

Description

[0001] The present invention relates to a closure assembly and a method for the manufacturing of a closure assembly.

[0002] Closure assemblies are known with a plastic screw cap that is screwed onto a neck, e.g. of a container. A tamper-evident ring is integrally formed as a part the plastic screw cap. In known designs the tamper-evident ring is non-frangible. Upon opening the closure through removal of the cap by rotation, the ring remains on the neck. The one or more frangible bridge portions between the tamper-evident ring and the skirt of the cap will be broken when the closure is opened for the first time by a user.

[0003] The present invention aims to provide an improved closure assembly, or at least an alternative for known closure assemblies.

[0004] The present inventions primarily aims to provide a closure assembly, wherein the tamper-evident ring which remains behind on the neck is extremely difficult to remove, e.g. by a child.

[0005] The present invention achieves one or more of the above-mentioned objects by providing a closure assembly according to claim 1.

[0006] In the inventive closure assembly the removal of the tamper-evident ring remaining behind on the neck of the article is extremely difficult. The confinement of the ring in vertical direction between the upper and lower flanges prevents motion in said direction. Also the upper and lower flanges prevent introduction of a tool or nail or the like behind the tamper-evident ring. This is further enhanced by the presence of the vertical shoulder face in the lower flange. This shoulder face also restricts deformation of the ring if an outward pulling force would be exerted locally on the ring, thereby again increasing the resistance against removal of the ring.

[0007] The presence of one or more raised rotation preventing bosses in conjunction with corresponding receiving openings formed as open-bottom recesses in the lower edge of the tamper-evident ring prevents rotation of the ring, thereby again increasing the resistance against removal of the ring. As is preferred multiple of such bosses are provided. The ring can not pass over the bosses, e.g. due to bending in vertical direction, as the ring is confined between the upper and lower flanges, which allows the bosses to be of limited height. Also, as the lower flange extends underneath the lower edge of the ring, it is difficult to exert any lifting force on the ring to achieve such deformation.

[0008] It is preferred that it is practically impossible to insert a fingernail or tool more than 2 millimeters between any of the flanges and the tamper-evident ring.

[0009] A further advantage of the invention is that breaking of the one or more frangible bridge portions occurs basically immediately upon the start of rotation in opening direction, and with great ease for the user.

[0010] The presence of angular positioning members

on the neck and the skirt allows to secure the cap on the neck at relatively high speed, normally with automated equipment, the finally obtained closed position of the cap on the neck being such that the one or more rotation preventing bosses are received in their respective openings in the lower edge of the tamper-evident ring.

[0011] Due to the presence of the receiving openings as recesses in the lower edge that are open from below, the body of the tamper-evident ring can be made with a relatively high strength using relative little plastic material. Therefore, preferably, the ring is free of holes extending through the body of the ring.

[0012] Further preferred details of the inventive closure assembly are disclosed in the subclaims and in the description with reference to the drawings.

[0013] The present invention also relates to a method for manufacturing a closure assembly as described herein, comprising the steps of:

- providing the article, e.g. by injection moulding of plastic material,
- injection moulding the cap with integral tamper-evident ring,
- securing the cap with integral tamper evident ring on the neck of the article.

[0014] In the drawings:

Fig. 1 shows a perspective view of an embodiment of the closure assembly according to the invention, Fig. 2 shows the embodiment of figure 1 in a different perspective,

Fig. 3 shows a vertical cross-section of the embodiment of figures 1 and 2,

Fig. 4 shows a horizontal cross-section of the embodiment of figures 1 and 2 at the height of the rotation preventing bosses,

Fig. 5 shows a different vertical cross-section of the embodiment of figures 1 and 2,

Fig. 6 shows a further horizontal cross-section of the embodiment of figures 1 and 2 at the height of the angular positioning members of the neck and the skirt in closed position of the cap,

Fig. 7 shows in vertical cross-section an alternative embodiment of a closure assembly according to the invention.

[0015] With reference to figures 1-6 now a first preferred embodiment of the closure assembly according to the invention will be discussed.

[0016] Reference numeral 1 denotes an article forming a tubular neck 2 around a product passage 3 in the article. The neck 2 forms a mouth at a top end of the product passage. The neck 2 has an exterior side.

[0017] The article 1 here comprises a connector portion 5 to be fastened to a container (not shown, e.g. a collapsible pouch). In this example the article 1 is embodied as a spout with a connector portion that is adapted

to be sealed between opposed film walls of a collapsible pouch container. The connector portion can have a different design, or even be absent, e.g. if the article is a container with an integral neck, e.g. a blow moulded bottle.

[0018] The tubular neck 2 here extends above the connector portion 5.

[0019] Reference numeral 20 denotes a rotational cap, preferably a screw cap, that is injection moulded of plastic material.

[0020] The cap 20 has been secured on the neck 2 of the article 1, the cap 20 sealing the product passage 3 in closed position of the cap on the neck. Here the cap 20 seals the product passage at the mouth at the top end of the product passage, but other designs, e.g. wherein sealing is at a distance below the mouth, are also possible.

[0021] The cap 20 is adapted to be manually rotated by a user from the closed position in an opening direction to allow for removal of the cap from the neck of the article by a user to open the product passage 3. The cap may be tethered to the article if desired.

[0022] The cap 20 comprises a top wall 21 and a downward depending skirt 22. The skirt 22 has an interior side, an exterior side, and a lower edge remote from the top wall 21.

[0023] The exterior side of the neck 2 and the interior side of the skirt 22 have cooperating rotational connection means, here first and second screw threads on the neck and skirt respectively.

[0024] The cap 20 furthermore comprises a tamper-evident ring 30 that is integrally moulded with the top wall 21 and the skirt 22 of the cap 20. The ring 30 is located below the skirt 21. The ring 30 has an interior side, an exterior side, a lower edge, and an upper edge.

[0025] The tamper-evident ring 30 is connected to the skirt 22 via one or more integrally moulded frangible bridge portions 31 between the upper edge of the tamper-evident ring 30 and the lower edge of the skirt 22. The ring body of the tamper-evident ring 30 is non-frangible and has no formed lines of weakness or the like.

[0026] The exterior side of the neck 2 has a circumferential lower flange 10 and a circumferential upper flange 12. These flanges 10, 12 each protrude outwardly and extend circumferentially around the neck 2, generally in a horizontal plane as is preferred. The lower and upper flanges 10, 12 are spaced apart. In another design, the lower flange 11 can e.g. be integrated in the connector portion of the article. The upper flange 12 is below the screw thread on the neck 2.

[0027] With the cap 20 secured on the neck 2 in closed position thereof, the tamper-evident ring 30 is in vertical direction confined between the lower and upper flanges 10, 12 so that vertical motion of the ring 30 is minimal or absent.

[0028] The lower flange 10 forms an annular radial face 10a that extends directly underneath the lower edge of the tamper-evident ring 30. The lower flange 10 also

forms a generally circular vertical shoulder face 10b that extends along a lower annular region of the interior side of the tamper-evident ring 30. It is noted here that radial and vertical with respect to the faces 10a, b denote the general direction of the extension of said faces, it is not necessary that these faces 10a, b lie exactly in those planes or are exactly planar. For the face 10a it is highly preferred that it is a continuous face so as to prevent access to the lower edge of the ring 30.

[0029] In this embodiment the lower flange 10 has a stepped outer rim forming said vertical shoulder face 10b and outwardly thereof the annular radial face 10a beneath the lower edge of the tamper-evident ring 30. As is preferred the lower flange 10 has an outermost contour that is flush with the exterior face of the tamper-evident ring 30.

[0030] The upper flange 12 extends above an inner portion of the upper edge of the tamper-evident ring 30, when the cap 20 is secured on the neck. As is preferred the upper edge of the tamper-evident ring 30 has an outer edge portion that is raised with respect to an inner edge portion, with a shoulder face between said outer and inner edge portions. The outer peripheral region of the upper flange 10 extends above the inner edge portion and has an outer contour engaging the shoulder face of the upper edge of the tamper-evident ring 30.

[0031] When the cap 20 with integrally moulded tamper-evident ring 30 was secured on the neck via a rotational securing motion, the tamper-evident ring and frangible bridge portions remained intact during said securing motion.

[0032] The cap 20 with tamper-evident ring 30 is embodied such that upon rotating the cap in opening direction by the user from its closed position for the first time, the tamper-evident ring 30 itself remains intact and remains confined between the lower flange 10 and the upper flange 12. In this first time unscrewing of the cap 20 however the one or more frangible bridge portions 31 break, thereby evidencing the removal (or an attempted removal) of the cap from the neck 2.

[0033] The lower flange 10 has one or multiple, here two, angularly spaced rotation preventing bosses 15, each boss 15 being raised from the annular radial face 10a of the lower flange 10.

[0034] The tamper-evident ring 30 has one or multiple, here two, angularly spaced receiving openings 33, each dimensioned to receive a rotation preventing boss 15 therein when the cap is in its closed position on the neck. The one or more receiving openings 33 are each being formed as a recess that is open at the underside in the lower edge of the tamper-evident ring 30, so that a raised rotation preventing boss 15 lies within a receiving opening 33.

[0035] As is preferred the openings 33 are also open to the interior and exterior side of the ring 30, so that it is visible that a boss 15 is received in an opening 33.

[0036] The bosses 15 and corresponding receiving openings 33 are adapted to prevent rotation of the

tamper-evident ring 30 in the opening direction when the user rotates the cap in opening direction when the closure assembly is opened for the first time.

[0037] As can be best seen in figure 6 the exterior of the neck and the interior of the skirt are furthermore provided with cooperating angular positioning members 40, 41 that define a predetermined angular position of the skirt with respect to the neck 2 when the cap 20 with the tamper-evident ring 30 is rotationally secured on the neck into its closed position. This predetermined angular position is such that the one or more rotation preventing bosses are then each received in a corresponding receiving opening.

[0038] As is preferred the cooperating angular positioning members 40, 41 are formed by two generally diametrically arranged angular positioning bosses 40 on the neck 2 and corresponding bosses 41 on the interior side of the skirt 22.

[0039] As is preferred, and can best be seen in figure 6, the angular positioning bosses 40 are formed as being raised from the upper flange 12.

[0040] In this example, as preferred, the interior side of the tamper-evident ring 30 has a tapering face or faces increasing in diameter towards the lower edge of the ring, so as to facilitate the passage of the ring 30 over the upper flange 12 upon securing the cap with tamper-evident ring on the neck. In this example multiple distinct inward protruding formations are integrated in the interior side of the ring 30, these formations being spaced apart in circumferential direction of the ring and their upper faces forming the inner portion of the upper edge of the ring 30.

[0041] It will be appreciated that the ring 30 basically snaps over the flange 12 in the process of screwing the cap with ring on the neck.

[0042] Each boss 15 has a blocking face 15a such that contact of the tamper-evident ring 30 with said blocking face prevents further rotation of the tamper-evident ring upon rotating the cap in opening direction by the user.

[0043] As is preferred each boss 15 has a leading ramp face 15b so as to flex a lower region of the tamper-evident ring 30 outwards during the process of securing the cap with tamper-evident ring on the neck.

[0044] As is preferred the lower edge of the skirt and the upper edge of the tamper-evident ring are provided with first and second torque absorbing means 44, 45 respectively, said first and second means being spaced by a gap. These torque absorbing means 44, 45 cooperate during the securing of the cap with tamper-evident ring on the neck so as to prevent premature breaking of the one or more frangible bridge portions.

[0045] As is preferred a pair of first and second torque absorbing means 44, 45 is arranged vertically above a receiving opening 33 in the lower edge of the tamper-evident ring 30.

[0046] As will be appreciated the article 1 could be a product container having a container body, wherein possibly the neck 2 is integrally moulded with the container

body.

[0047] In the embodiment shown here the article is a fitment to be secured to a container body.

[0048] Figure 7 illustrates an alternative version of the inventive closure assembly. The relevant difference with the embodiment discussed with reference to figures 1-6 is that the lower flange 10' has an open topped groove 18 therein, the annular radial face 10a' forming the bottom of said groove and the vertical shoulder 10b' forming the inner wall of said groove. The tamper-evident ring 30 extends into said open topped groove 18, so that the outer wall of said groove vertically overlaps the lower region of the exterior side of the tamper-evident ring. The one or more bosses 15 are located within said groove 18. It will be appreciated that this design with groove 18 provides further resistance against removal of the tamper-evident ring 30 from the neck 2.

Claims

1. A closure assembly comprising:

- an article (1) forming a tubular neck (2) around a product passage (3) in said article, said neck forming a mouth at a top end of said product passage, said neck having an exterior side;
- a rotational cap (20) that is injection moulded of plastic material and that is secured on or to be secured on said neck (2) of the article, the cap sealing the product passage (3) in closed position of the cap on said neck, and the cap - for removal of the cap from the neck of the article by a user to open the product passage - being adapted to be manually rotated from the closed position in an opening direction;

wherein the cap (20) comprises a top wall (21) and a downward depending skirt (22), said skirt having an interior side, an exterior side, and a lower edge remote from the top wall,

wherein the exterior side of the neck (2) and the interior side of the skirt (22) have cooperating rotational connection means, preferably first and second screw threads on said neck and skirt respectively, wherein the cap (20) furthermore comprises a tamper-evident ring (30) that is integrally moulded below the skirt, said tamper-evident ring having an interior side, an exterior side, a lower edge, and an upper edge, said tamper-evident ring being connected to the skirt via one or more integrally moulded frangible bridge portions (31) between the upper edge of the tamper-evident ring and the lower edge of the skirt,

wherein said tamper-evident ring (30) is non-frangible,

wherein the exterior side of the neck has a circumferential lower flange (10;10') and a circumferential

upper flange (12), said flanges each protruding outwardly and extending circumferentially around the neck, the lower and upper flanges being spaced apart,

wherein - with the cap (20) secured on the neck in closed position thereof - the tamper-evident ring is in vertical direction confined between the lower and upper flanges (10,12;10",12),

wherein the lower flange (10;10') forms an annular radial face (10a;10a') extending underneath the lower edge of the tamper-evidence ring (30), and the lower flange forming a circular vertical shoulder face (10b;10b') extending along a lower annular region of the interior side of the tamper-evident ring (30), wherein the upper flange (12) extends above an inner portion of the upper edge of the tamper-evident ring,

wherein the cap (20) with integrally moulded tamper-evident ring (30) has been or will be secured on the neck via a rotational securing motion, the tamper-evident ring and frangible bridge portions remaining intact during said securing motion,

wherein the cap (20) with tamper-evident ring (30) is embodied such that upon rotating the cap in opening direction by the user from its closed position for the first time, the tamper-evident ring remains intact and confined between the lower and upper flanges and the one or more frangible bridge portions break thereby evidencing the removal of the cap from the neck,

wherein the lower flange (10;10') has one or multiple angularly spaced rotation preventing bosses (15), each boss (15) being raised from the annular radial face (10a;10a') of the lower flange, wherein the tamper-evident ring has one or multiple angularly spaced receiving openings (33), each dimensioned to receive a rotation preventing boss (15) therein when the cap is in its closed position on the neck, said one or more receiving openings (33) each being formed as a recess that is open at the underside in the lower edge of the tamper-evident ring, so that a rotation preventing boss (15) lies within a receiving opening (33), the boss and receiving opening being adapted to prevent rotation of the tamper-evident ring in opening direction when the user rotates the cap in opening direction,

wherein the exterior of the neck and the interior of the skirt are furthermore provided with cooperating angular positioning members (40,41) that define a predetermined angular position of the skirt (22) with respect to the neck (2) when the cap (20) with the tamper-evident ring (30) is rotationally secured on the neck into its closed position, said predetermined angular position being such that the one or more rotation preventing bosses (15) are then each received in a corresponding receiving opening (33).

2. Closure assembly according to claim 1, wherein the

lower flange (10) has a stepped outer rim forming said vertical shoulder face (10b), and outwardly thereof the annular radial face ((10a) beneath the lower edge of the tamper-evident ring (30), preferably the lower flange (10) having an outermost contour that is flush with the exterior face of the tamper-evident ring.

3. Closure assembly according to claim 1, wherein the lower flange (10') has an open topped groove (18) therein, the annular radial face (10a') forming the bottom of said groove and the vertical shoulder face (10b') forming the inner wall of said groove, wherein the tamper-evident ring (30) extends into said open topped groove, so that the outer wall of said groove vertically overlaps the lower region of the exterior side of the tamper-evident ring.

4. Closure assembly according to one or more of the preceding claims, wherein the cooperating angular positioning members (40,41) are formed by two generally diametrically arranged angular positioning bosses on the neck and corresponding bosses on the interior side of the skirt.

5. Closure assembly according to claim 4, wherein the angular positioning bosses (40) are raised from the upper flange (12).

6. Closure assembly according to one or more of the preceding claims, wherein the upper edge of the tamper-evident ring (30) has an outer edge portion that is raised with respect to an inner edge portion thereof, with a shoulder face between said outer and inner edge portions, said upper flange (12) extending above said inner edge portion and preferably having an outer contour engaging the shoulder face of the upper edge of the tamper-evident ring.

7. Closure assembly according to one or more of the preceding claims, wherein the interior side of the tamper-evident ring (30) has a tapering face or faces increasing in diameter towards the lower edge of the ring, so as to facilitate the passage of the ring over the upper flange upon securing the cap with tamper-evident ring on the neck.

8. Closure assembly according to one or more of the preceding claims, wherein each rotation preventing boss (15) has a blocking face (15a) such that contact of the tamper-evident ring (30) with said blocking face prevents further rotation of the tamper-evident ring upon rotating the cap in opening direction by the user.

9. Closure assembly according to one or more of the preceding claims, wherein each rotation preventing boss (15) has a leading ramp face (15b) so as to flex

a lower region of the tamper-evident ring outwards during the process of securing the cap with tamper-evident ring on the neck.

10. Closure assembly according to one or more of the preceding claims, wherein the neck has two rotation preventing bosses (15) at 180° angularly spaced locations. 5

11. Closure assembly according to one or more of the preceding claims, wherein the lower edge of the skirt and the upper edge of the tamper-evident ring are provided with first and second torque absorbing means (44,45) respectively, said first and second means being spaced by a gap, said torque absorbing means cooperating during the securing of the cap with tamper-evident ring on the neck so as to prevent premature breaking of the one or more frangible bridge portions. 10
15
20

12. Closure assembly according to claim 11, wherein a pair of first and second torque absorbing means (44,45) is arranged vertically above a receiving opening (33) in the lower edge of the tamper-evident ring. 25

13. Closure assembly according to one or more of the preceding claims, wherein the article is a container having a container body, wherein possibly the neck is integrally moulded with the container body. 30

14. Closure assembly according to one or more of the claims 1-12, wherein the article is a fitment to be secured to a container body, e.g. the article is a spout, e.g. having a lower connector portion to be secured between opposed film walls of a collapsible pouch container. 35

15. Method for manufacturing an assembly according to one or more of the preceding claims, comprising the steps of: 40
 - providing the article,
 - injection moulding the cap with integral tamper-evident ring, 45
 - securing the cap with integral tamper evident ring on the neck of the article.

50

55

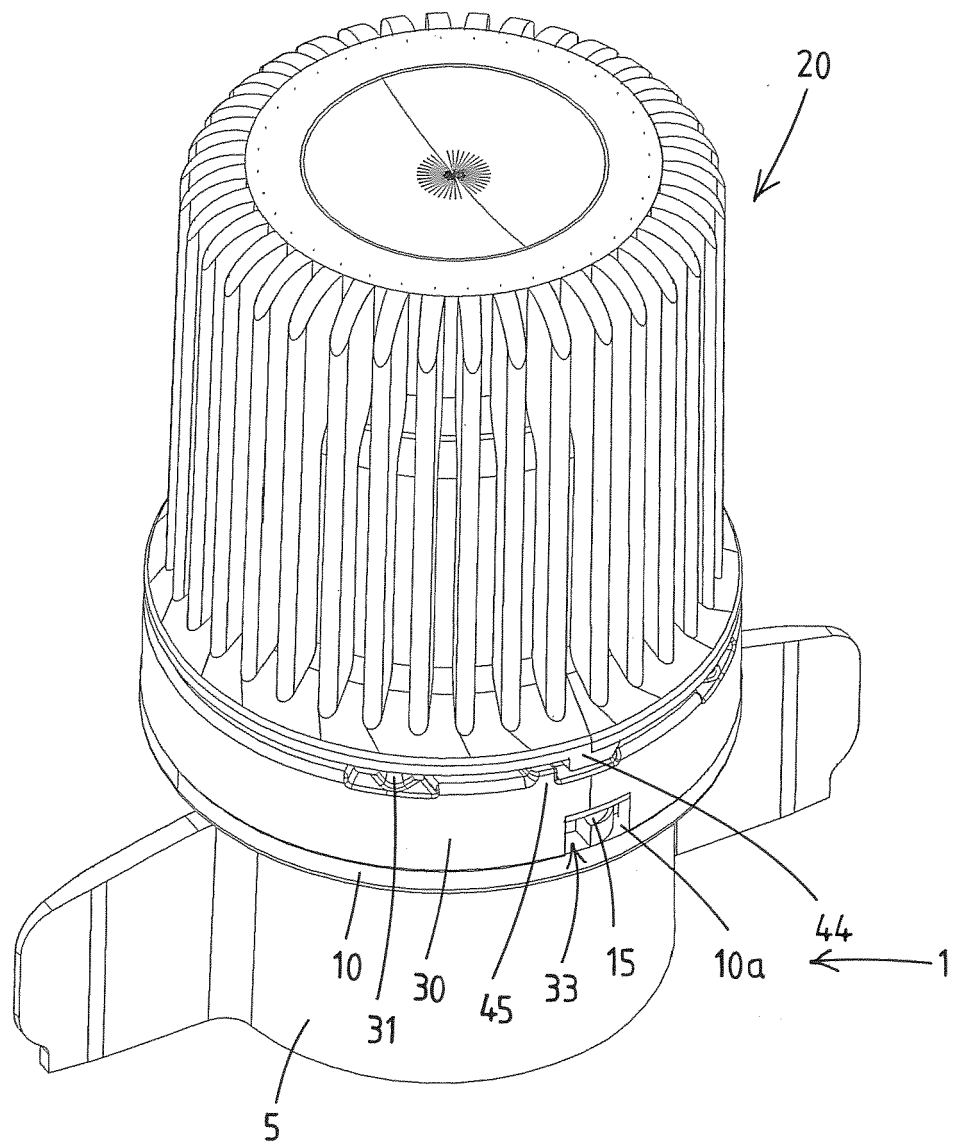


Fig.1

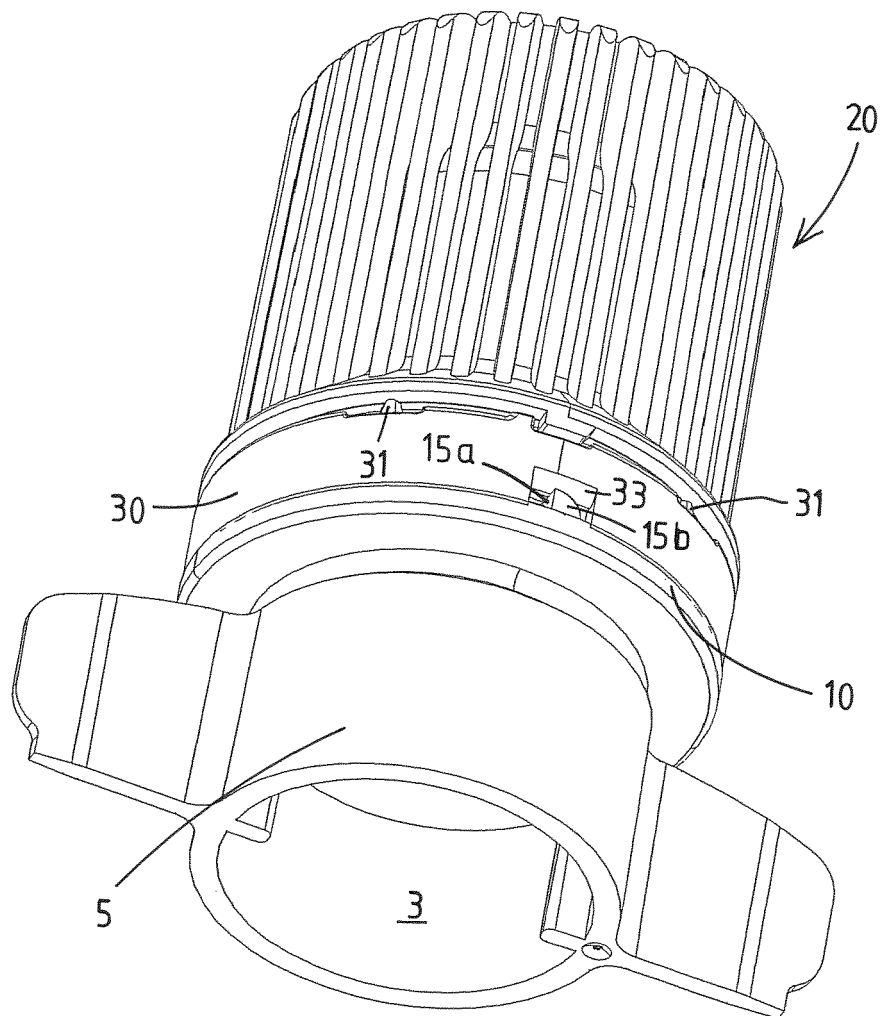


Fig.2

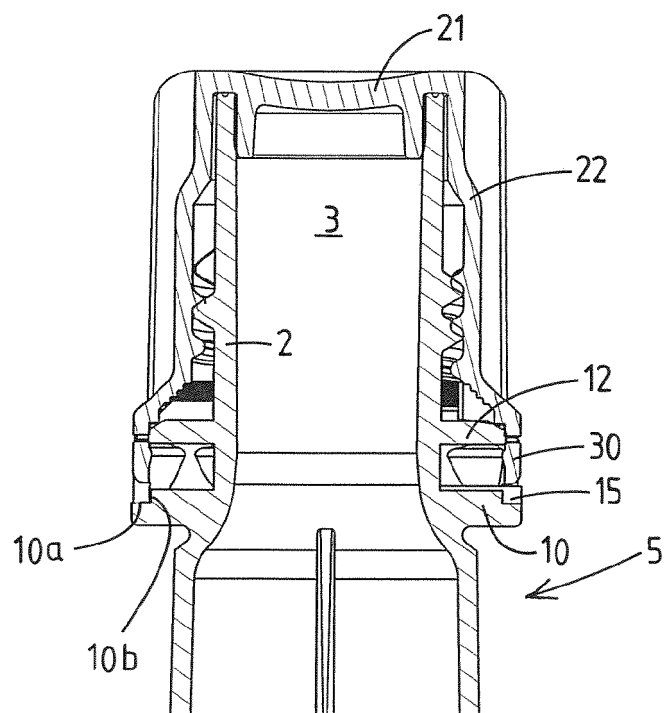


Fig.3

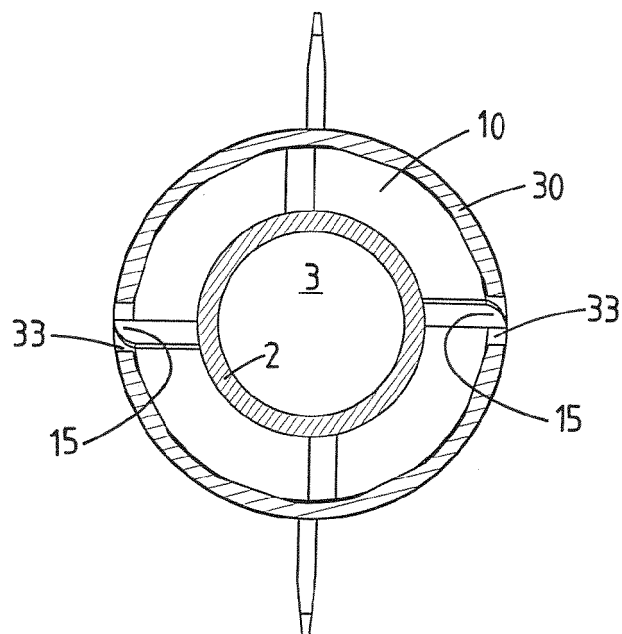


Fig.4

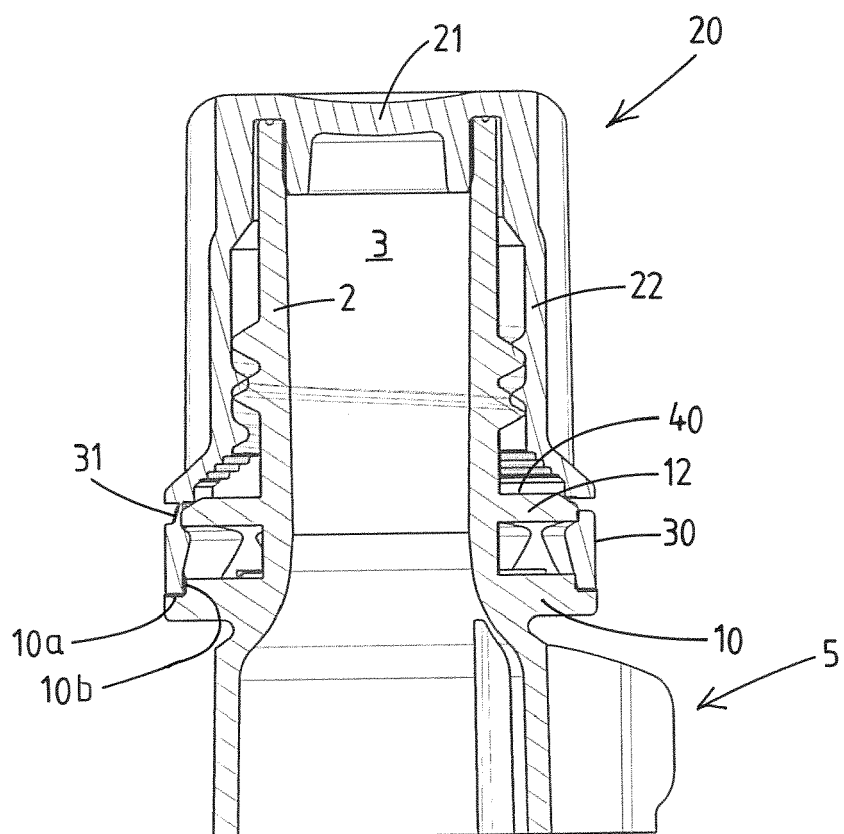


Fig.5

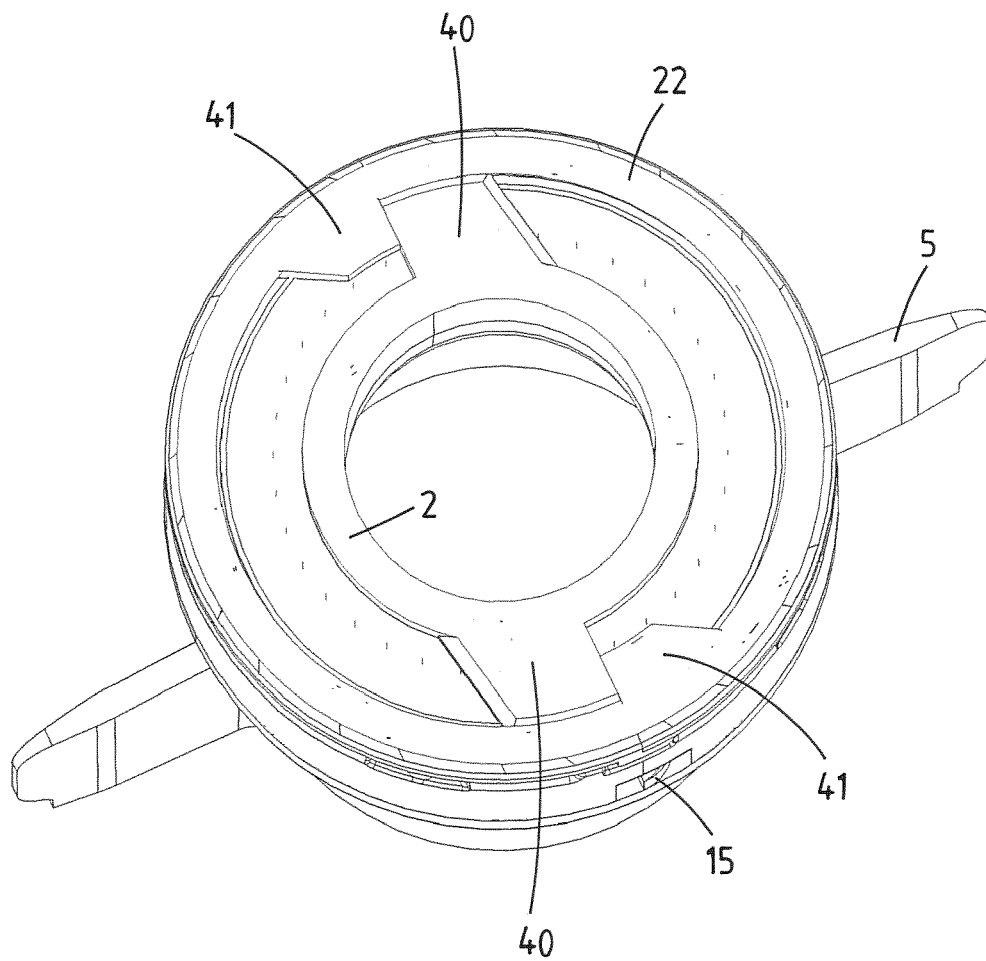


Fig.6

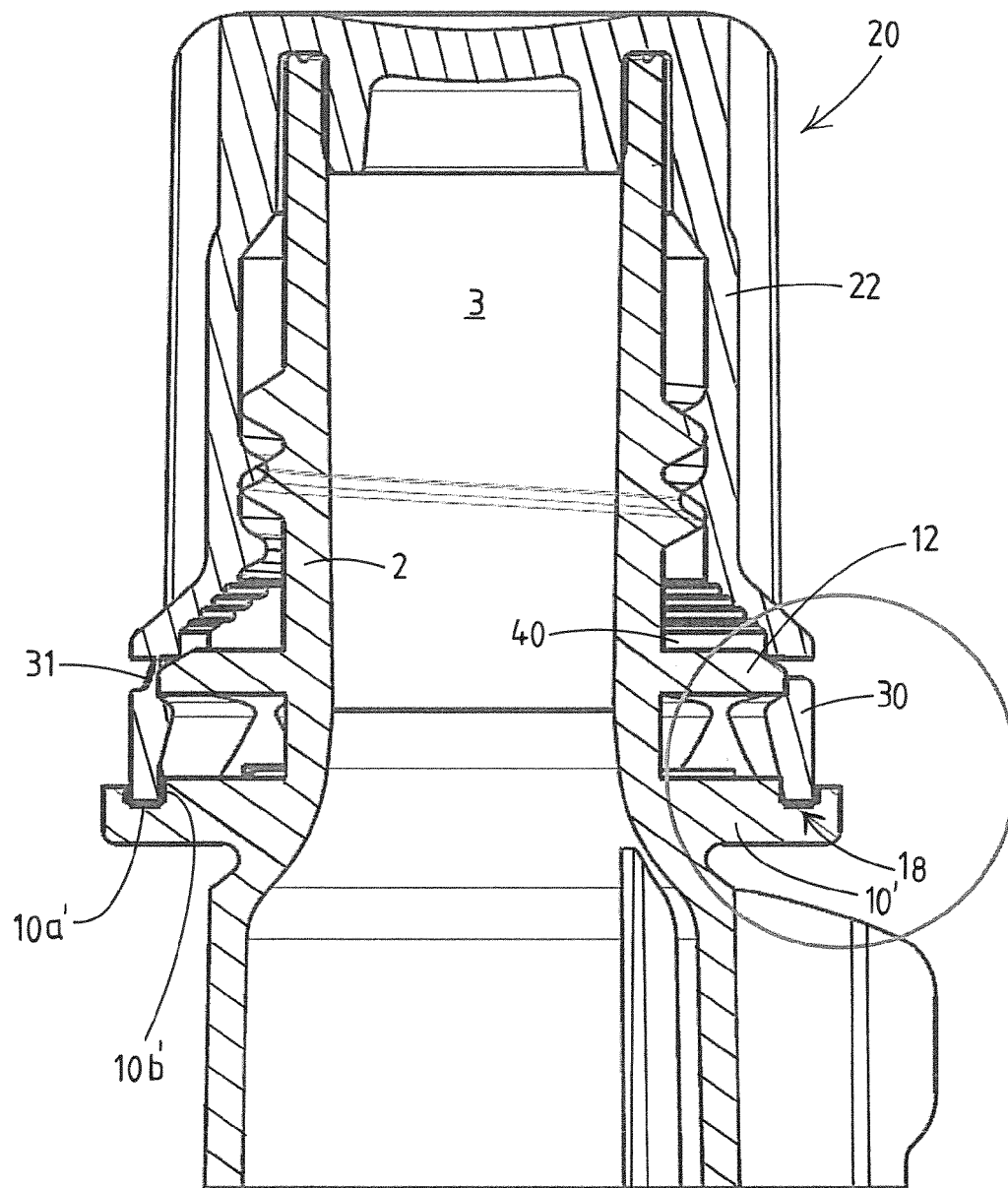


Fig.7



EUROPEAN SEARCH REPORT

Application Number
EP 11 16 3452

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2010/012576 A1 (VOLPAK S A U [ES]; BONET PEDROL JAUME [ES]) 4 February 2010 (2010-02-04) * figure 9 *	1,15	INV. B65D41/34
A	DE 202 12 541 U1 (GEORG MENSCHEN GMBH & CO KG [DE]) 24 October 2002 (2002-10-24) * figure 4 *	1,15	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 July 2011	Examiner Bridault, Alain
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 16 3452

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-07-2011

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 2010012576	A1	04-02-2010	ES	2312296 A1	16-02-2009

DE 20212541	U1	24-10-2002	AT	391085 T	15-04-2008
			AU	2003255347 A1	29-03-2004
			CN	1668511 A	14-09-2005
			WO	2004022443 A1	18-03-2004
			EP	1529005 A1	11-05-2005
			US	2006006130 A1	12-01-2006
