the grommet (which is generally a rubber part, e.g. of TPU, neoprene, vulcanized rubber, etc.) can be covered with a plastic part, namely the flange of the valve stem, which

has a much lower water vapour transmission rate than rubber parts thereby reducing water vapour transition from the grommet to the product contained in the container.

[0013] This solution makes it possible to prevent water vapour from entering in contact with the product in the container or at least decrease the amount of water vapour entering in contact with the product in the container. In order to achieve this, the grommet area in a 2D bottom view should be for at least 65 %, preferably 70 %, more preferably 80 % and most preferably 90 % covered by the flange of the valve stem. In the best case, it is 100 % covered by the flange of the valve stem.

[0014] All negative effects of water vapour entering the product, such as skin formation and sticking are thereby avoided or delayed. Another advantage is the reduction of splashback during filling of the container. Splashback is the contact between the liquid chemicals and the valve during or just after gas filling due to the sudden impact of those gases on the liquid phase resulting in turbulences and hence liquid droplets being ejected against the surroundings, including the valve and the valve member.

[0015] As a further improvement in comparison to standard valves, the grommet is isolated from the chemicals in the container so that degradation of the grommet due to chemical influences coming from the product in the container is avoided. All these advantages lead to a longer shelf life of the container.

[0016] According to a preferred embodiment of the invention, the valve cup is designed to present a circular contact surface which extends to the level of the flange of the valve stem and toward which the flange of the valve stem is directed.

[0017] In this context, it is preferred that the valve cup has a substantially planar central portion and a peripheral edge suitable for sealingly fixing the cup to the top opening of the container, said valve cup comprising an inner surface and an outer surface, the through opening being surrounded by a first annular fold forming a first groove in its inner surface and a first rib in its outer surface.

[0018] In this context, it is useful that the through opening is surrounded by a second annular fold with greater diameter than the first annular fold forming a second rib in its inner surface and a second groove in its outer surface.

[0019] In fact, the flange can have a conical form with the free end extending upwards to the level of the valve cup and covering at least partially the grommet.

[0020] It is also within the scope of the present invention that the flange has a disk form with the free ends extending sideward and sealing against the valve cup, in particular against the second rib thereof.

[0021] According to the present invention, the stem is made of a thermoplastic polymer, preferably of polyolefin, most preferably of high density polyethylene (HDPE), each of them with or without filler(s) such as glass fibres or stone fibres, e.g. basalt fibres.

[0022] High density polyethylene (HDPE) has the lowest water vapour transmission rate of all plastics.

[0023] In a preferred embodiment of the invention, the grommet is produced by an injection over injection moulding process, preferably the grommet being injected over the valve stem.

[0024] Finally, the grommet is preferably injection moulded over the valve cup.

[0025] In the following, preferred embodiments of the invention are described with reference to the drawings in which

Figure 1 represents a sectional view of a first embodiment of the present invention,

Figure 2 represents a sectional view of a second embodiment of the present invention,

Figure 3 represents a representation of different degrees of coverage,

Figure 4 results of a comparison test of a conventional valve and of a valve according to the invention.

[0026] In Figures 1 and 2 identical parts have identical reference numbers.

[0027] Referring to Figures 1 and 2, a valve (1) for a fluid dispensing container is represented. This valve comprises a valve cup (2) to be fixed on a container, a resilient grommet (3) extending on both sides of the valve cup (2) through the opening thereof. A valve stem (4) comprising a hollow tubular portion defining a central bore snugly fits in the central bore of the grommet (3) and extends on both sides thereof. It has a first opening (5) to ambient on the upper side and a second, opposite end which is closed by a circular flange (6) of diameter greater than the diameter of the central bore of the grommet (3). The central bore of the valve stem (4) is in fluid communication with the interface between the valve stem base and the grommet flange via at least one lateral opening (7). The valve stem (4) further comprises a circular sealing lip (8) located near the distal end.

[0028] The valve cup (2) generally has a first annular fold forming a groove (9) in its inner surface and a rib in its outer surface. In the present embodiments, the valve cup (2) has a second annular fold with greater diameter than the first annular fold forming a rib (10) in its inner surface and a groove in its outer surface.

[0029] In an assembled valve (1), the valve stem (4) is inserted into the central bore of the grommet (3) whereby the grommet (3) is clamped between circular sealing lip (8) at the outlet end of the stem (4) and the stem base forming a flange (6) at the inlet end of the stem (4). The stem (4) is hereby in sealing contact with the inner walls of the central bore.

[0030] The valve stem (4) which is responsible for the activation of the valve and for this reason the mechanically most solicited part is made of a thermoplastic pol-

ymer, preferably of polyolefin, most preferably of high density polyethylene (HDPE) which has the lowest water vapour transmission rate of all plastics. The thermoplastic polymer may at least one filler such as glass fibres or stone fibres, e.g. basalt fibres.

[0031] The grommet (3) is made of a resilient material and is preferably a rubber part, e.g. of TPU, which has very good mechanical properties. Rubber parts have good mechanical properties, but a relatively high water vapour transmission rate in comparison to polyolefins.

[0032] Therefore, environmental water vapour tends to enter the container by diffusion through the grommet (3).

[0033] According to the present invention, the flange (6) of the valve stem (4) is designed in order to cover at least partially the grommet (3), e.g. by sealing against the valve cup (2). This means that the flange (6) of the valve stem (4) covers at least partially the grommet (3), e.g. by being in sealing contact with the inner wall of the valve cup (2) so that the grommet (3) is at least partially separated from the product in the container by the flange (6) of the valve stem (4). In summary, the grommet (3) which has a higher water vapour transmission rate than the stem is covered or sealed at least partially from the product in the container either by a protection screen formed by the flange (6) of the valve stem (4) or by a plastic to cup contact (valve stem (4) to valve cup (2)). In the best mode, the flange (6) of the valve stem (4) seals fully against the valve cup (2).

[0034] This solution prevents water vapour from entering in contact with the product in the container or at least decreases the amount of water vapour entering in contact with the product in the container. All negative effects of water vapour entering into contact with the product, such as skin formation and sticking are thereby avoided or at least decreased. Another advantage is the reduction of splashback during filling of the container. As a further improvement in comparison to standard valves, the grommet (3) is at least partially isolated from the chemicals in the container so that degradation of the grommet (3) due to chemical influences is avoided. All these advantages lead to a longer shelf life of the container. There are neither supplementary parts required nor is the production more difficult than for valves according to the prior art.

[0035] This rib (10) in the inner surface of the valve cup (2) may be closer to the upper side of the valve (1) than the stem (4). In this case, the grommet (3) which extends more or less to the groove (10) in the inner surface of the valve cup (2) is sealed by the flange (6) of the valve stem (4) which has a conical form with the free end being directed upward to the rib (10) in the inner surface of the valve cup (2). This solution is shown in Figure 1.

[0036] If the rib (10) in the inner surface of the valve cup (2) is on the same level as the upper side of the flange (6) of the valve stem (4), as shown in figure 2, the flange (6) of the valve stem (4) needs not to be directed upwardly but may have a disk form extending to the rib (10) in the inner surface of the valve cup (2) in order to seal the grommet (3).

[0037] Figure 3 shows different degrees of coverage. Figure 3 is a 2D bottom view (most outer diameter) of the grommet area. The grommet (3) is represented by a fine line, the flange (6) of the valve stem (4) is represented with four different diameters, each diameter being represented by a different line. They show a 40 % coverage (strong line), a 60 % coverage (thin dashed line), a 80 % coverage (dotted line) and a 100 % coverage (strong dashed line) of the grommet (3). According to the invention the coverage should be for at least 65 %, preferably 70 %, more preferably 80 % and still more preferably 90 % covered by the flange of the valve stem. In the best case, it is 100 % covered by the flange of the valve stem.

[0038] Figure 4 shows results of a comparison test of a conventional valve and of a valve according to the invention. Two valves have been compared, one being a standard CSV valve (CSV301x) and the other one a valve according to the present invention (EXP3418-00). Both valves have the same grommet material (TPU), design (except for the diameter of the flange of the valve which results in a coverage of 61.04 % for the standard CSV valve and in a coverage of 100 % for the valve according to the present invention). Each valve has been tested with two different PU foam formulations (F7198 and F7716). Skin formation has been observed weekly.

[0039] It can be seen from these results that the valve according to the present invention does not show skin formation after 4 weeks whereas the standard valve shows skin formation after less than one week. Since the valves were identical with the exception of the flange of the valve, it can be concluded that valve according to the present invention shows clearly improved performance compared to the standard valve.

Claims

1. Valve (1) for a fluid dispensing container,

- comprising a valve cup (2) for tightly closing the container comprising a through opening,
- a resilient grommet (3) extending on both sides of the valve cup (2) through the opening of the valve cup (2), and
- a valve stem (4) comprising a hollow tubular portion defining a central bore, said valve stem (4) snugly fitting in the central bore of the grommet (3) and extending on both sides of the grommet (3), with a first opening to ambient and a second, opposite end being closed by a circular flange (6) of diameter greater than the diameter of the central bore of the grommet (3), the central bore of the valve stem (4) being in fluid communication with the interface between base of the valve stem (4) and the flange of the grommet (3) via at least one lateral opening (7),

characterized in that the flange (6) of the valve stem (4) is designed in order to cover at least partially the grommet (3).

2. Valve according to claim 1, **characterized in that** the valve cup (2) is designed to present a circular contact surface which extends to the level of the flange (6) of the valve stem (4) and toward which the flange (6) of the valve stem (4) is directed.

3. Valve according to claim 1 or to claim 2, **characterized in that** the valve cup (2) has a peripheral edge suitable for sealingly fixing the cup to the top opening of the container, said valve cup (2) comprising an inner surface and an outer surface, the through opening being surrounded by a first annular fold forming a first groove (9) in its inner surface and a first rib in its outer surface.

4. Valve according to claim 3, **characterized in that** the through opening is surrounded by a second annular fold with greater diameter than the first annular fold forming a second rib (10) in its inner surface and a second groove in its outer surface.

5. Valve according to one of the preceding claims, **characterized in that** the flange (6) of the valve stem (4) has a conical form with the free end extending upwards to the level of the valve cup (2) and covering at least partially the grommet (3).

6. Valve according to one of the preceding claims, **characterized in that** the flange (6) of the valve stem (4) has a disk form with the free ends extending sideward and covering at least partially the grommet (3).

7. Valve according to one of claims 4 to 6, **characterized in that** the flange (6) of the valve stem (4) is directed toward the second rib (10) of the valve cup (2).

8. Valve according to one of the preceding claims, **characterized in that** the valve stem (4) is made of a thermoplastic polymer, preferably of polyolefin.

9. Valve according to claim 8, **characterized in that** the valve stem (4) is made of high density polyethylene (HDPE).

10. Valve according to one of claims 8 and 9, **characterized in that** the thermoplastic polymer contains at least one filler.

11. Valve according to one of claims 1 to 10, **characterized in that** the grommet (3) is produced by an injection over injection moulding process, preferably the grommet being injected over the valve stem (4).

12. Valve according to one of claims 1 to 11, **characterized in that** the grommet (3) is injection moulded over the valve cup (2).

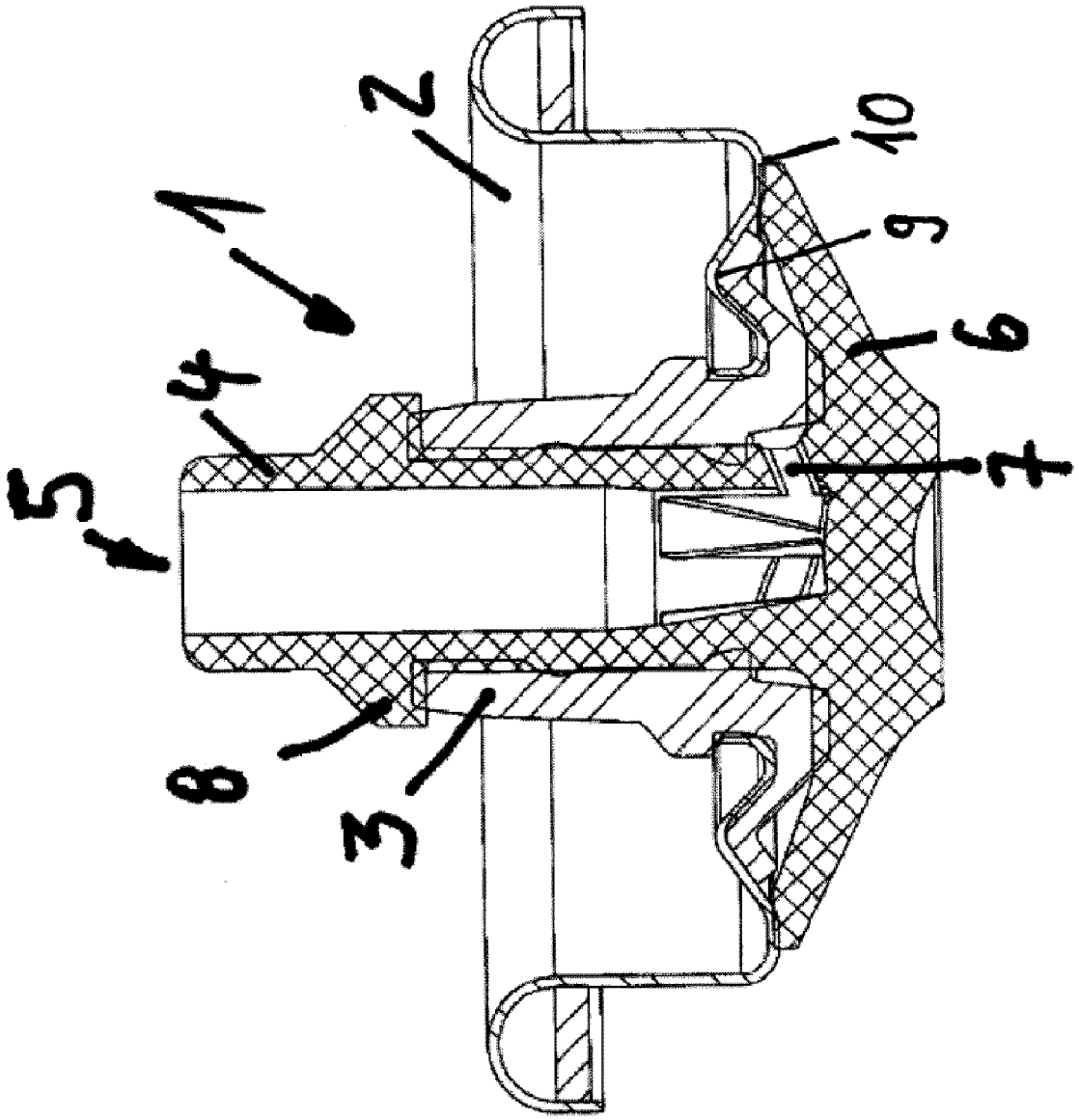

FIGURE 1

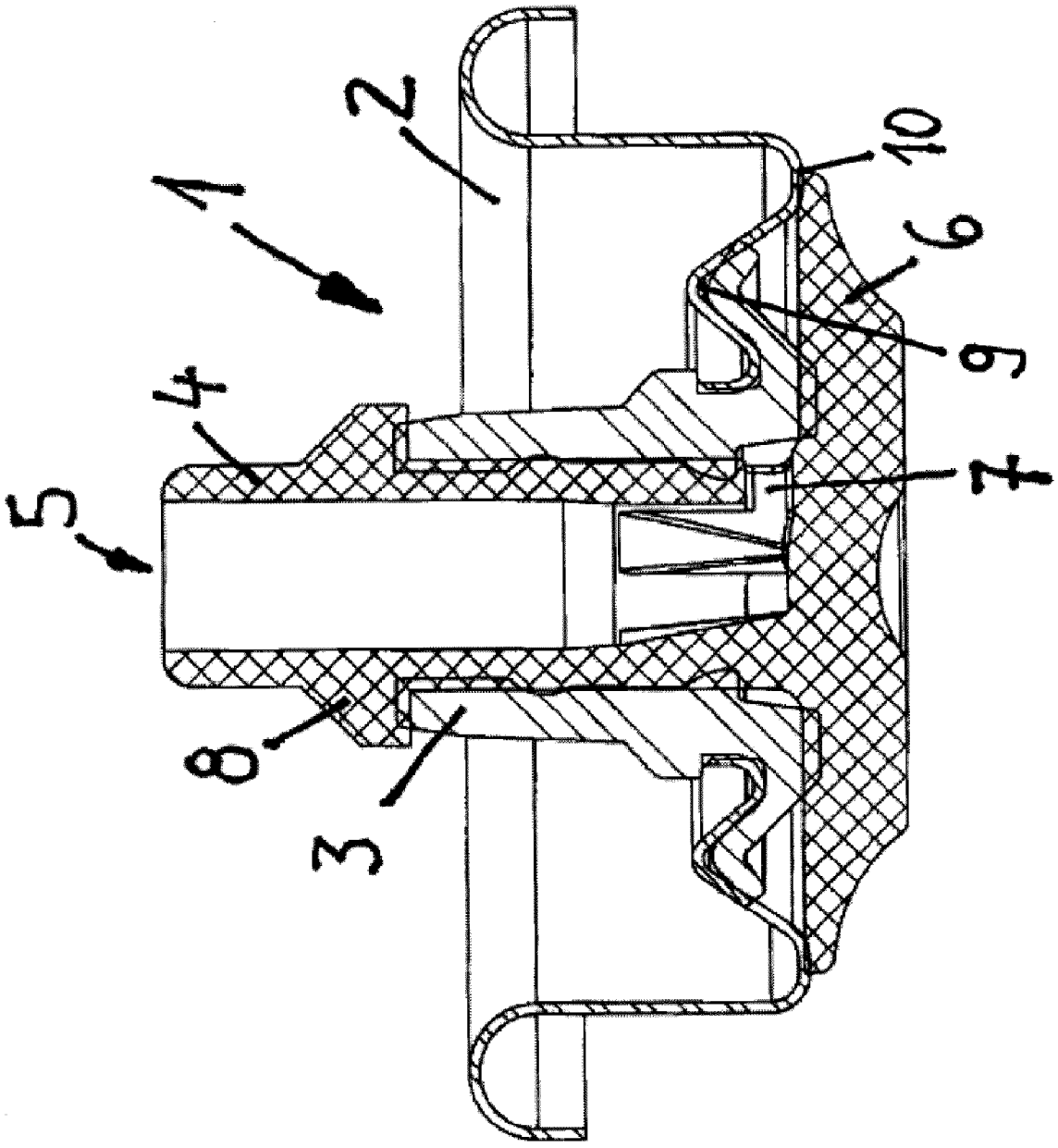

FIGURE 2

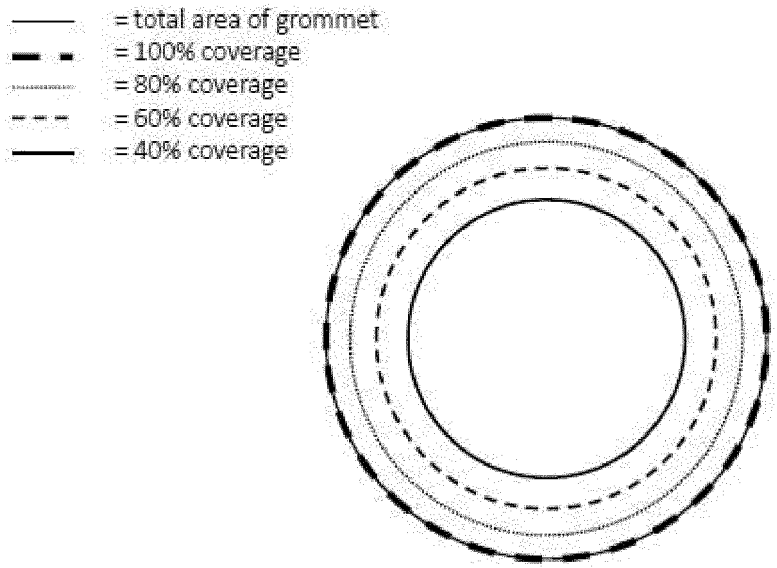
= total area of grommet
= 100% coverage
= 80% coverage
= 60% coverage
= 40% coverage

FIGURE 3

Ref	Picture	% coverage	Skin formation		Material grommet
			Formu-lation	Last week without skin	
CSV301x		61.04	F7198	0	TPU
			F7716	0	
EXP3418-00		100	F7198	4 (ongoing)	TPU
			F7716	4 (ongoing)	

FIGURE 4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 1669

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 February 2015	Gineste, Bertrand

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- EP 2354037 B1 **[0007]**