(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 253 268 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.10.2023 Bulletin 2023/40

(21) Application number: **23187574.1**

(22) Date of filing: **26.11.2019**

(51) International Patent Classification (IPC):
B65D 5/74 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65D 5/748; B65D 2251/0025; B65D 2251/0093

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Validation States:
MA

(30) Priority: **26.11.2018 IT 201800010569**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
19812738.3 / 3 887 270

(71) Applicant: **Easy Plast S.r.l.**
63073 Offida (AP) (IT)

(72) Inventors:
- **SILLA, Roberto**
  63073 Offida (AP) (IT)
- **MICHETTI, Luigino**
  63073 Offida (AP) (IT)

(74) Representative: **Ercolani, Simone Pietro**
Marietti, Gislon e Trupiano S.r.l.
Via XX settembre, 80
06121 Perugia (PG) (IT)

Remarks:
This application was filed on 25-07-2023 as a divisional application to the application mentioned under INID code 62.

(54) **OPENING/CLOSING DEVICE FOR A CONTAINER FOR POURABLE PRODUCTS**

(57) Opening/closing device (1) for a container (100) for pourable products, having at least one perforable portion (101), said opening/closing device comprising a collar (2) combinable with said container at said perforable portion, a cap (3) constrainedly movable by first guiding means (40), which are interposed between said cap (3) and said collar (2), on the outer surface (2a) of said collar (2), and a cutting element (5) constrainedly movable by second guiding means (60), which are interposed between said cutting element (5) and said collar (2), inside said collar (4) for severing said perforable portion, said device (1) further comprising pushing means (7) for said cutting element (5), which are actuated by said cap (3) during at least its first displacement on said outer surface (2a) of said collar (2), for promoting the displacement inside said collar of said at least one cutting element in the direction of said perforable portion, wherein said cap (3) is provided with at least one through hole (32) for pouring said pourable product and with at least one lid (10) integrally constrained to said cap and adapted to seal, or open, the passage of said at least one through hole (32), said first guiding means (40) only rotatably constraining said cap (3) to said collar (2), characterized further comprising means (11) for limiting the rotation of said cap with respect to the outer surface (2a) of said collar (2) between a first assembled position (P1) for said opening/closing device and a second locked position (P2) of said cap (3) on said collar (2), and in that by comprising a retaining ring (80) integrally constrained at the lower end of said cap by a plurality of frangible bridges, said frangible bridges being severed at least when said cap is displaced from said first assembled position

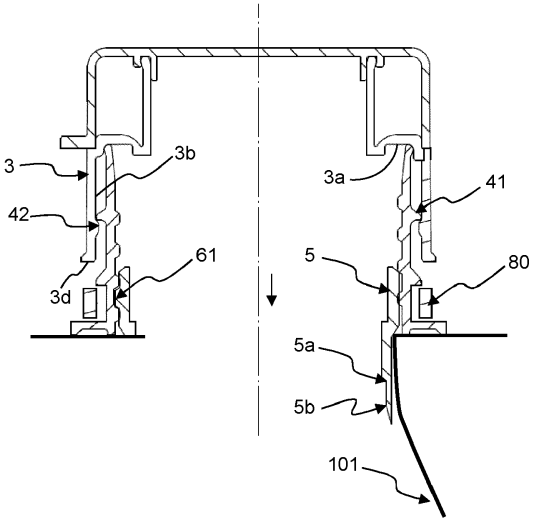

FIG. 3B

EP 4 253 268 A2

Description

FIELD OF INVENTION

[0001] This invention concerns a closure/opening device for a container suitable for the containment of pourable products. In particular, said closure/opening device is of the three-piece type, namely it is equipped with a collar having a flange that can be associated with a perforable portion of the container, a cutting element that perforates the cutting portion during the first opening of the device, and an upper cap that is screwed to the collar and has the task of both controlling the movement of the cutting element at the first opening of the device, and to preserve the product that can be placed inside the container during the period in which the container, although open, has not yet been emptied of its contents.

PRIOR ART

[0002] Such opening/closing devices are known. For example, document WO9505996 in the name of International Paper Company Inc. describes a three-piece locking device of the type discussed above.

[0003] Said opening/closing device is extremely efficient, but it is not without drawbacks, especially in terms of environmental impact. In fact, the cap, once removed, is not always repositioned on the collar because, either is carelessly thrown away by the user immediately after the first opening, or falls on the ground and, therefore, is no longer hygienically usable. This is clearly extremely damaging to the environment as the cap, as well as the entire opening/closing device, is made of plastic.

[0004] Document DE102010028518, under the name Bosch GmbH, describes a closing device that can be applied mainly to containers made entirely of plastic and that can be opened by means of suitable cutting elements that are activated when the container is first opened and that, once opened, can be conveniently opened and closed several times. This design describes, in particular, a closing device comprising a collar, a cutting edge and a rotating cap, equipped with a lower part and a lid which can also be rotated to the said lower part by means of a plastic hinge. The cap is associated with the collar and is attached to it in a way that can only be rotated by means of a lower cylindrical retaining element. The cap includes means for rotating the cutting element the first time the closing element is rotated with respect to the collar.

[0005] This solution, which should be applied to completely plastic containers, although it avoids the environmental problems associated with such devices since the cap remains always associated with the collar, would not be usable in laminated containers to which the opening/closing device of this invention are applicable. In these containers, which are normally parallelepiped shaped, the opening/closing device is positioned on the upper face, close to one side of the upper face of the parallelepiped (or also the pouring side), so that when the cap is removed, the product contained in the container can be easily poured, orienting the latter precisely on the side of the upper face closest to the closing device. The application of the cap described in DE102010028518 on a laminated container would not allow the user to obtain an efficient pouring of the product since the upper lid, once lifted, could also be on the "wrong" side of the upper face of the parallelepiped, namely it could be on the side of the upper face closest to the device, so that the liquid would be poured by orienting the container from the side of the upper face further away to the opening/closing device. In addition, the user should also hold the cap during pouring to prevent it from rotating.

SUMMARY OF THE INVENTION

[0006] A purpose of this invention is therefore to create a three-piece opening/closing device of the type described above that reduces, or completely eliminates, the problems of pollution caused by containers for pourable products of known art and that, at the same time, allows an efficient pouring of the product present in the container on whose upper face the opening/closing device is associated.

[0007] Another purpose of this invention is to create an opening/closing device that is still simple from a structural point of view and, therefore, simple and economical to manufacture.

[0008] These and other purposes are achieved by an opening/closing device according to the claim 1 of the present invention.

[0009] This solution allows, therefore, to avoid having to remove the cap completely from the collar, but allows to use the lid with the cap still associated with the collar both to store the product to be poured into the container and to pour the product outside the container, simply by lifting the cap. In practice, therefore, the cap cannot be pulled out of the collar and remains tied to it even after causing the cutting element to move and the consequent breakage of the perforable portion. According to the invention, moreover, the rotation of the cap with respect to the collar is limited between two distinct positions: a first position, the one of the end of the assembly of the opening/closing device, that is, with the collar, cap and cutting element coupled together by pressure; and a second position, in which the cap is clamped at an angle in a position that prevents the cutting element from completely cutting the perforable portion, thus causing it to fall into the container. This also has the effect of ensuring that, when the cap is open, the pouring can be done at the side of the container closest to the collar and, therefore, it is easier for the user to pour the product in the container. Moreover, this pouring takes place with the collar locked in a stable position, namely at the second position. In this way, the user will not have to worry about keeping the cap in a precise angular position with respect to the collar, but will be able to make the pouring in peace.

[0010] Furthermore, such limiting means shall comprise at least two mutually binding parts attached to the cap and the collar respectively. In particular, such limiting means shall include at least one locking tooth engaging in at least one corresponding seat, in which at least one locking tooth protrudes inside that cap and at least one seat is defined on that outer surface of that collar, or vice versa. In practice, when the cap is in its second position, this locking element engages with this seat in such a way that it no longer rotates with respect to the collar.

[0011] According to the invention, the angular interval between said first position and said second position is between 180 and 360°. This prevents the cutting element from completely cutting off the perforable portion with the result that the perforated portion falls into the container.

[0012] According to a particular aspect of the invention, said first guiding means comprise a first protruding radial portion and a second protruding radial portion, wherein said first protruding portion is integral to the external surface of said collar and said second protruding portion is integral to the internal surface of said cap and capable of crawling on said first protruding portion during the rotation of said cap with respect to said collar. Said first protruding portion and/or said second protruding portion shall be elastically deformable at least when said cap is associated with said collar during the assembly of said opening/closing device. In practice, therefore, the second protruding portion serves as a guide in the rotation of the cap on the external surface of the casting and at the same time prevents the cap from slipping out of the collar because the first portion is always in contact with the second portion.

[0013] In addition, the opening/closing device shall comprise a safety ring which is firmly attached to the lower end of said cap by means of a number of breakable bridges; said breakable bridges shall be severed at least when said cap is moved, or rotated, from said first assembly position for said opening/closing device to reach said second locking position.

[0014] Again, said lid is made in one piece with said cap.

[0015] Additionally, the cap includes a pouring spout. Preferably, the through-hole is made on the upper surface of the pouring spout.

[0016] Advantageously, that lid is hinged to that cap by means of a plastic hinge associated with the lateral surface of that cap. In particular, said plastic hinge shall be placed on this side surface in such an angular position that, at least when this cap is in its second locking position, this lid, when opened, is on the side of the container opposite to the nearest side or sides of pouring.

[0017] Further according to the invention it is made available a method for the first opening of a container for pourable products provided with an opening/closing device according to one or more of claims 1 to 9, comprising the steps of:

a) displacing said cap with respect to said collar;

b) causing, during said step a), the displacement of said cutting element in the direction of said perforable portion of said container for severing it;

said method further comprising subsequently to said step b), the step c) of raising said lid integral with said cap for pouring the product contained in said container, characterized that the method further comprises the step d) of limiting the displacement of said cap between a first assembled position for said opening/closing device and a second locked position of said cap to said collar.

[0018] In particular, said phase a) comprises phase a1) of rotating the cap in relation to the outer surface of the collar between that first position and that second position. Preferably, the angular interval between said first position and said second position is between 180 and 360°.

[0019] Finally, step c) includes the step of rotating the lid_with respect to the cap.

BRIEF DESCRIPTION OF THE FIGURES

[0020] Some forms of particular realization of the present invention will now be described, by way of example only and not limited to, with reference to the attached figures, in which:

Figure 1A is a perspective view of the opening/closing device according to the invention still closed and mounted on a container for pourable products;
Figure 1B is a perspective view of the opening/closing device according to the invention open and mounted on a container for pourable products;
Figure 2A is a perspective view of the opening/closing device according to the invention without a cap;
Figure 2B is a longitudinal section view of the device of Figure 2A, still in its first position and equipped with a cap;
Figure 3A is a partial forward view of the device in Figure 1 after the cap has reached its second position;
Figure 3B is a longitudinal cross-section view of the device of Figure 3A;
Figure 4A is a perspective view of the device of figure 1B with the lid open, in its second position;
Figure 4B is a longitudinal cross-section view of the device in Figure 4A.

DETAILED DESCRIPTION OF A PREFERRED FORM OF REALIZATION OF THE PRESENT INVENTION

[0021] With particular reference to these figures, it has been indicated with 1 the generic opening/closing device according to the invention.

[0022] The opening/closing device 1 is applied on a 100 container (here not shown completely but known to the skilled person) for pourable products having a perforable portion 101 (see figure 3B). Said container 100

is made in a well-known way using a laminated material, obtained by superimposing several layers of paper, or cardboard, aluminum, polyethylene and/or other additional materials, suitably shaped and folded, usually in the shape of a parallelepiped, and having at its top a perforated portion 101, or a portion of the laminate that is free of the layer of paper, or cardboard, and therefore easily perforable by a sharp body to allow the leakage of the liquid contained in the container 100.

[0023] According to the embodiment described here, the opening/closing device 1 comprises a collar 2 that can be associated with container 100 in correspondence with the perforable portion 101, a cap 3 that can be moved on the external surface 2a of collar 2 in a way bound by the first guide means 40 placed between cap 3 and collar 2, and a cutting element 5 that can be moved on the internal surface 2b of collar 2 in a way bound by the second guide means 60 placed between cutting element 5 and collar 2 to cut off the perforable portion 101. The second guiding means 60 are of the screw 61 type and the nut 62 type, in which the screw 61 is attached to the cutting element 5 and the nut 62 is attached to the collar 2. It should be noted that the opening/closing device 1 is made of plastic material such as, for example, polypropylene. Other plastic materials can be used for the realization of the device 1 without departing from the scope of protection of the present invention.

[0024] Collar 2 also includes a flange 30 that surrounds the entire perforable portion 101 of the container 100 and that, from its lower side 30a, is associated with the 100 container for gluing.

[0025] The annular-shaped cutting element 5 has at its end 5a a plurality of teeth 5b to facilitate the breakage of the perforable portion 101.

[0026] The opening/closing device 1 also includes pushing means 7 for cutting member 5 actuated by cap 3, during at least its first movement on the outer surface 2a of collar 2, to promote the movement inside the collar 2 of cutting member 5 in the direction of the perforable portion 101.

[0027] These pushing means 7 are made of in one piece with cap 3. In particular, according to the invention, while cap 3 moves on the collar 2, the cutting element 5 is forced by means of the pushing means 7 to move in the direction of the perforable portion 101 to cut it at least partially.

[0028] Advantageously, cap 3 is equipped with a through-hole 32 for pouring the pourable product and a lid 10 attached firmly to cap 3 and able to close tightly, or open the through-hole passage 32 to, respectively, store or pour the product contained in container 101.

[0029] In practice, therefore, without the need to remove the cap 3 from the collar 2, the user, once the cutting element 5 has perforated the perforable portion 101, can lift the lid 10 and pour the liquid product contained in the container 100.

[0030] It should be noted that the pushing means 7 include two wings 71 (in the attached figures it is represented only one wing for reasons of simplicity) that assume a partially cylindrical shape that project axially from the upper surface 3a of the cap 3 inside the same. In addition, the pushing means 7 include appropriate engaging elements (not shown here but known to the skilled person) for the two fins 71 attached to the cutting element 5. When cap 3 is placed on the collar 3 at least one fin 71 of the two fins comes into contact with a commitment element, thus subjecting the cutting element 5 to a torque. This torque causes the cutting element 5 to be rotated over the inner surface 2b of collar 2 and the perforation of the perforable portion 101 to occur.

[0031] It should be noted that in other embodiments not shown here the number of wings 71 is different from that indicated in the form of realization described here, also the second guiding means 7 could be different such as, for example, including cam elements that interact with appropriate guides that allow the cutting element 5 to move along a trajectory that is not only helical, but partly helical and partly straight.

[0032] According to the embodiment described here, the first guiding means 40 only rotate the cap 3 to the outer surface 2a of the collar 2.

[0033] This solution allows, therefore, to avoid having to remove the cap 3 completely from the collar 2, but it allows to use the lid 10 also with cap 3 still associated with the collar 2 both to store the product to be poured into the container 100 and to pour the product outside the container 100, simply by lifting the lid 10.

[0034] In addition, device 1 also includes means 11 to limit the rotation of cap 3 with respect to the outer surface 2a of collar 2 between a first assembly position P1 for opening/closing device 1 and a second position P2 for locking the cap to collar 2. In practice, therefore, cap 3 rotates for a given angular interval, starting from a first P1 position, which is the initial assembly position of device 1 at the exit of the production plant, until it reaches a second locking position to the collar 2.

[0035] The angular range between the first position P1 and the second position P2 is comprised between 180 and 360°. In the form described here, the rotation interval is 355°.

[0036] This has the advantage that the cutting element 5, which will therefore rotate at an angle equal to that of rotation of cap 3, will not be able to fully perforate the perforable portion 101, thus causing it to fall into the container 100.

[0037] Furthermore, such a solution allows the lid 10 to open in such a position that the product contained in the container 100 is easily poured into the collar 2 at the second locking position P2 of the cap 3. Moreover, the user does not have to worry about keeping the cap 3 in a precise angular position to allow it to be poured as it is locked in a fixed position with respect to the collar 2.

[0038] As shown in the attached figures, the first guide vehicles 40 comprise a first protruding radial portion 41 and a second protruding radial portion 42, in which the first protruding portion 41 is attached to the outer surface

2a of collar 2 and the second protruding portion 42 is attached to the inner lateral surface 3b of cap 3 and is suitable for sliding on the first protruding portion 41 during the rotation of cap 3 with respect to collar 2. The first protruding portion 41 is also slightly elastically deformable at least when cap 3 is associated with collar 2 during the assembly of the opening/closing device 1, thus allowing the association of cap 3 with collar 2. These guide means 40 also prevent cap 3 from being axially removed from collar 2 once it has been assembled with collar 2 itself.

[0039] In addition, the opening/closing device 1 includes a safety ring 80 which is firmly attached to the lower end 3d of cap 3 by means of a number of breakable bridges 81. Breakable bridges 81 are broken when the user turns cap 3 for the first time with respect to collar 2, thus moving from its first position P1. The breakage of these bridges 81 is obtained, in a known way, thanks to appropriate 90 fracturing elements attached to the collar 2.

[0040] The limitating means 11 comprise at least two mutually binding parts 12 and 13, respectively attached to cap 3 and collar 2.

[0041] In particular, the limiting means 11 include a locking tooth 12 that can be engaged within a corresponding seat 13. The locking tooth 12 is protruding inside the cap 3 and the seat 13 is defined on the external surface 2a of the collar 2. The seat 13, however, is made by a pair of protruding elements 13a, 13b suitably spaced to leave space between them to accommodate the tooth 12 at the end of the rotation of the cap 3 from its first position P1 to its second locking position P2. The protrusion 13a of the seat 13 that first comes into contact with the tooth 12 is in the form of a ramp to facilitate the entry of the tooth 13 within the space obtained between the two protruding elements 13a, 13b and so lock in position P2 the cap 3.

[0042] In other embodiments not shown here, the locking tooth 12 is protruding from the outside of the collar 2, while the seat 13 is defined on the inner lateral surface 3b of the cap 3, without leaving the scope of protection of this invention.

[0043] In addition, in the form described here, tooth 12 and seat 13 are dimensioned in such a way that they do not interfere during the axial sliding of cap 3 with collar 2, during the assembly of device 1, and can only be engaged with each other during the reciprocal rotation between cap 3 and collar 2.

[0044] As shown in the attached figures, the lid 10 is made in one piece with cap 3.

[0045] Cap 3 has a pouring nozzle 31 that juts out from the top surface 3a of cap 3 itself. The through-hole 32 is made on the upper surface of the pouring nozzle 31. The diameter of the nozzle is smaller than the diameter of the upper surface 3a of cap 3, so that it is referred to as a kind of stepped surface 33 on cap 3. Lid 10 is hinged to cap 3 by a plastic hinge 35 associated with the outer lateral surface 3c of cap 3. In particular, the plastic hinge 35 is located right at the above-mentioned step 33.

[0046] The pushing means 7 are arranged around the lower end section 31a of the nozzle 31 and protrude axially from the upper surface 3a of the cap 3 into it.

[0047] Moreover, cap 10 is equipped, on its inner side 10a, the one facing container 100 when closed, with U-shaped sealing elements 18 able to associate in a sealed fashion with the upper end section 31b of the pouring nozzle 31. The nozzle 31 is therefore delimited, at the top, by the upper terminal section 31b and, at the bottom, by the lower terminal section 31a.

[0048] As shown in figure 4B, the plastic hinge 35 is placed on the outer lateral surface 3c of cap 3 in such an angular position that at least when cap 3 is in its second locking position P2 the lid 10, when opened, is on the side of the container 100 opposite to the sides 102, 103 of the container 100 closest to the collar 3 (see also figure 1B). In this way it is possible to easily pour the liquid contained in the container 100, in fact the lid 10, when opened, does not hinder the pouring of the product contained in the container 100 being, the collar 2, in a position close to the sides of the faces 103 and 102 and the lid 10 in a position approximately opposite to the sides of the two faces 103 and 102. If, on the other hand, the lid 10 is located, once opened and the collar 3 has reached its second position P2, near the sides of the two faces 102 and 103, it would be difficult for the user to be able to pour the product contained in the container 100 especially at the beginning, when the container 100 is full. In fact, the same lid 10 would hinder the pouring of the product from the side or sides closest to collar 2 (in the example shown by the sides where the faces 103 and 102 closest to collar 2 are located).

[0049] Finally, the method for the first opening of a 100 container for pourable products equipped with an opening/closing device 1 of the type described above includes the phases of:

a) turning cap 3 relative to collar 2;
b) causing, during step (a), the shear element 5 to move in the direction of the perforable portion 101 of container 100 to cut it off;

and, finally, c) lifting the lid 10 attached to the cap 3 to pour the product contained in the container 100.

[0050] According to the invention, the method also includes step d) to limit the rotation of cap 3 between the first assembly position P1 for opening/closing device 1 and a second locking position P2 of cap 3 to collar 2.

[0051] In particular, the displacement of the cutting element 5 in the direction of the perforable portion 101 of the container 100 is a roto-translation caused by the second guiding means 60 by means of screw 61 and screw nut 62 integral with, respectively, to the cutting element 5 and to the collar 2.

[0052] Step c) includes the step of rotating the lid 10 with respect to cap 3.

[0053] Finally, it should be noted that the first rotation

of the cap 3 also causes the breakage of the safety tab 80.

Claims

1. Opening/closing device (1) for a container (100) for pourable products, having at least one perforable portion (101), said opening/closing device comprising a collar (2) combinable with said container at said perforable portion, a cap (3) constrainedly movable by first guiding means (40), which are interposed between said cap (3) and said collar (2), on the outer surface (2a) of said collar (2), and a cutting element (5) constrainedly movable by second guiding means (60), which are interposed between said cutting element (5) and said collar (2), inside said collar (4) for severing said perforable portion, said device (1) further comprising pushing means (7) for said cutting element (5), which are actuated by said cap (3) during at least its first displacement on said outer surface (2a) of said collar (2), for promoting the displacement inside said collar of said at least one cutting element in the direction of said perforable portion, wherein said cap (3) is provided with at least one through hole (32) for pouring said pourable product and with at least one lid (10) integrally constrained to said cap and adapted to seal, or open, the passage of said at least one through hole (32), said first guiding means (40) only rotatably constraining said cap (3) to said collar (2), characterized further comprising means (11) for limiting the rotation of said cap with respect to the outer surface (2a) of said collar (2) between a first assembled position (P1) for said opening/closing device and a second locked position (P2) of said cap (3) on said collar (2), and in that by comprising a retaining ring (80) integrally constrained at the lower end of said cap by a plurality of frangible bridges, said frangible bridges being severed at least when said cap is displaced from said first assembled position.

2. Device according to claim 1, **characterized in that** said limiting means (11) comprise at least two parts, which can be reciprocally engaged and are respectively integral with said cap and said collar.

3. Device according to claim 2, **characterized in that** said limiting means (1) comprise at least one locking tooth (11) which can be engaged in at least one corresponding seat (12), at least when said cap is in said second position, said at least one locking tooth protruding inside said cap and said at least one seat being defined on said outer surface of said collar, or vice-versa.

4. Device according to one or more of claims 1 to 3, **characterized in that** the angular range between said first position and said second position is between 180 and 360°.

5. Device according to one or more of claims 1 to 4, **characterized in that** said first guiding means (40) comprise a first protruding radial portion (41) and a second protruding radial portion (42), wherein said first protruding portion is integral with the outer surface of said collar and said second protruding portion is integral with the inner surface (3b) of said cap (3) and adapted to brush against said first protruding portion during the rotation of said cap with respect to said collar, said first protruding portion and/or said second protruding portion being elastically deformable at least when said cap is combined with said collar during the assembly of said opening/closing device (1).

6. Device according to any one of the preceding claims, **characterized in that** said lid (10) is made in one piece with said cap.

7. Device according to any one of the preceding claims, **characterized in that** said cap (3) comprises a pouring spout (31), said through hole (32) being made at the upper final end (31b) of said pouring spout.

8. Device according to any one of the preceding claims, **characterized in that** said lid is hinged to said cap by a plastic hinge combined with the side surface of said cap.

9. Device according to claim 8, **characterized in that** said plastic hinge is arranged on said side surface (3c) in an angular position so that at least when said cap (3) is in its second locked position, said lid (10), when open, is on the part of the container opposite the side(s) of the container closest to said collar.

10. Method for the first opening of a container for pourable products provided with an opening/closing device according to one or more of claims 1 to 9, comprising the steps of:

    a) displacing said cap with respect to said collar;
    b) causing, during said step a), the displacement of said cutting element in the direction of said perforable portion of said container for severing it;

    said method further comprising subsequently to said step b), the step c) of raising said lid integral with said cap for pouring the product contained in said container, **characterized by** further comprising the step d) of limiting the displacement of said cap between a first assembled position for said opening/closing device and a second locked position (P2) of said cap to said collar.

11. Method according to claim 10, **characterized in that** said step a) comprises the step a1) of rotating said cap with respect to the outer surface of said collar between said first position and said second position.

12. Method according to claim 10 or 11, **characterized by** the fact that said step (c) comprises the step of turning the lid with respect to the cap.

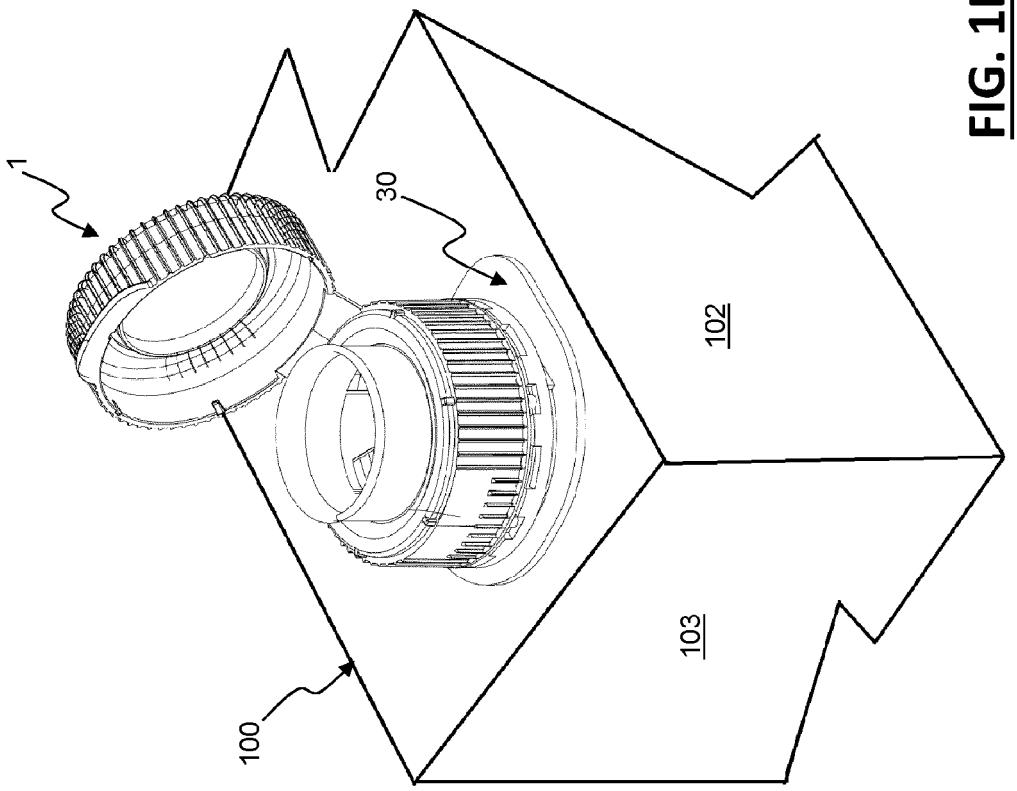

FIG. 1B

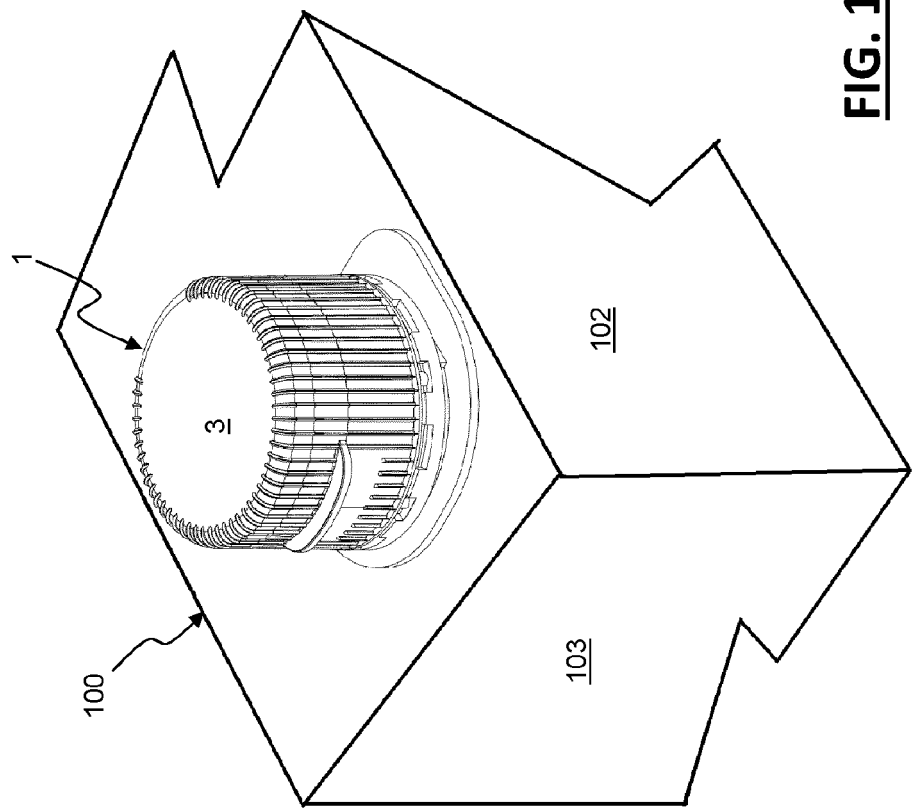

FIG. 1A

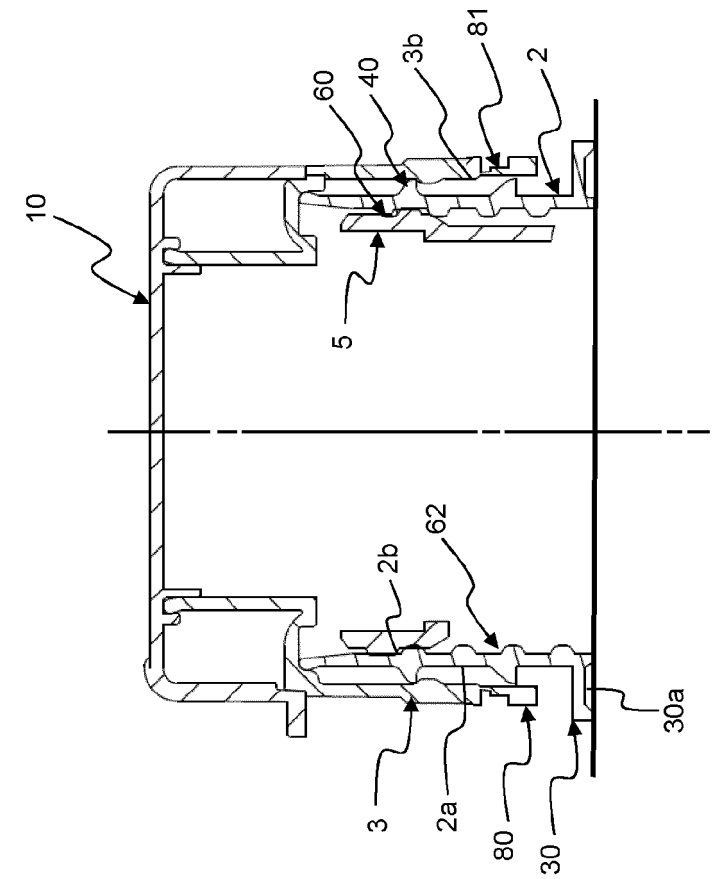
10
60
40
3b
81
2
5
62
2b
3
2a
80
30
30a

FIG. 2B

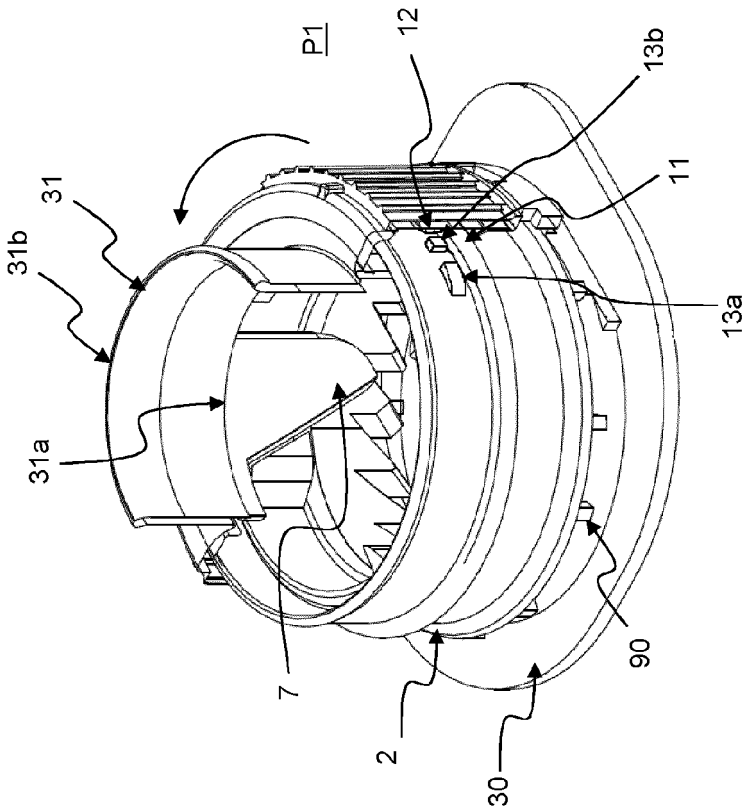
P1
12
13b
11
13a
31
31b
31a
7
2
30
90

FIG. 2A

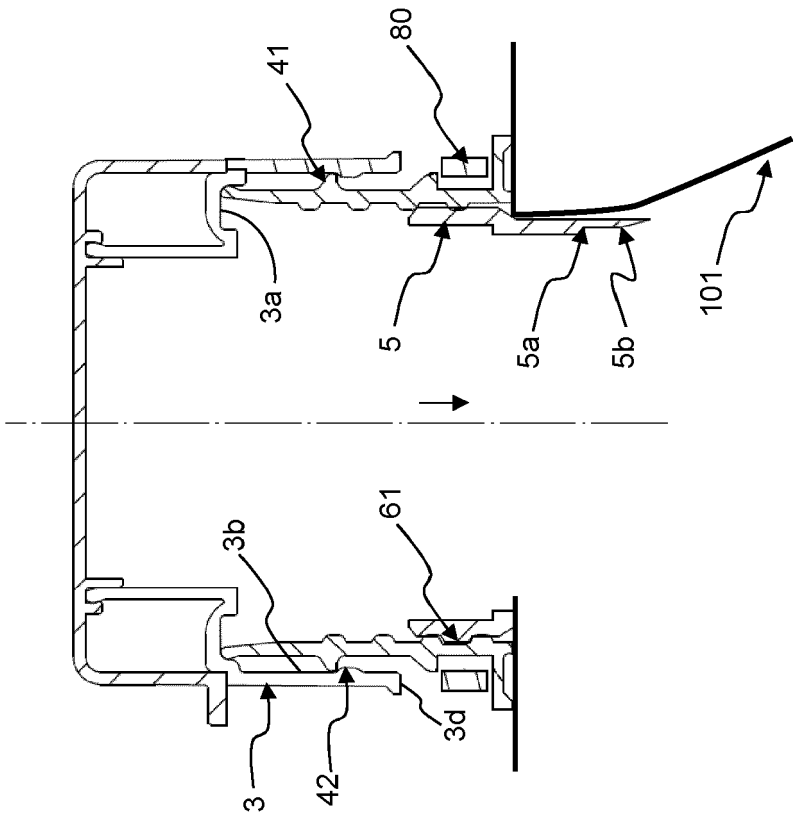

FIG. 3B

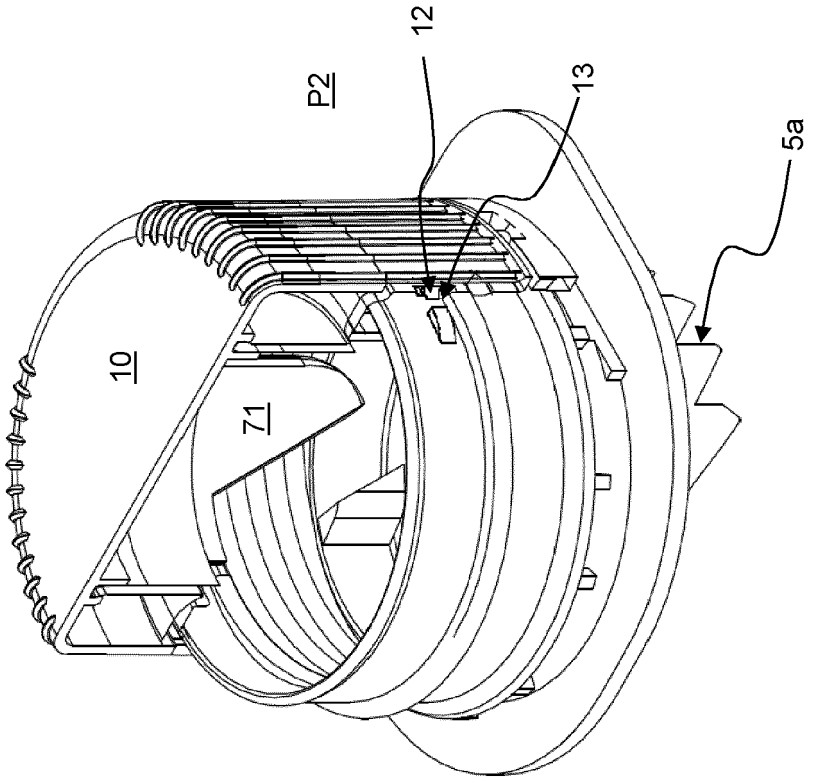

FIG. 3A

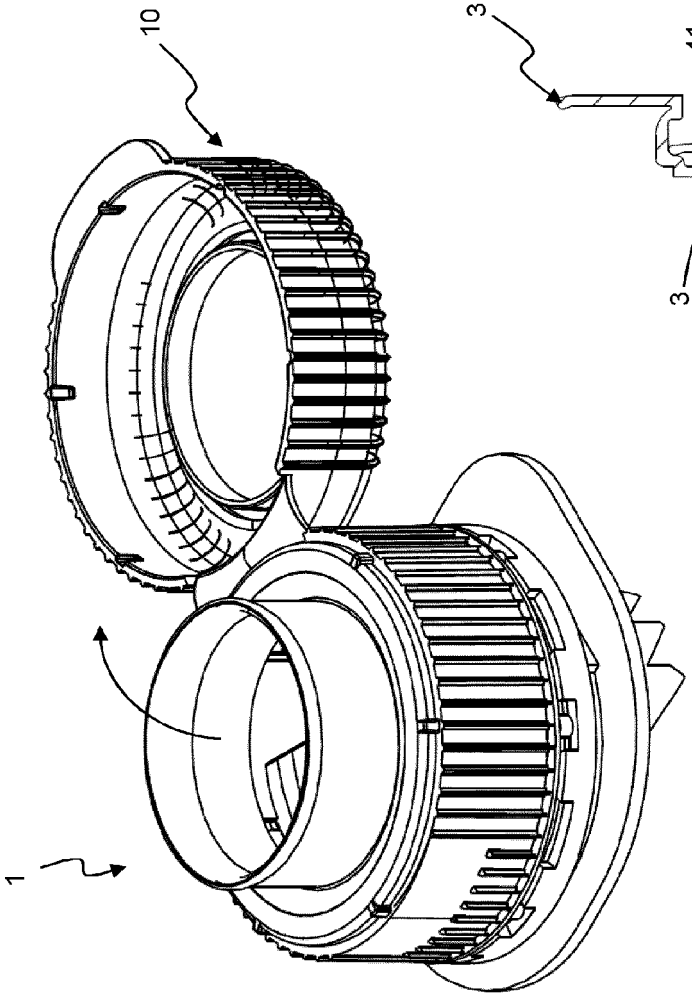

FIG. 4A

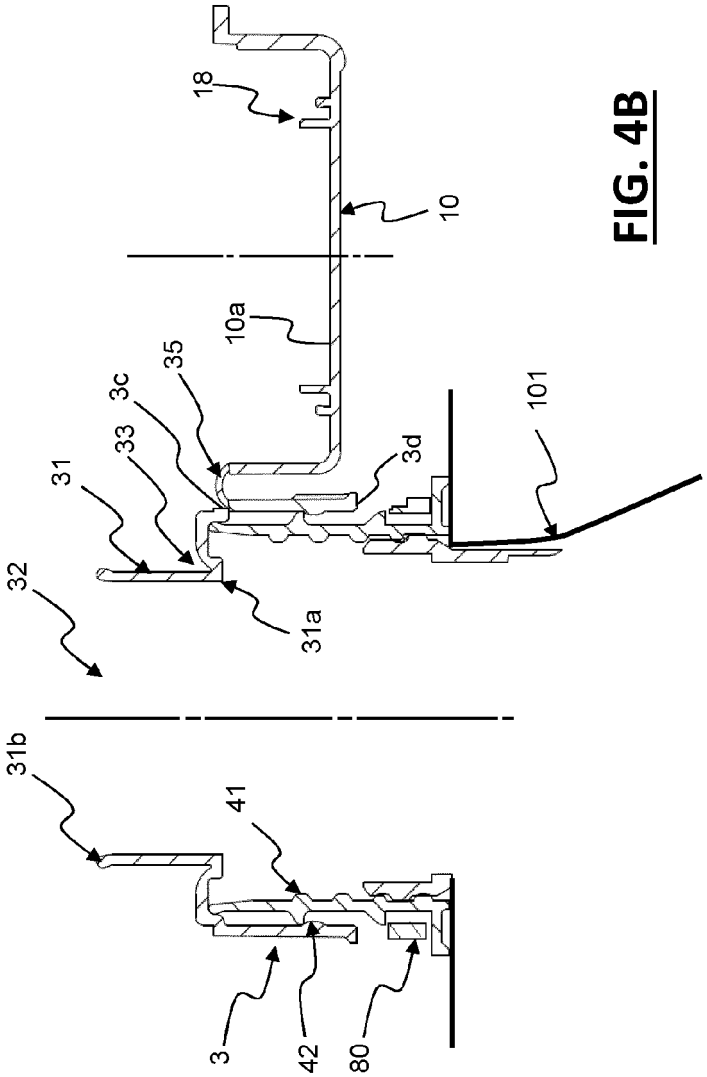

FIG. 4B

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 9505996 A **[0002]**
- DE 102010028518 **[0004] [0005]**