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(54) **DOUBLE TAMPER EVIDENCE CAP FOR A NECK OF A CONTAINER, SYSTEM INCLUDING SAID CAP AND A CONTAINER AND METHOD FOR MANUFACTURING SAID CAP**

DOPPELTE ORIGINALITÄTSVERSCHLUSSKAPPE FÜR EINEN HALS EINES BEHÄLTERS,
SYSTEM MIT BESAGTER KAPPE UND BEHÄLTER UND VERFAHREN ZUR HERSTELLUNG DER
BESAGTEN KAPPE

CAPUCHON À DOUBLE INVIOUABILITÉ POUR COL DE RÉCIPIENT, SYSTÈME COMPRENANT
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Description

Field of the invention

[0001] The invention relates to a cap for closing the neck of a container -preferably a bottle- suitable for containing water or other liquids for human consumption (generically drinking water hereafter).

[0002] More particularly, the cap according to the invention is a screw cap manufactured by moulding (*i.a* injection-molding or compression molding) of plastic material, such as a polyolefin, e.g polypropylene, a High Density PolyEthylene (HDPE), a Low Density PolyEthylene (LDPE), a Linear Low Density PolyEthylene (LLDPE), and mixtures and/or alloys thereof.

[0003] The container is usually a bottle, e.g a plastic ISBM bottle (ISBM: Injection Stretch Blow Molding). The constituent material of these bottles is typically a thermoplastic polymer for instance a PolyEthyleneTerephthalate (PET) or a PolyEthyleneFuranoate (PEF). These bottles are intended to contain drinks (e.g. water).

[0004] The cap includes an upper removable part (opening by unscrewing) and a non-removable part which is a Tamper Evidence Band TEB.

[0005] The system including such a cap container closed with said cap as well as the method for manufacturing said cap, and a method for bottling a container comprising said cap, are encompassed in the present invention.

Background

[0006] Containers, especially bottles, are prone to infringement through the filling offence. This latter consists in filling empty containers bearing an authentic registered trademark, with a liquid (e.g. drinkable water) which is not the authentic liquid. Such a criminal act is not only deleterious for the brand image of the owner of the trademark, but represents also a major health risk, in view of the doubtful quality of the infringing liquid.

[0007] To fight against that some tamper-proof containers for drinking beverages have been developed.

[0008] In this respect, WO2011064489 (A1) discloses a lid 1, intended to be screwed onto the neck 2 of a bottle, which is open at its lower end and closed at its upper end with a bottom wall 10, at the outer periphery of which a tubular skirt 11 centered on the axis X-X and with a circular base extends axially downward. During the first licit unscrewing of the lid 1, the skirt 11 is adapted so as to separate into two distinct portions, i.e. an upper portion 121, made with the bottom wall 10 in the same material, and a lower portion 122 initially connected to the upper portion 121 at a peripheral break line 20 axially located in the running portion of the skirt. The skirt 11 further comprises a peripheral break segment 28 distinct from the break line 20. The break segment 28, which is delimited distinctly from the break line 26 so as to form, between the break

line 26 and the break segment 28 along the direction of the axis of the skirt 11, a strand 32 extending along the periphery of the skirt 11, wherein either each of both peripheral ends, or the running portion of said strand, is bound in a non-breakable way to a first of the removable and non-removable skirt portions, while, respectively either the running portion, or each of both peripheral ends of said strand is connected to the second of the skirt portions through a breakable bridge which is adapted, during the first opening of the lid, for successively resisting to failure while the break line is already broken, and for then breaking after plastic deformation of the strand and for thus separating the removable and non-removable skirt portions from each other.

[0009] CN102514807B describes a double etched line anti-fake bottle cap, comprising an upper sleeve (1) and a lower sleeve (2) that are connected with each other by an upper etched line. A lower etched line is provided below and in parallel with the upper etched line. A fracture zone (3) is formed between the upper and lower etched lines. The upper etched line is constituted by several upper notches (4) and upper connecting points (5) that are arranged in an alternative manner. The lower etched line is constituted by several lower notches (6) and lower connecting points (7) that are arranged in an alternative manner. The upper connecting points (5) correspond to the lower notches (6) longitudinally, and the lower connecting points (7) correspond to the upper notches (4) longitudinally. When the bottle cap is licitly opened at the first time, the fracture zone between two etched lines can be fractured under the shearing forces of the upper and lower sleeves in opposed directions such that the fracture zone is separated from the cap or deformed obviously. Thus, the upper and lower sleeves are not recoverable and the fracture zone cannot be connected with the upper sleeve again. It is a simple and obvious visible change to inform the user that this container has been opened before.

[0010] EP1851128 describes a tamper evident screw cap according to the preamble of claim 1, comprising a secondary tamper evidence element.

[0011] The faking markers of the caps according to this above-mentioned prior art include Tamper Evidence Band (TEB) made of superposed breaking lines. But these latter are only dedicated to warn the consumers of the bottle first opening.

[0012] The problem is that before said bottle normal first opening, the lawbreakers who want to fill fake and inferior products in the bottle, compete of ingeniousness to break in the bottle cap without damaging the TEB. Such a breaking in could be done by means of tools which play on the elasticity of the plastic material to remove the cap. Instead of or in addition to such a mechanical action, the lawbreakers can try to distend the cap through heating it (steaming).

[0013] It exists therefore an acute need of anti-fake systems comprising a cap and a bottle which, on the one hand, complicates the task of lawbreakers in breakings

in before the first bottle opening, and on the other hand, give to consumers flagrant indication of said prior breakings in.

Objectives of the invention

[0014] In the above recalled background, the invention aims at fulfilling at least one of the following objectives: Said cap makes it possible to prevent breaking in of the bottle, by removing the cap without breaking the TEB, through inserting of a tool, possibly with heating of the cap to deform the plastic material of the cap.

1. Providing an improved container (e.g bottle) cap which complicates a lot the counterfeiting consisting in removing the cap, filling the container with a non-authentic liquid and put back sealingly the cap with no apparent signs of previous removal.

2. Providing an improved container (e.g bottle) cap which makes it possible to prevent breaking in of the bottle, before its first opening, by removing the cap without breaking the TEB, through inserting of a tool, possibly with heating of the cap to deform the plastic material of the cap.

3. Providing an improved tamperproof cap which shows obvious indications of the first opening as well as of any illicit opening before the first opening and of any re-use.

4. Providing an improved plastic injection molded cap for a plastic injection molded container (e.g bottle) which is a single use leak-proof closing.

5. Providing an improved tamperproof cap which fulfils at least one of the objectives 1 to 4 and having tamperproof means which make easier the opening of the cap.

6. Providing an improved tamperproof cap which fulfils at least one of the objectives 1 to 5 and having tamperproof means which enables waterproof or non-waterproof re-closings after a first opening.

7. Providing an improved tamperproof cap which fulfils at least one of the objectives 1 to 6, which makes it possible to render the appearance of the cap more attractive.

8. Providing an improved tamperproof cap which fulfils at least one of the objectives 1 to 7, which is economical and simple to manufacture by means of an injection process.

9. Providing a system composed of a screw cap as defined in at least one of the objectives 1 to 8 and of a container -e.g. a bottle-.

10. According to an embodiment not covered by the claimed invention, providing a container -preferably a bottle- or preform for the manufacture by blowing of said container designed to be closed by a cap as defined in at least one of the objectives 1 to 8.

11. Providing a method for manufacturing a cap as defined in at least one of the objectives 1 to 8.

12. Providing a method for bottling a container -preferably a bottle- with a cap as defined in at least one of the objectives 1 to 8.

13. According to an embodiment not covered by the claimed invention, providing a method for licitly opening a container -preferably a bottle- filled with a genuine commercial product and closed by a cap as defined in at least one of the objectives 1 to 10.

Summary of the Invention

[0015] The invention aims at fulfilling the above mentioned objectives. To this end, according to a first aspect, the invention provides a screw cap for a neck of a container -preferably a bottle- comprising an upper part removable from the neck and a lower part non-removable from the neck, said lower non-removable part being a tamper evidence band (TEB);

> said neck having an external face including downwardly and successively from the open top end: at least one thread, a lock ring and a support ring;
> said upper removable part of the cap comprising:

- a top wall and
- an annular skirt extending downwardly from the top wall and having a bottom edge which is linked to the lower non-removable part of the cap once said cap is fixed onto the neck after bottling;

> said TEB

- being linked to the bottom edge of the skirt by annularly -preferably regularly- distributed frangible connection bridges;
- having an inner face presenting at least one inwardly extending upper shoulder which is intended to abut the lock ring of the neck, during the container first opening, by unscrewing of the upper removable part of the cap, said container first opening involving the rupture of the connection bridges which are so upper markers of said container first opening;

→ wherein said TEB indicates, on the one hand, the container first licit opening and, on the other hand, any breaking in of the cap before the container first

licit opening;

→ wherein said TEB comprises, below the markers of said container first licit opening, some additional lower markers of breaking in of the cap before the container first licit opening.

[0016] This peculiar double level of tamper evidence markers of this cap increases the safety of the consumers and guarantees the authenticity of the container closed by said cap.

[0017] These markers reveal unquestionably the breakings in and breakings in attempts prior to the first opening of the container, as well as the first regular opening of said container.

[0018] These double markers are quite easy to manufacture and do not burden the economy of the manufacturing method of the caps.

[0019] The cap according to the invention proceeds from combining the typical tamper evidence band (TEB) including the break line defining frangible bridges with evidence of prior breaking in which are located below the known break line of the TEB and which also constitutes an obstacle to any illicit mechanical and/or thermic cap removal.

[0020] The cap according to the invention is an improved container (e.g bottle) cap which is a single use leakproof closing, which shows obvious indications of an illicit opening and re-use, having tamperproof means which make easier the opening of the cap and which enables non-waterproof re-closings after a first opening. The invention offers a reinforced safety against misuses and infringements.

[0021] According to a preferred embodiment, and in order to prevent the insertion of a tool in view of illicit removal of the cap prior to the 1st opening of the container, the inner annular face of at least one - preferably of each - additional lower marker is inwardly set back (interval I) with respect to the peripheral end of the lock ring of the neck. Said interval I is the smallest as possible, while enabling the setting up of the cap onto the neck of container, during the bottling, after the filling of the container, on an industrial line.

[0022] In this respect, the inner annular face of at least one - preferably of each - additional lower marker, is preferably at a minimum interstitial distance d of the facing external face of the neck, said distance being defined as follows, in an increasing order of preference: $d \leq 3 \text{ mm}$; $d \leq 2 \text{ mm}$; $d \leq 1 \text{ mm}$; $d \leq 0,5 \text{ mm}$; $d \leq 0,01 \text{ mm}$.

[0023] In a variant the invention pertains to a molded plastic screw cap for a neck of a container -preferably a bottle-,

said cap comprising:

- a top wall
- an annular skirt extending downwardly from the top wall and having a bottom edge; and
- a tamper evidence band (TEB) linked to the bot-

tom edge of the skirt by annularly -preferably regularly- distributed frangible connection bridges;

said neck of the container being in a single piece with the rest of the container and having a top edge which delimits the opening of the container and which is in sealed contact with the lower face of the cap top wall in the closed position of said cap, namely the original position, before the first licit opening of the container by unscrewing the upper removable part of the cap, said first licit opening involving the rupture of the connection bridges which are so upper markers of said first licit opening;

→ wherein said TEB comprises a top ring and a bottom ring linked to the top ring by at least two annularly -preferably regularly- distributed additional frangible bridges;

→ wherein both frangible bridges and additional frangible bridges are below the top edge of the neck in the original position,

→ wherein the top ring of the TEB between frangible bridges and additional frangible bridges is intact after the first licit opening.

[0024] The cap according to the invention does not include an in-bore fitment, especially an in-bore non return pouring fitment (one-way valve), which is secured within the container neck and within the cap and which is an additional piece between the cap and the container, so that the lower face of the top wall of the cap is not in sealed contact with the top edge of the edge in the original position of the cap closing the container.

[0025] According to a possible structural feature of the double level of frangible bridges of the cap according to the invention, the height h^5 of the top ring of the TEB is lower than the height h^{11} of the skirt (11), preferably $h^5 \leq [h^{11} / 2]$; more preferably $h^5 \leq [h^{11} / 3]$.

[0026] Preferably, the cap comprises comprising at least one lower shoulder which extends inwardly from the inner face of the TEB, and which is intended to come close, and preferably to abut, the top face of a groove of the neck, during the container first opening. Such a feature prevents the introduction of a breaking in tool.

[0027] Advantageously, the upper shoulder and/or the lower shoulder is composed of several protusions, which are for instance annularly and regularly distributed.

[0028] According to an interesting feature of the invention, the marks given by the upper markers of said container first opening and by the additional lower markers of said container breaking in, are visible to the naked eye.

[0029] It is a peculiarity of the invention the additional lower markers are mechanically- and/or heat-deformable and include:

■ According to a first embodiment, at least one frangible additional bridge which connects the lower por-

tion of the TEB to the upper portion of said TEB,

■ and/or, according to a second embodiment, at least one outwardly, preferably radially, extending ribs.

[0030] Advantageously, the frangible additional bridges and/or the outwardly - preferably radially- extending ribs, are:

- annularly -preferably regularly- distributed around the TEB,
- and/or parallel to the axis Y-Y of the cap.

[0031] In view of improving the mechanical strength of the frangible additional bridges of the additional lower markers, the bottom and/or the top of said at least one frangible additional bridges, comprise(s) a lug which extends outwardly from the lower portion of the TEB and/or from the upper portion of the TEB, each additional bridge being preferably located between a lower lug and an upper lug.

[0032] In the case where the mold for manufacturing the cap comprises an ejector of the type ram slide stroke, it is preferable that the cap includes at least two undercuts, advantageously two diametrically opposed undercuts, each undercut being for instance composed of at least three of the upper lugs and the three corresponding lower lugs, are gathered three by three, at the upper and lower levels, to form a superposed structural protruding unit, which is designed to improve the mechanical performances, said cap preferably comprising two superposed structural protruding units, advantageously diametrically opposed.

[0033] Always in this case, according to the here above mentioned second embodiment, at least, preferably at least three of the outwardly extending ribs, are gathered to form a single structural protruding unit, which is designed to improve the mechanical performances, said cap preferably comprising two single structural protruding units, advantageously diametrically opposed.

[0034] Outstandingly, the bridges of the upper markers and/or the additional bridges of the lower markers are separated from each other by openings which projections on a plane have a shape which is preferably and independently rectangular, trapezoidal or ovoid.

[0035] In a particular embodiment adapted to the manufacture of the cap's openings in the course of the manufacture of the whole cap by compression moulding, rather than by slitting afterwards a mold cap without openings, after the bottling, at least one of said opening being possibly partially closed by a counter-bridge extending upwardly from the bottom from the lower side of the opening or downwardly from the upper side of the opening. The counter-bridges make it possible to hinder crashing of the openings, especially during the setting up of the cap onto the container for closing the filled container, during the bottling.

[0036] According to an interesting feature of the inven-

tion, the cap is a plastic molded (e.g. compression, injection) cap, made from thermoplastic material chosen in the group comprising a polyolefin and preferably polypropylene, a High Density PolyEthylene (HDPE), a Low Density PolyEthylene (LDPE), a Linear Low Density PolyEthylene (LLDPE), and mixtures and/or alloys thereof.

[0037] Advantageously, the cap according to the invention can further comprise a plurality of ribs extending parallel to the central axis (A) on the outer surface of the skirt of the upper removable part of the cap.

[0038] According to a second aspect, the invention concerns a system composed of a screw cap according to at least one of any preceding claims and a container (3) -preferably a bottle-.

[0039] According to a third aspect not covered by the claimed invention, the disclosure concerns a container -preferably a bottle- or preform for the manufacture by blowing of said container, comprising a neck finish designed to be closed by a cap according to at least one of any preceding claims, said container being preferably made of polyester(s), advantageously, PolyEthylene-Terephthalate (PET) or PolyEthyleneFuranoate (PEF).

[0040] According to a fourth aspect, the invention concerns a method for manufacturing a cap (1) according to the invention comprising the steps of:

- molding, in a cavity of a mold, the cap having a top wall and a pre-skirt;
- possibly slitting the pre-skirt to make the annular openings obtaining so the frangible bridges, which delimit the skirt of the removable part of the cap (1), the upper and the lower portions of the TEB or non-removable part of the cap;
- demolding the cap.

[0041] Advantageously, the annular openings between the upper frangible bridges, on the one hand, and the annular openings between the lower frangible bridges, on the other hand, are made by means of a tool which slits simultaneously the pre-skirt of the cap at two different heights, or with two tools which slit successively the pre-skirt of the cap, at two different heights.

[0042] According to a fifth aspect, the invention concerns a method for bottling a container -preferably a bottle- with a cap according to the invention comprising the steps of:

- Providing a container-preferably a bottle-;
- Filling said container with a liquid;
- Providing the cap with a pre-skirt;
- Closing the container with the cap;
- Possibly slitting the pre-skirt to make the annular openings, obtaining so the frangible bridges;
- Packaging the closed container.

[0043] As the invention provides means for fighting against illicit opening of a container - preferably a bottle- filled with a genuine commercial product -preferably a

beverage-, said disclosure also encompasses, in its sixth aspect not covered by the claimed invention, a method for licitly opening a container -preferably a bottle- filled with a genuine commercial product and closed by the cap according to the invention.

[0044] Said essentially consists in :

- i. Grasping the cap with fingers, particularly the upper removable part of the cap, and more particularly the skirt of said upper part;
- ii. Rotate the cap in the unscrewing direction in order that the at least upper shoulder of the inner face of the TEB abuts the lock ring of the neck and causes the rupture of the upper frangible connection bridges;
- iii. Remove the cap from the neck.

Definitions

[0045] According to the terminology of this text, the following non limitative definitions have to be taken into consideration as illustrations for the construction of the present text:

- Every singular designates a plural and reciprocally.
- "*the closed position of the cap or the original position*" is the position wherein the cap is screwed in on the neck of bottle and sealingly closed said bottle, before the first licit opening.
- "*licit first opening*" or "*first opening*" is the opening of the container which is regularly done by the consumer by unscrewing of the cap from the container (e.g. bottle), just before the first use.
- "*bottle*" refers to any container for liquids, especially beverages like water: bottles, jugs, fountains, barrels, in particular adapted for beverage dispensers (Home & Office Delivery HOD), the capacity of which being, for instance, between 10 liters and 21 liters.
- "*thermoplastic*" refers to mouldable thermoplastic homopolymer or copolymer that becomes pliable or moldable above a specific temperature, and returns to a solid state upon cooling.
- "*molded*" refers to any forming technique of thermoplastic raw materials, such as extrusion blow moulding, extrusion profiles & sheet, injection blow moulding, injection moulding injection moulding (gas assisted), injection stretch blow moulding insert moulding, rotational moulding, compression moulding.
- For convenience, the terms herein "upper", "top", "lower" and "bottom" correspond to a direction globally parallel to the axis Y-Y of the cap and of the container and refer to the system comprising the cap closing the container standing up through its base on a horizontal support which is the bottom; and the terms herein "inward" and "outward" are given with reference to the inside and the outside of the cap and of the container.

Detailed description of the invention

[0046] Other objects and advantages of the invention will emerge from the following disclosure of particular embodiments of the invention given as non limitative examples, the disclosure being made in reference to the enclosed drawings in which:

- Figure 1 is a perspective view of a cap according to a first embodiment of the invention, wherein there are two levels of frangible bridges as 1st opening markers and breaking in markers;
- Figure 2 is a front view of a cap of Figure 1;
- Figure 2A is a section view in the diametral plane according to the line A-A of the cap of Figure 2;
- Figure 2B is a section view in the non-diametral plane according to the line B-B of the cap of Figure 2;
- Figure 3 is a front view of a cap of Figure 1;
- Figure 3 is a diametral section view according to the line A-A of the cap of Figure 2;
- Figure 3C is a cross section view according to the line C-C of the cap of Figure 3;
- Figure 3D is a cross section view according to the line D-D of the cap of Figure 3;
- Figure 4 is a front view of a system comprising the cap according to Figure 1 tightly screwed on the neck of a bottle;
- Figure 4E is a diametral section view in the plane according to the line A-A of the cap of Figure 4;
- Figure 5 is a magnified detailed view of the system/bottle shown on Figure 4E;
- Figure 6 is a perspective view of a cap according to a second embodiment of the invention, wherein there are one level of frangible bridges as 1st opening markers and one level of ribs as breaking in markers;
- Figure 7 is a front view of a cap of Figure 6;
- Figure 7A is a section view in the diametral plane according to the line A-A of the cap of Figure 7;
- Figure 7B is a section view in the non-diametral plane according to the line B-B of the cap of Figure 7;
- Figure 8 is a front view of a cap of Figure 6;
- Figure 8C is a cross section view according to the line C-C of the cap of Figure 8;
- Figure 8D is a cross section view according to the line D-D of the cap of Figure 8;
- Figure 9 is a front view of a system comprising the cap according to Figure 1 tightly screwed on the neck of a bottle;
- Figure 10 is a magnified detailed view of the system/bottle shown on Figure 9E;
- Figure 11 is a front view of a cap according to a variant of the first embodiment of the invention, wherein there are grasping ribs on the skirt of the cap.
- Figure 12 is a front view of a cap according to a variant of the second embodiment of the invention, wherein there are grasping ribs on the skirt of the cap.
- Figures 13A-13C are front views with partial section of the system constituted by the cap according to the

first embodiment and closing the bottle's neck from a start position before the first opening (Figure 13A) to a released position of the cap (Figure 13C) wherein the cap can be removed and the frangible connection bridges are broken to mark the first licit opening.

- Figure 14A & 14B are front views of the system constituted by the cap according to the first embodiment and closing the bottle's neck, respectively before and after a breaking in by means of a tool and/or by thermic action; said breaking in occurring prior to the first opening. -Figure 15A & 15B are front views of the system constituted by the cap according to the second embodiment and closing the bottle's neck, respectively before and after a breaking in by means of a tool and/or by thermic action; said breaking in occurring prior to the first opening.

[0047] On the Figures, the same reference numbers refer to the same or similar elements.

[0048] Figures 1, 11 & 6,12 represent two embodiments of a screwed cap 1 for closing the opening of a container 3, such as a plastic bottle, adapted to receive a product, and especially a liquid product such as water, optionally flavoured and/or carbonated, soda, fruit juice, milk based liquid product or other.

[0049] The bottle (3) shown on Figures 4, 4E, 9, 9E, 12 comprises a neck 2 delimiting the opening for pouring the product.

First embodiment

[0050] In the illustrated first embodiment (Figures 1, 2, 2A, 2B, 3, 3C, 3D, 4, 4E, 5, 11), the cap 1 presents a symmetry of revolution about a central axis Y and comprises a molded shell which is substantially annular and which is composed of an upper part 4 removable from the neck 2 of the bottle 3, and a lower part 5 non-removable from the neck 2.

[0051] The removable upper part 4 and the non-removable lower part 5 forms a whole which is snap-fitted by deformation on the neck 2 of the bottle 3, just after the filling of the bottle 3, to close it in the bottling industrial process. The non-removable lower part 5 is a Tamper Evidence Band (TEB) linked to the upper part 4 by frangible connection bridges 13, and the inner face 14 of which presents several inwardly extending shoulders 15, which are annularly distributed.

[0052] The TEB 5 comprises a top ring 5^t and a bottom ring 5^b linked to the top ring 5^t by the two annularly and regularly distributed additional frangible bridges 18.

[0053] Both frangible bridges 13 and additional frangible bridges 18 are below the top edge 2^t of the neck 2 in the original position.

[0054] As shown on figures 2B & 5, the height h^5 of the top ring 5^t is measured from the top the lower bridges 18 to the top of the upper bridges 13, whereas the height h^{11} is between the inner face of the bottom edge 12 of the skirt 11 and the top of the skirt 11 (Figures 2B, 4E),

corresponding to the diametral plane of the upper face of the top wall 10 of the cap 1. For instance, $h^5 \approx h^{11}/3$.

[0055] Moreover, the neck 2 has an external face 2° which includes downwardly and successively from the open top end 6: a thread 7, a lock ring 8 having a peripheral end 20 and a support ring 9. Therefore, during the first opening of the bottle by unscrewing of the cap 1, the shoulders 15 of the cap 1 abut the lock ring 8 of the neck 2 which involve the breaking of the frangible connection bridges 13 and the splitting of the upper 4 and lower 5 parts of the cap. The TEB remains on the neck 2 of the bottle 3, as marker of the 1st opening, whereas the upper part 4 is removed. This latter 4 can be then screwed back again on the neck 2. The broken bridges 13 indicate visually and also at the time of the further unscrewings that the 1st opening has occurred.

[0056] As an illustration of the consequence of the first licit opening of the bottle 3, reference is made to figures 13A-13B-13C which show the cinematic of a regular 1st opening by unscrewing of the cap, including the rupture of the frangible connection bridges 13 which enables the removal of the cap (Figure 13D). The cap 1 of the figure 13A is in its closed position, namely its original position. The figure 13B shows an intermediary position of the cap 1, after a partial unscrewing. The shoulders 15 of inner face 14 of the cap 1 abut the lock ring 8. Figure 13C represents the further step wherein the unscrewing has been done further and so as the frangible bridges 13 are broken. After this breakage, the unscrewing goes further till the removal of the cap 1 from the neck 2.

[0057] Each shoulder 15 of the cap 1 according to the first embodiment of the invention herein described, has a slope 15° which extend downwardly and inwardly, with an angle comprised between 10 and 60°, i.e. of 30° regarding the perpendicular to the axis Y-Y'. This slope is close from the slope of the lower edge of the lock ring 8, which is the abutment of the shoulder 15.

[0058] In addition, the upper removable part 4 further comprises a top wall 10 and an annular skirt 11 extending downwardly from the top wall 10 and having a bottom edge 12 connected to the lower non-removable part 5 of the cap 1, through the frangible bridges 13. The outer surface of the skirt 11 of the cap 1 according to this first embodiment is the grip part for the cap's unscrewing. The grasping of the cap can be improved by means of a plurality of ribs 35 extending parallel to the central axis Y and equally distributed on the outer surface of the skirt 11, as shown on the variant of figure 11.

[0059] The inner face 11¹ of the skirt 11 presents a thread 17 which is designed to cooperate with the complementary thread 7 of the outer face of the bottle's neck 2.

[0060] As represented on Figure 4E and for providing a tight contact between the cap 1 and the neck 2 of the bottle 3, the top wall 10 has an annular crown 30 extending downwardly, perpendicular to its inner surface 31. The crown 30 defines a groove 32 with the annular seal lip 33. To improve tightness, on the one hand, an annular

bulge 34 is provided on the outer surface of the free end of the crown 30, and, on the other hand, there is also an annular seal lip 35. In other embodiments, a tight attachment of the cap 1 to the neck could be provided in any other suitable manner.

[0061] The frangible connection bridges 13 are roughly regularly distributed on the circumference of the cap 1, according to the example shown on Figure 4E. Said bridges 13 are separated by openings 24 which projection on plane can be rectangular (see for instance the variant of figure 11) or almost rectangular because said opening is partially close by an annular counter-bridge 25, which extends upwardly in the direction Y-Y, as represented on figures 1, 2A, 2B. According to a non-represented variant, the counter-bridges 25 could extend downwardly from the upper rim of the openings 25.

[0062] These counter-bridges 25 prevent the compression of the TEB during the snap-fitting of the cap on to the bottle 3, to cork the filled bottle 3 in the bottling.

[0063] Below its inner shoulders 15 which abut the lock ring 8 of the neck 2 at the time of the first opening, the TEB 5 has also, in addition to the frangible upper markers 13, some additional lower markers formed by annularly and regularly distributed bridges 18 which join a lower portion 40 of the TEB 5 to an upper portion 41.

[0064] Like the frangible upper bridges 13, the lower bridges 18 are separated by rectangular (in front view) openings 24 -see Figure 11-, or openings 25 partially closed by rectangular (front view Figures 2A & 2B) counter-bridges 25. These latter have the same function as their homologs of the upper openings inter upper bridges 13.

[0065] These additional lower markers 18 are designed to become signs of any breaking in of the system composed of the genuine filled bottle 3 and of the closing cap 1, before the first opening. Whatever be the breaking in, by mechanical and/or thermic action, the bridges 18 will be clearly deformed or broken.

[0066] The TEB 5 not only bears the additional lower markers 18 of breaking in, but is also designed to hinder any breaking in before the first opening. In this purpose, firstly, there is a lower level of shoulders 16 inwardly extending from the inner face 14 of the lower portion of the TEB, and secondly, the inner annular face 19 of the additional lower markers, i.e the frangible additional bridges 18, is both as close as possible from the facing external face 2° of the neck 2, and inwardly set back with respect to the peripheral end 20 of the lock ring 8 of the neck 2.

[0067] The anti-breaking lower shoulders 16 are advantageously regularly and annularly distributed at the bottom edge of the TEB 5 (see e.g Figure 1). It appears on Figures 4E & 5 that the shoulders 16 are housed in a neck's groove 22:

- which bottom face is the top face of the support ring 9 of the neck 2,
- which back 26 is closer from the inner of the neck 2 than the external face 2° of the neck 2 which faces

the additional bridges 18,

- and which top face 21 is outwardly delimited by the above mentioned external face 2°.

[0068] In order to impede the way of misusing tools for removing the whole cap 1, before the 1st opening, the inner end 27 of each shoulder 16 is advantageously in contact or almost in contact with the back 26 of the neck's groove 26.

[0069] Moreover, the upper face 28 of each shoulder 16 is preferably intended to come close, and for instance to abut, the top face 21 of the groove 22 of the neck 2, during the container 3 first opening.

[0070] Concerning the shoulders 16, it should be also emphasized that each space between two adjacent shoulders 16 is in line, along an axis parallel to the axis Y-Y of the cap 1-with an additional connection bridge 18, just above placed. According to an alternative not shown on the drawings, the shoulders 16 can be replaced by a single shoulder 16, which would be an inwardly extended ring of axis Y-Y.

[0071] Any breaking in is also complicated thanks to the fact:

- there is an inward interval (I) shown on Figure 5 between the inner annular face 19 of each additional lower marker, i.e frangible bridge 18, and the peripheral end 20 of the lock ring 8.
- the inner annular face 19 of each additional lower marker 18, i.e frangible bridge 18, is at a minimum interstitial distance d from the facing external face 2° of the neck 2. For instance $d = 0.01 \pm 10\%$.

[0072] Figures 1 & 2 show a lug 23° at the bottom and a lug 23¹ at the top of each frangible additional bridges 18 (additional lower markers). These lugs 23 which extend outwardly, respectively, from the lower portion and the upper portion of the TEB 5, act as strengthening pieces of the cap 1 useful for the manufacture and the bottling, but which are not detrimental to the anti-breaking in function of these additional lower markers 18.

[0073] It should also be noted that the cap 1 represented on Figures 1, 2, 3D includes two diametrically opposed superposed structural protruding units 23⁰¹, 23¹¹ resulting from the gathering of three of the upper lugs 23¹ and three corresponding lower lugs 23°. These protruding units 23⁰¹, 23¹¹ are undercuts useful notably as the cap 1 is manufactured by means of slides molds.

[0074] Before its first opening, the cap 1 according to this first embodiment is protected against illicit opening by means of any tool which can be used to try to remove the whole cap 1, and to possibly commit any offence such as filling offence : the genuine bottle's content is replaced a fake product. Figures 14A and 14B show the marks left either by a tool 50 which the infringer unsuccessfully tried to insert between the TEB 5 of the cap 2 and the bottle's neck 2 (left side of Figures 14A & 14B), or by a heating of the cap 1 (right side of Figures 14A & 14B).

[0075] As shown on Figure 14B, the lower markers, i.e the connection bridges 180 are broken off (left side: mechanical breaking in) and/or deformed (right side: thermic breaking in).

Second embodiment

[0076] The cap 1 according to the illustrated second embodiment (Figures 6, 7, 7A, 7B, 8, 8C, 8D, 9, 9E, 10, 12), is identical to the cap 1 according to the first embodiment herein above described, except concerning the following points:

- the several inwardly extending shoulders 15 of the cap's inner face 14 which are intended to abut the lock ring 8 of the neck 2 and to involve the breaking of the frangible connection bridges 13 and the splitting of the upper 4 and lower 5 parts of the cap, during the first opening, are replaced by a single shoulder 15;
- the additional lower markers of the TEB 5, i.e the frangible connection bridges 18 are replaced by outwardly and radially extending ribs 180;
- the two diametrically opposed superposed structural protruding units 23⁰¹, 23¹¹ correspond to two diametrically opposed single structural protruding units 181.

[0077] The single shoulder 15 of the cap 1 according to the second embodiment of the invention herein described, has also a slope 15°, as in the first embodiment.

[0078] The outwardly and radially extending ribs 180 are regularly annularly distributed. They also have a triangular cross section as shown on Figures 6 & 8D. Their height (in the direction parallel to the axis Y-Y of the cap 1) roughly correspond to the height of the lower portion of the TEB 5. These ribs are sensitive to the mechanical and/or thermic action which can be used to unlawfully remove the whole cap 1, before the 1st opening.

[0079] Each of the two diametrically opposed single structural protruding units 181 results from the gathering of three ribs 181. These two diametrically opposed protruding units 181 are undercuts useful notably as the cap 1 is manufactured by means of slides molds.

[0080] Before its first opening, the cap 1 according to this second embodiment is protected against illicit opening by means of any tool which can be used to try to remove the whole cap 1, and to possibly commit any offence such as filling offence : the genuine bottle's content is replaced a fake product. Figures 15A and 15B show the marks left either by a tool 50 which the infringer unsuccessfully tried to insert between the TEB 5 of the cap 2 and the bottle's neck 2 (left side of Figures 15A&15B), or by a heating of the cap 1 (right side of Figures 15A&15B).

[0081] As shown on Figure 15B, the lower markers, i.e the ribs 180 are deformed.

The variants of Figures 11 & 12

[0082] The cap 1 of Figure 11 comprises 1st opening upper markers constituted by frangible connection bridges 13 and additional breaking in lower markers constituted, on the one hand, by frangible bridges 18, and on the other hand, by outwardly and radially extending ribs 180.

[0083] In this variant the connection bridges 13 and 18 are made slitting a molded pre-cap, and more precisely a pre-skirt 110.

[0084] The cap 1 of Figure 12 comprises 1st opening upper markers constituted by frangible connection bridges 13 and additional breaking in lower markers constituted by outwardly and radially extending ribs 180 which height is greater than the height of the marking ribs 180 of the variant of Figure 11.

[0085] In this variant the connection bridges 13 are made by slitting a molded pre-cap, and more precisely a pre-skirt 110.

[0086] The cap 1 of Figures 11 & 12 has also a plurality of ribs 40 extending parallel to the central axis Y-Y and equally distributed on the outer surface of the skirt 11. The ribs 40 are intended to facilitate the grasping of the cap 1 by the bottling device on the industrial bottling line and by the consumer.

The raw materials

[0087] For the cap 1, it is for instance a thermoplastic polymer such as high density polyethylene (HDPE), whereas for the bottle 3 it can be a thermoplastic polymer such as PET.

Other objects than the cap 1

[0088] The invention also pertains to a system cap 1/bottle 3 such as the one shown on Figures 4 and 9. The container can be different from a bottle 3. It can be the preform for the manufacture of the bottle injection/blowing molding, as well as the bottle filled and closed by the whole cap 1.

The method for manufacturing the cap

[0089] The cap according to the invention can be obtained by a compression molding process which leads directly to the cap 1 or by a 2-steps injection molding process, wherein a pre-cap consisting of a shell made of a top-wall and of a pre-skirt is manufactured. The pre-skirt is free from the openings 24, 25 delimiting the connection bridges 18, 13. The achievement of these missing elements is then done by slitting the pre-skirt.

Variants

[0090] The invention has been disclosed with a cap 1 presenting a symmetry of revolution with a circular top

wall 10, an annular skirt 11 of circular cross-section. The invention is however not limited thereto and the cap 1 could be of any other suitable shape, the top wall 10, the skirt 11 and the double level of markers being adapted accordingly.

Claims

1. Screw cap (1) for a neck (2) of a container (3)-preferably a bottle- comprising an upper part (4) removable from the neck (2) and a lower part (5) non-removable from the neck (2), said lower non-removable part (5) being a tamper evidence band (TEB),

> said neck (2) having an external face (2°) including downwardly and successively from the open top end (6) : at least one thread (7), a lock ring (8) and a support ring (9);
> said upper removable part (4) of the cap (1) comprising:

- a top wall (10) and
- an annular skirt (11) extending downwardly from the top wall (10) and having a bottom edge (12) which is linked to the lower non-removable part (5) of the cap (1) once said cap (1) is fixed onto the neck (2) after bottling;

> said TEB (5)

- being linked to the bottom edge (12) of the skirt (11) by annularly - preferably regularly-distributed frangible connection bridges (13) ;
- having an inner face (14) presenting at least one inwardly extending upper shoulder (15) which is intended to abut the lock ring (8) of the neck (2), during the container (3) first opening, by unscrewing of the upper removable part (4) of the cap (1), said container (3) first opening involving the rupture of the connection bridges (13) which are so upper markers (13) of said container (3) first licit opening;

→ **characterized in that** said TEB (5) indicates, on the one hand, the container (3) first licit opening and, on the other hand, any breaking in of the cap (1) before the first licit container (3) opening;

→ wherein said TEB (5) comprises, below the markers (13) of said container (3) first licit opening, some additional lower markers (18) of breaking in of the cap (1) before the container (3) first licit opening.

2. Screw cap (1) according to claim 1 wherein the inner annular face (19) of at least one - preferably of each - additional lower marker (18) is inwardly set back (interval I) with respect to the peripheral end (20) of the lock ring (8).

3. Screw cap (1) according to claim 2, wherein the inner annular face (19) of at least one - preferably of each - additional lower marker (18), is at a minimum interstitial distance d of the facing external face (2°) of the neck (2), said distance being defined as follows, in an increasing order of preference:
 $d \leq 3 \text{ mm}$; $d \leq 2 \text{ mm}$; $d \leq 1 \text{ mm}$; $d \leq 0,5 \text{ mm}$; $d \leq 0,01 \text{ mm}$.

4. Screw cap (1) according to at least one of any preceding claims, wherein the marks given by the upper markers (13) of said container (3) first opening and by the additional lower markers (18) of said container (3) breaking in, are visible to the naked eye.

5. Screw cap (1) to at least one of any of the preceding claims comprising at least one lower shoulder (16) which extends inwardly from the inner face (14) of the TEB (5), and which is intended to come close, and preferably to abut, the top face (21) of a groove (22) of the neck (2), during the container (3) first opening.

6. Screw cap (1) according to claim 5 wherein the upper shoulder (15) and/or the lower shoulder (16) is composed of several protusions (15, 16), which are advantageously annularly and regularly distributed.

7. Screw cap (1) according to at least one of any preceding claims wherein the additional lower markers (18, 180) are mechanically- and/or heat-deformable and include:

- at least one frangible additional bridge (18) which connects the lower portion of the TEB to the upper portion of said TEB,
- and/or, at least one outwardly, preferably radially, extending ribs (180).

8. Screw cap (1) according to claim 5 and possibly to claim 6 or 7, wherein the frangible additional bridges (18) and/or the outwardly -preferably radially- extending ribs (180), are:

- annularly -preferably regularly- distributed around the TEB (5),
- and/or parallel to the axis Y-Y of the cap (1).

9. Screw cap (1) according to claim 5 and possibly to at least one of claims 6 to 8, wherein the bottom and/or the top of at least one frangible additional bridges (18) of the additional lower markers (18),

comprise(s) a lug (23) which extends outwardly from the lower portion of the TEB (5) and/or from the upper portion of the TEB (5), each additional bridge (18) being preferably located between a lower lug (23°) and an upper lug (23¹).

10. Screw cap (1) according to at least one of any preceding claims, wherein the bridges (13) of the upper markers (13) and/or the additional bridges (18) of the lower markers (18) are separated from each other by openings (24) which projections on a plane have a shape which is preferably and independently rectangular, trapezoidal or ovoid, at least one of said opening (24) being possibly partially closed by a counter-bridge (25) extending upwardly from the bottom from the lower side of the opening (24) or downwardly from the upper side of the opening (24).
11. System composed of a screw cap (1) according to at least one of any preceding claims and a container (3) -preferably a bottle-.
12. Method for manufacturing a cap (1) according to at least one of any of the claims 1 to 10 comprising the steps of:
 - molding, in a cavity of a mold, the cap (1) having a top wall (10) and a pre-skirt;
 - possibly slitting the pre-skirt to make the annular openings (25,24) obtaining so the frangible bridges (13, 18), which delimit the skirt (11) of the removable part (4) of the cap (1), the upper and the lower portions of the TEB (5) or non-removable part (5) of the cap (1) ;
 - demolding the cap (1).
13. Method according to claim 13 wherein the annular openings (25) between the upper frangible bridges (13), on the one hand, and the annular openings (24) between the lower frangible bridges (18), on the other hand, are made by means of a tool which slits simultaneously the pre-skirt of the cap (1) at two different heights, or with two tools which slit successively the pre-skirt of the cap (1), at two different heights.
14. Method for bottling a container (3) -preferably a bottle- with a cap (1) according to at least one of any of the claims 1 to 10 comprising the steps of:
 - Providing a container (3)-preferably a bottle-;
 - Filling said container (3) with a liquid;
 - Providing the cap (1) with a pre-skirt;
 - Closing the container with the cap (1);
 - Possibly slitting the pre-skirt to make the annular openings (25,24) obtaining so the frangible bridges (13, 18);
 - Packaging the closed container (3).

Patentansprüche

1. Schraubkappe (1) für einen Hals (2) eines Behälters (3) - vorzugsweise einer Flasche - mit einem oberen Teil (4), der vom Hals (2) abnehmbar ist, und einem unteren Teil (5), der vom Hals (2) nicht abnehmbar ist, wobei der untere, nicht abnehmbare Teil (5) ein Manipulationsschutzband (TEB) ist,
 - > wobei der genannte Hals (2) eine Außenfläche (2°) aufweist, die vom offenen oberen Ende (6) aus nach unten und aufeinanderfolgend Folgendes umfasst: mindestens ein Gewinde (7), einen Verschlussring (8) und einen Stützring (9);
 - > der obere abnehmbare Teil (4) der Kappe (1) umfasst:
 - einer oberen Wand (10) und
 - eine ringförmige Schürze (11), die sich von der oberen Wand (10) nach unten erstreckt und einen unteren Rand (12) aufweist, der mit dem unteren, nicht abnehmbaren Teil (5) der Kappe (1) verbunden ist, sobald die Kappe (1) nach dem Abfüllen auf dem Hals (2) befestigt ist;
 - > wobei das TEB (5)
 - mit dem unteren Rand (12) der Schürze (11) durch ringförmig -vorzugsweise regelmäßig- verteilte zerbrechliche Verbindungsbrücken (13) verbunden ist;
 - mit einer Innenfläche (14), die mindestens eine sich nach innen erstreckende, obere Schulter (15) aufweist, die dazu bestimmt ist, bei der ersten Öffnung des Behälters (3) durch Abschrauben des oberen abnehmbaren Teils (4) der Kappe (1) an dem Verriegelungsring (8) des Halses (2) anzuliegen, wobei die erste Öffnung des Behälters (3) das Brechen der Verbindungsbrücken (13) beinhaltet, die so obere Markierungen (13) der ersten Öffnung des Behälters (3) sind;
- **dadurch gekennzeichnet, dass** das TEB (5) einerseits die erste zulässige Öffnung des Behälters (3) und andererseits ein eventuelles Aufbrechen des Verschlusses (1) vor der ersten zulässigen Öffnung des Behälters (3) anzeigt;
- wobei das TEB (5) unterhalb der Markierungen (13) der ersten zulässigen Öffnung des Behälters (3) einige zusätzliche untere Markierungen (18) des Einbrechens der Kappe (1) vor der ersten zulässigen Öffnung des Behälters (3) aufweist.
2. Schraubkappe (1) nach Anspruch 1, bei der die innere Ringfläche (19) mindestens einer - vorzugswei-

- se jeder - zusätzlichen unteren Markierung (18) gegenüber dem Umfangsende (20) des Verschlussrings (8) nach innen zurückgesetzt ist (Intervall I).
3. Schraubkappe (1) nach Anspruch 2, wobei die innere Ringfläche (19) mindestens einer - vorzugsweise jeder - zusätzlichen unteren Markierung (18) einen Mindestabstand d von der zugewandten Außenfläche (2°) des Halses (2) hat, wobei dieser Abstand wie folgt definiert ist, in aufsteigender Reihenfolge: $d \leq 3 \text{ mm}$; $d \leq 2 \text{ mm}$; $d \leq 1 \text{ mm}$; $d \leq 0,5 \text{ mm}$; $d \leq 0,01 \text{ mm}$.
 4. Schraubkappe (1) nach mindestens einem der vorhergehenden Ansprüche, wobei die Markierungen, die durch die oberen Markierungen (13) des sich zuerst öffnenden Behälters (3) und durch die zusätzlichen unteren Markierungen (18) des Behälters (3) gegeben sind, beim Brechen mit dem bloßen Auge erkennbar sind.
 5. Schraubkappe (1) nach mindestens einem der vorhergehenden Ansprüche, die mindestens eine untere Schulter (16) aufweist, die sich von der Innenfläche (14) des TEB (5) nach innen erstreckt und die dazu bestimmt ist, sich während des ersten Öffnens des Behälters (3) der oberen Fläche (21) einer Nut (22) des Halses (2) anzunähern und vorzugsweise an diese anzustoßen.
 6. Schraubkappe (1) nach Anspruch 5, wobei die obere Schulter (15) und/oder die untere Schulter (16) aus mehreren Vorsprüngen (15, 16) zusammengesetzt ist, die vorteilhafterweise ringförmig und regelmäßig verteilt sind.
 7. Schraubkappe (1) nach mindestens einem der vorhergehenden Ansprüche, wobei die zusätzlichen unteren Markierungen (18, 180) mechanisch und/oder thermisch verformbar sind und umfassen:
 - mindestens eine zerbrechliche zusätzliche Brücke (18), die den unteren Teil des TEB mit dem oberen Teil des TEB verbindet,
 - und/oder mindestens eine sich nach außen, vorzugsweise radial, erstreckende Rippe (180).
 8. Schraubkappe (1) nach Anspruch 5 und gegebenenfalls nach Anspruch 6 oder 7, wobei die zerbrechlichen Zusatzstege (18) und/oder die nach außen - vorzugsweise radial - verlaufenden Rippen (180) sind:
 - ringförmig - vorzugsweise regelmäßig - um das TEB herum verteilt (5),
 - und/oder parallel zur Achse Y-Y der Kappe (1).
 9. Schraubkappe (1) nach Anspruch 5 und gegebenenfalls nach mindestens einem der Ansprüche 6 bis 8, wobei die Unterseite und/oder die Oberseite mindestens einer zerbrechlichen zusätzlichen Brücke (18) der zusätzlichen unteren Markierungen (18) eine Lasche (23) aufweist, die sich von dem unteren Abschnitt des TEB (5) und/oder von dem oberen Abschnitt des TEB (5) nach außen erstreckt, wobei jede zusätzliche Brücke (18) vorzugsweise zwischen einer unteren Lasche (23°) und einer oberen Lasche (23¹) angeordnet ist.
 10. Schraubkappe (1) nach mindestens einem der vorhergehenden Ansprüche, wobei die Stege (13) der oberen Markierungen (13) und/oder die zusätzlichen Stege (18) der unteren Markierungen (18) durch Öffnungen (24) voneinander getrennt sind, die in einer Ebene projiziert eine Form aufweisen, die vorzugsweise und unabhängig voneinander rechteckig, trapezförmig oder eiförmig sind, wobei mindestens eine der Öffnungen (24) gegebenenfalls teilweise durch eine Gegenbrücke (25) verschlossen ist, die sich von der Unterseite der Öffnung (24) nach oben vom Boden her oder von der Oberseite der Öffnung (24) nach unten erstreckt.
 11. System bestehend aus einem Schraubverschluss (1) nach mindestens einem der vorhergehenden Ansprüche und einem Behälter (3) - vorzugsweise einer Flasche -.
 12. Verfahren zur Herstellung einer Kappe (1) nach mindestens einem der Ansprüche 1 bis 10, umfassend die Schritte:
 - Gießen in einem Hohlraum einer Form, wobei die Kappe (1) eine obere Wand (10) und eine Vorschürze aufweist;
 - gegebenenfalls Aufschlitzen der Vorschürze, um die ringförmigen Öffnungen (25, 24) herzustellen, die so die zerbrechlichen Brücken (13, 18) erhalten, die die Schürze (11) des abnehmbaren Teils (4) der Kappe (1), den oberen und den unteren Bereich des TEB (5) oder des nicht abnehmbaren Teils (5) der Kappe (1) begrenzen;
 - Entformen der Kappe (1).
 13. Verfahren nach Anspruch 13, bei dem die ringförmigen Öffnungen (25) zwischen den oberen zerbrechlichen Stegen (13) einerseits und die ringförmigen Öffnungen (24) zwischen den unteren zerbrechlichen Stegen (18) andererseits mit einem Werkzeug, das die Vorschürze der Kappe (1) gleichzeitig auf zwei verschiedenen Höhen schlitzt, oder mit zwei Werkzeugen, die die Vorschürze der Kappe (1) nacheinander auf zwei verschiedenen Höhen schlitzen, hergestellt werden.

14. Verfahren zum Abfüllen eines Behälters (3) - vorzugsweise einer Flasche - mit einer Kappe (1) nach mindestens einem der Ansprüche 1 bis 10, umfassend die Schritte::

- Bereitstellen eines Behälters (3) - vorzugsweise einer Flasche -;
- Füllen des Behälters (3) mit einer Flüssigkeit;
- Versehen der Kappe (1) mit einer Vorschürze;
- Verschließen des Behälters mit der Kappe (1);
- gegebenenfalls Aufschlitzen der Vorschürze, um die ringförmigen Öffnungen (25, 24) zu schaffen, so dass die zerbrechlichen Brücken (13, 18) entstehen;
- Verpacken des geschlossenen Behälters (3).

Revendications

1. Capuchon (1) à vis pour un col (2) d'un récipient (3) - de préférence une bouteille - comprenant une partie (4) supérieure amovible par rapport au col (2) et une partie (5) inférieure non amovible par rapport au col (2), ladite partie (5) non amovible inférieure étant une bande d'inviolabilité (TEB),
- > ledit col (2) ayant une face externe (2⁰) comportant vers le bas et successivement à partir de l'extrémité supérieure ouverte (6) : au moins un filet (7), une bague de verrouillage (8) et une bague de support (9) ;
- > ladite partie (4) supérieure amovible du capuchon (1) comprenant :
- une paroi supérieure (10) et
 - une jupe (11) annulaire s'étendant vers le bas à partir de la paroi du haut (10) et ayant un bord inférieur (12) qui est relié à la partie (5) inférieure non amovible du capuchon (1) une fois que ledit capuchon (1) est fixé sur le col (2) après l'embouteillage ;
- > ladite TEB (5)
- étant reliée au bord du bas (12) de la jupe (11) par des ponts (13) de connexion cassables et distribués de manière annulaire - de préférence régulièrement - ;
 - ayant une face intérieure (14) présentant au moins un épaulement supérieur (15) s'étendant vers l'intérieur qui est destiné à venir en butée contre la bague de verrouillage (8) du col (2), durant la première ouverture du récipient (3), par dévissage de la partie (4) amovible supérieure du capuchon (1), la première ouverture dudit récipient (3) impliquant la rupture des ponts (13) de connexion qui sont ainsi des repères (13) su-

périeurs de la première ouverture licite dudit récipient (3) ;

→ **caractérisé en ce que** ladite TEB (5) indique, d'une part, la première ouverture licite du récipient (3), et d'autre part, toute effraction du capuchon (1) avant la première ouverture licite du récipient (3) ;

→ dans lequel ladite TEB (5) comprend, en dessous des repères (13) de la première ouverture licite dudit récipient (3), quelques repères inférieurs (18) supplémentaires d'effraction du capuchon (1) avant la première ouverture licite du récipient (3).

2. Capuchon (1) à vis selon la revendication 1 dans lequel la face annulaire intérieure (19) d'au moins un - de préférence de chaque - repère inférieur (18) supplémentaire est décalée vers l'intérieur (intervalle I) par rapport à l'extrémité périphérique (20) de la bague de verrouillage (8).
3. Capuchon (1) à vis selon la revendication 2, dans lequel la face annulaire intérieure (19) d'au moins un - de préférence de chaque - repère inférieur (18) supplémentaire, est à une distance interstitielle minimale d de la face externe (2⁰) opposée du col (2), ladite distance étant définie comme suit, dans un ordre croissant de préférence :
- $d \leq 3 \text{ mm}$; $d \leq 2 \text{ mm}$; $d \leq 1 \text{ mm}$; $d \leq 0,5 \text{ mm}$; $d \leq 0,01 \text{ mm}$.
4. Capuchon (1) à vis selon au moins l'une quelconque des revendications précédentes, dans lequel les marques données par les repères (13) supérieurs de la première ouverture dudit récipient (3) et par les repères inférieurs (18) supplémentaires de l'effraction dudit récipient (3), sont visibles à l'œil nu.
5. Capuchon (1) à vis selon au moins l'une quelconque des revendications précédentes comprenant au moins un épaulement inférieur (16) qui s'étend vers l'intérieur à partir de la face intérieure (14) de la TEB (5), et qui est destiné à s'approcher de, et de préférence à venir en appui contre, la face supérieure (21) d'une rainure (22) du col (2), durant la première ouverture du récipient (3).
6. Capuchon (1) à vis selon la revendication 5 dans lequel l'épaulement supérieur (15) et/ou l'épaulement inférieur (16) est composé de plusieurs saillies (15, 16), qui sont d'une façon avantageuse distribuées de manière annulaire et régulièrement.
7. Capuchon (1) à vis selon au moins l'une quelconque des revendications précédentes dans lequel les repères inférieurs (18, 180) supplémentaires sont déformables mécaniquement et/ou par la chaleur et

comportent :

- au moins un pont (18) supplémentaire cassable qui connecte la partie inférieure de la TEB à la partie supérieure de ladite TEB, 5
 - et/ou, au moins une nervure (180) s'étendant vers l'extérieur, de préférence radialement.
- 8. Capuchon (1) à vis selon la revendication 5 et possiblement selon la revendication 6 ou 7, dans lequel les ponts (18) supplémentaires cassables et/ou les nervures (180) s'étendant vers l'extérieur - de préférence radialement -, sont : 10
 - distribués de manière annulaire - de préférence régulièrement - autour de la TEB (5), 15
 - et/ou parallèles à l'axe Y-Y du capuchon (1).
- 9. Capuchon (1) à vis selon la revendication 5 et possiblement selon au moins l'une des revendications 6 à 8, dans lequel le bas et/ou le haut d'au moins un pont (18) supplémentaire cassable des repères inférieurs (18) supplémentaires, comprend une patte (23) qui s'étend vers l'extérieur depuis la partie inférieure de la TEB (5) et/ou depuis la partie supérieure de la TEB (5), chaque pont (18) supplémentaire étant de préférence situé entre une patte inférieure (23⁰) et une patte supérieure (23¹). 20 25
- 10. Capuchon (1) à vis selon au moins l'une quelconque des revendications précédentes, dans lequel les ponts (13) des repères (13) supérieurs et/ou les ponts (18) supplémentaires des repères inférieurs (18), sont séparés les uns des autres par des ouvertures (24) dont les projections sur un plan, ont une forme qui est, de préférence et indépendamment, rectangulaire, trapézoïdale ou ovoïde, au moins une ouverture (24) étant possiblement partiellement fermée par un contre-pont (25) s'étendant vers le haut à partir de la base du côté inférieur de l'ouverture (24) ou vers le bas à partir du côté supérieur de l'ouverture (24). 30 35 40
- 11. Système composé d'un capuchon (1) à vis selon au moins l'une quelconque des revendications précédentes et d'un récipient (3) - de préférence une bouteille -. 45
- 12. Procédé pour fabriquer un capuchon (1) selon au moins l'une quelconque des revendications 1 à 10 comprenant les étapes consistant à : 50
 - mouler, dans une cavité d'un moule, le capuchon (1) ayant une paroi supérieure (10) et une pré-jupe ; 55
 - éventuellement inciser la pré-jupe pour faire les ouvertures (25, 24) annulaires, de manière à obtenir les ponts (13, 18) cassables, qui déli-

mitent la jupe (11) de la partie (4) amovible du capuchon (1), les parties supérieure et inférieure de la TEB (5) ou la partie (5) non amovible du capuchon (1) ;

- démouler le capuchon (1).

13. Procédé selon la revendication 13 dans lequel les ouvertures (25) annulaires entre les ponts (13) cassables supérieurs, d'une part, et les ouvertures (24) annulaires entre les ponts (18) cassables inférieurs, d'autre part, sont faites au moyen d'un outil qui incise simultanément la pré-jupe du capuchon (1) à deux hauteurs différentes, et avec deux outils qui incisent successivement la pré-jupe du capuchon (1), à deux hauteurs différentes.

14. Procédé pour embouteiller un récipient (3) - de préférence une bouteille - avec un capuchon (1) selon au moins l'une quelconque des revendications 1 à 10 comprenant les étapes consistant à :

- fournir un récipient (3) - de préférence une bouteille - ;
- remplir ledit récipient (3) avec un liquide ;
- doter le capuchon (1) d'une pré-jupe ;
- fermer le récipient avec le capuchon (1) ;
- éventuellement inciser la pré-jupe pour faire les ouvertures (25, 24) annulaires, de manière à obtenir les ponts (13, 18) cassables ;
- emballer le récipient (3) fermé.

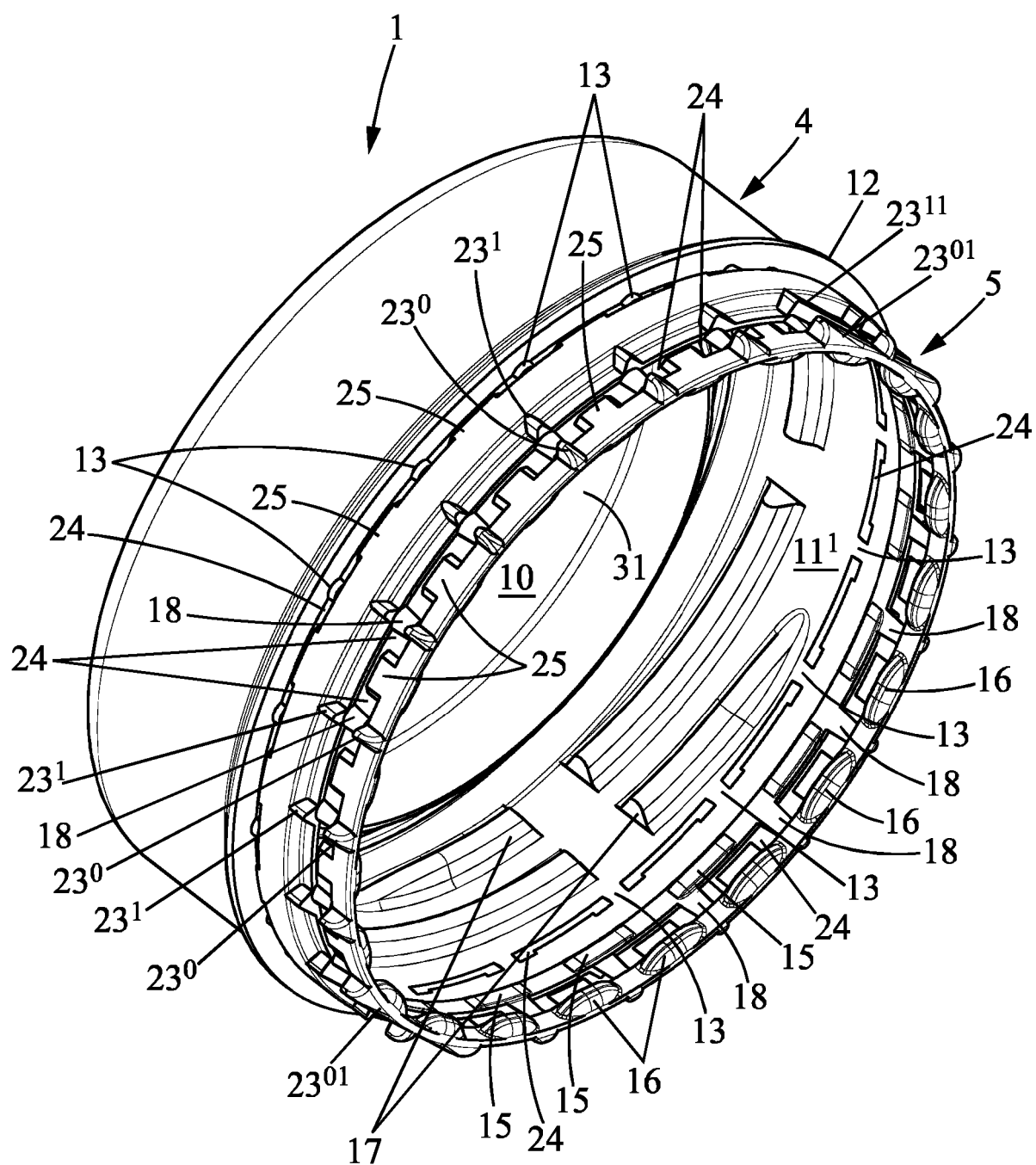


FIG. 1

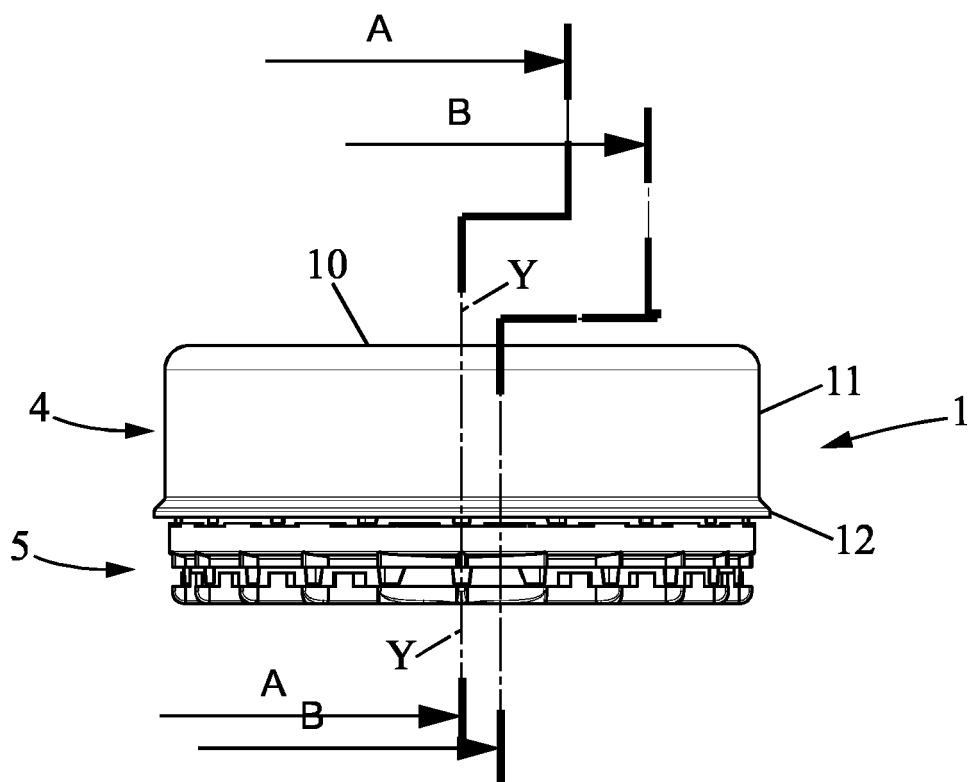


FIG. 2

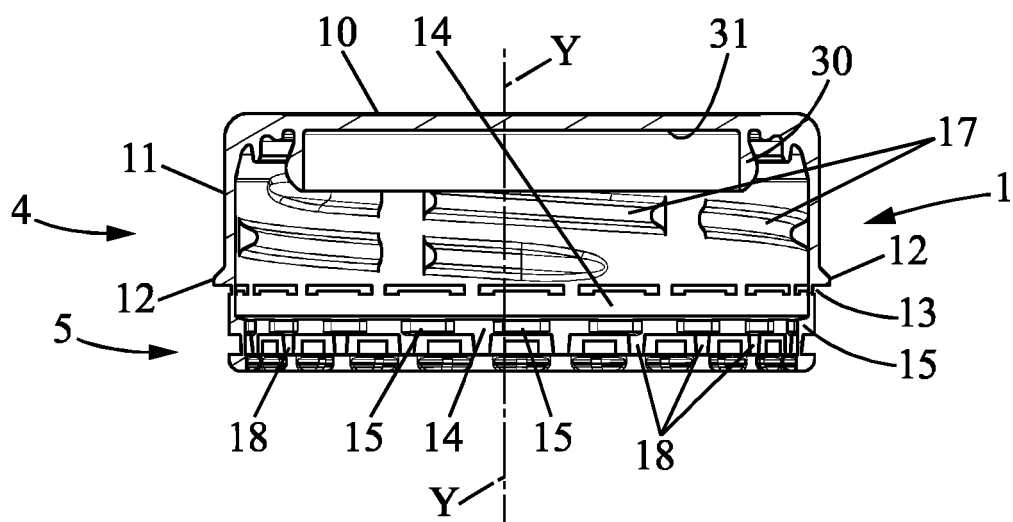


FIG. 2A

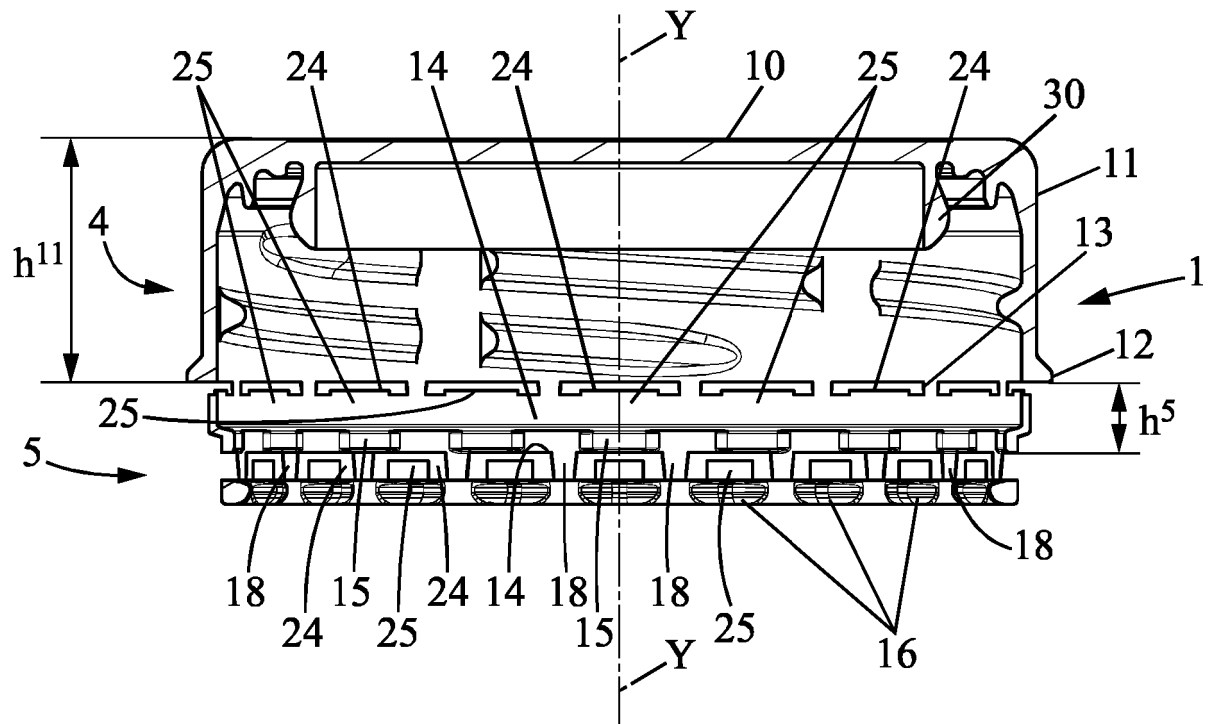
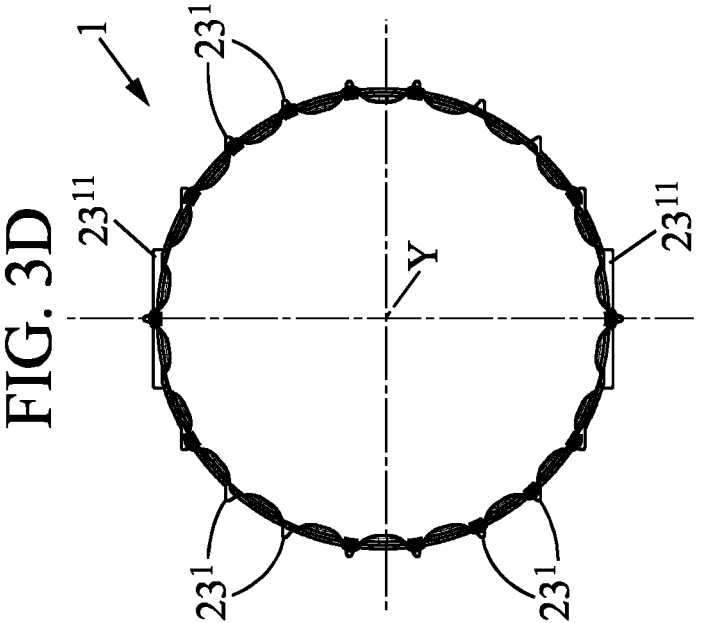
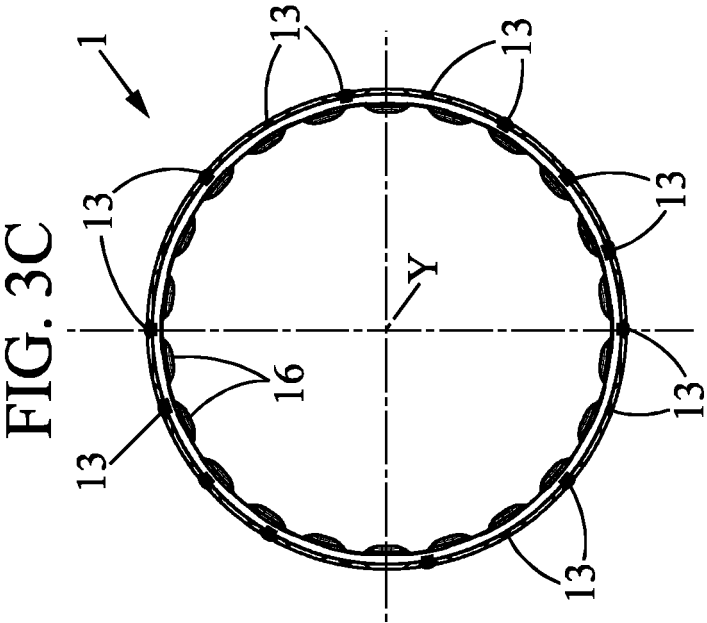
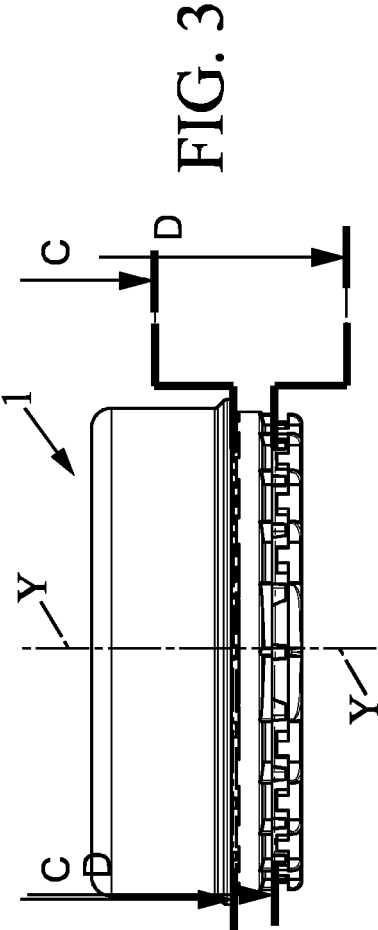
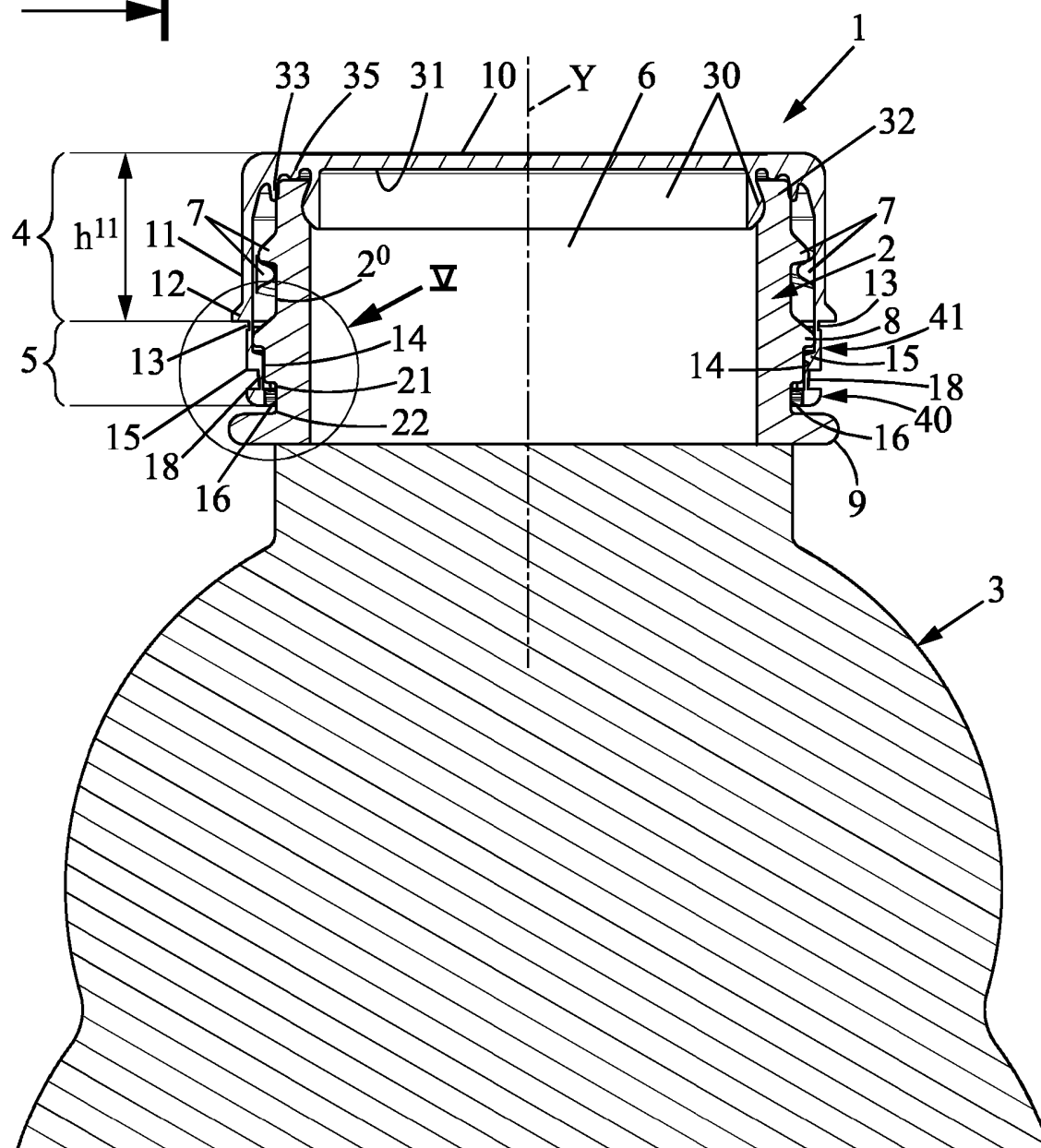
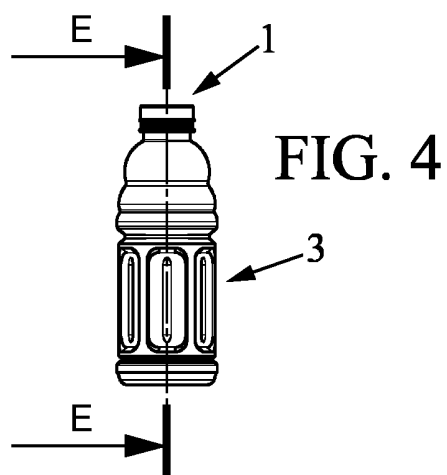


FIG. 2B





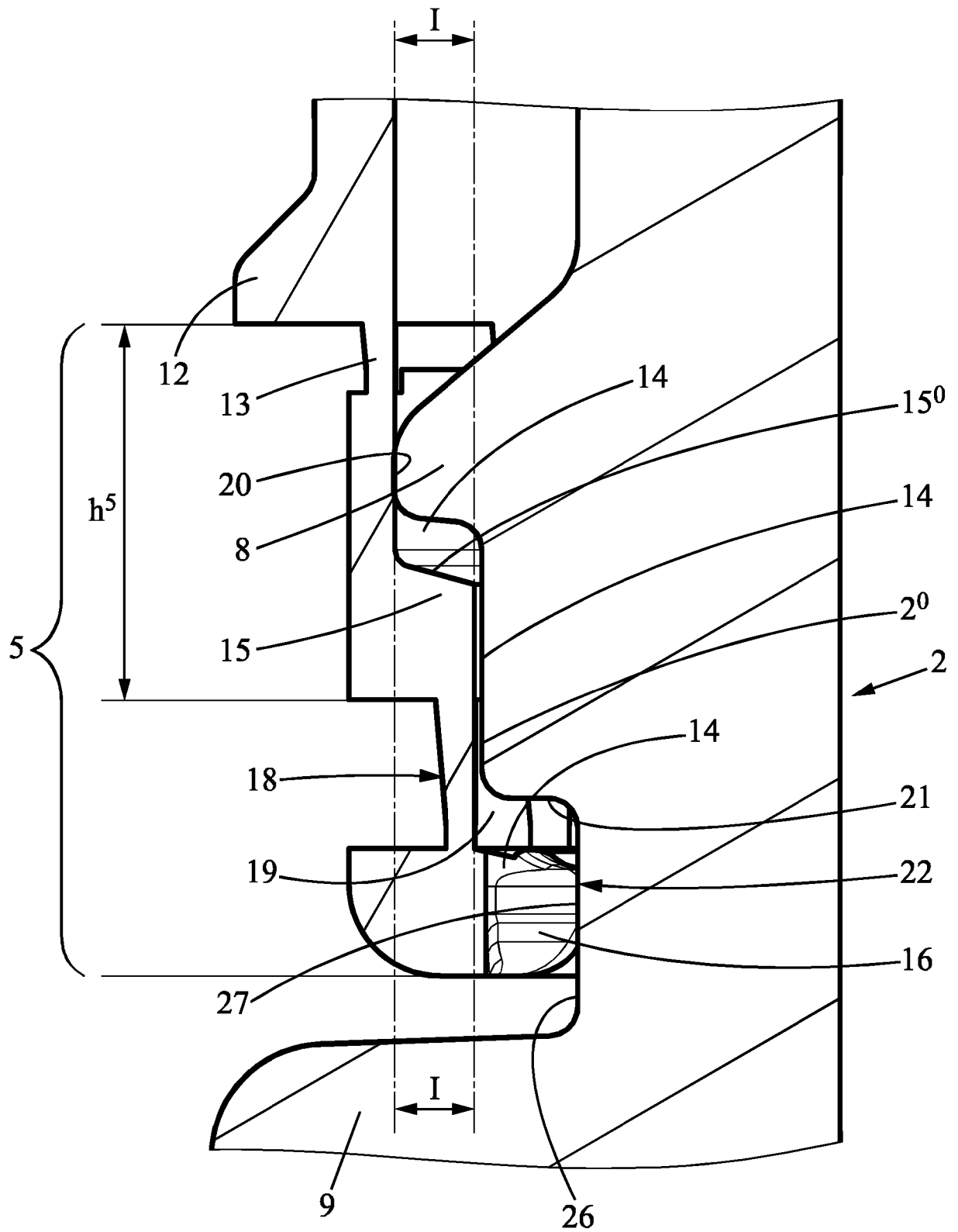


FIG. 5

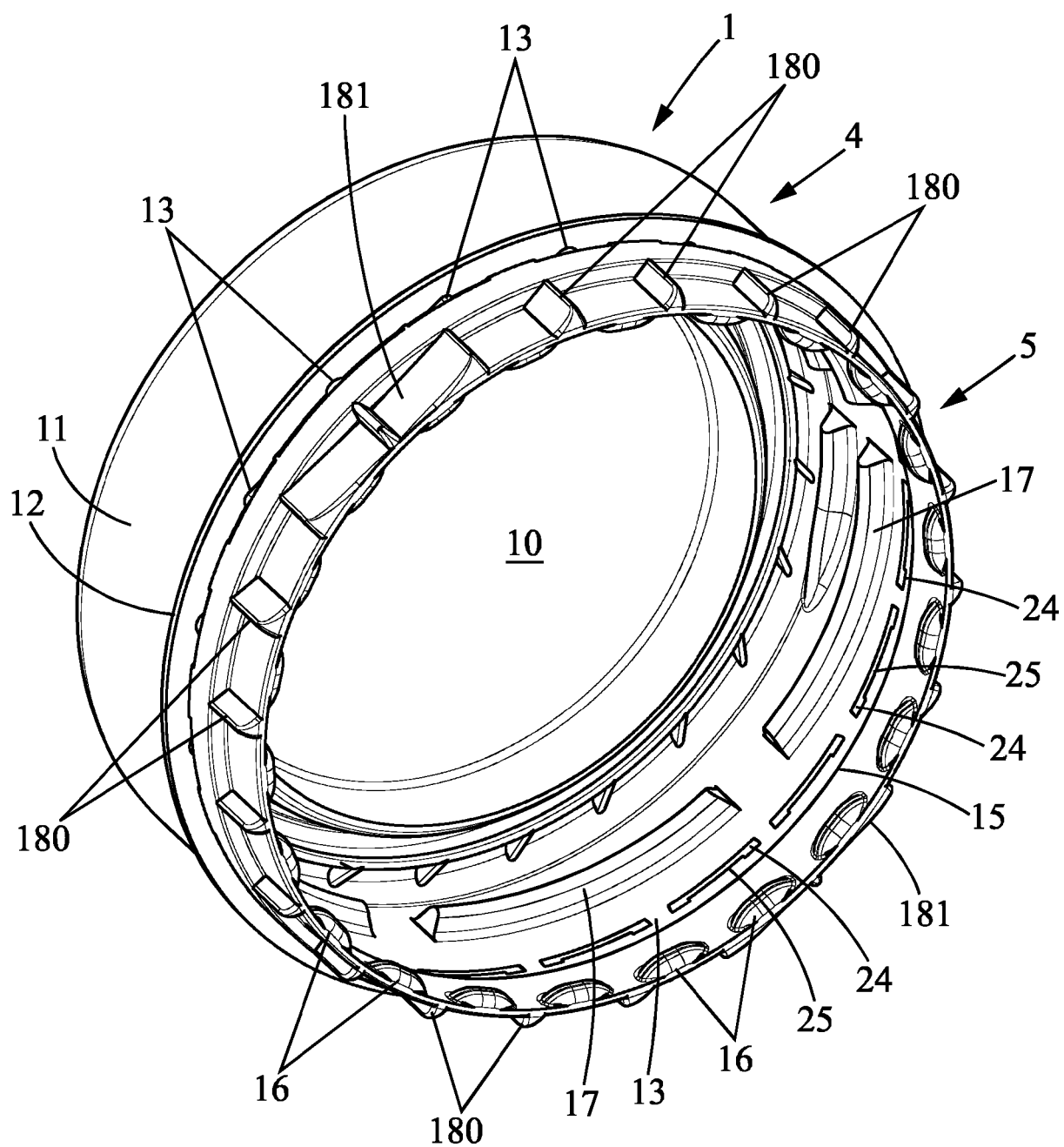


FIG. 6

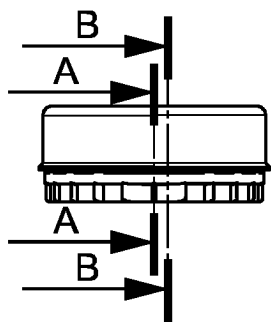


FIG. 7

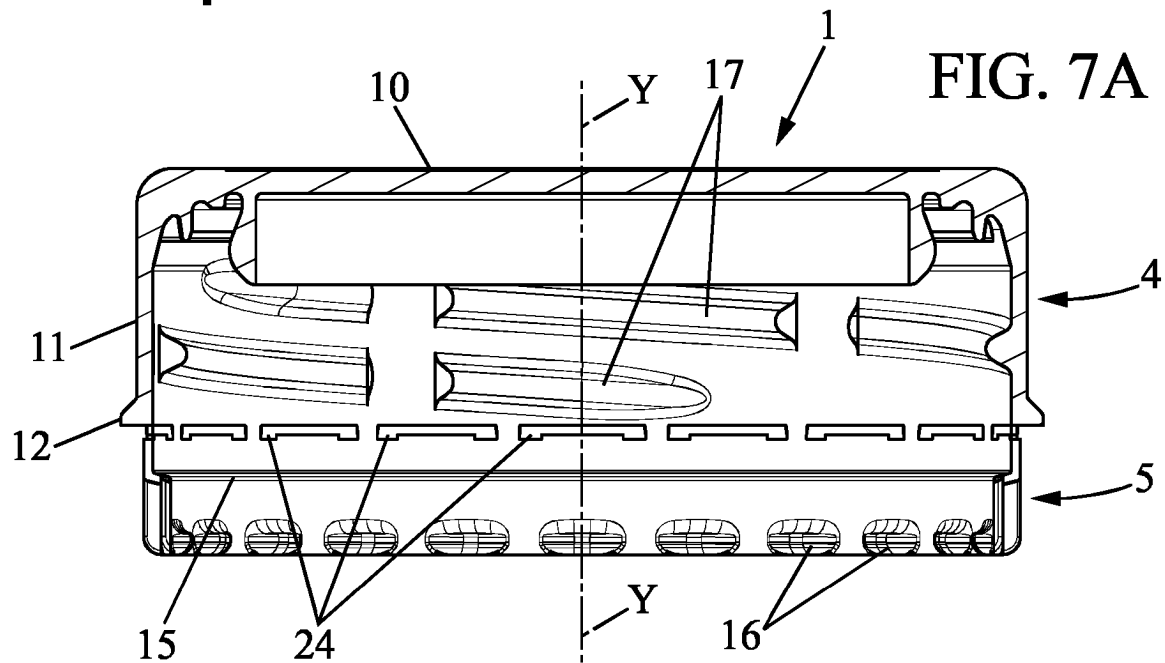


FIG. 7A

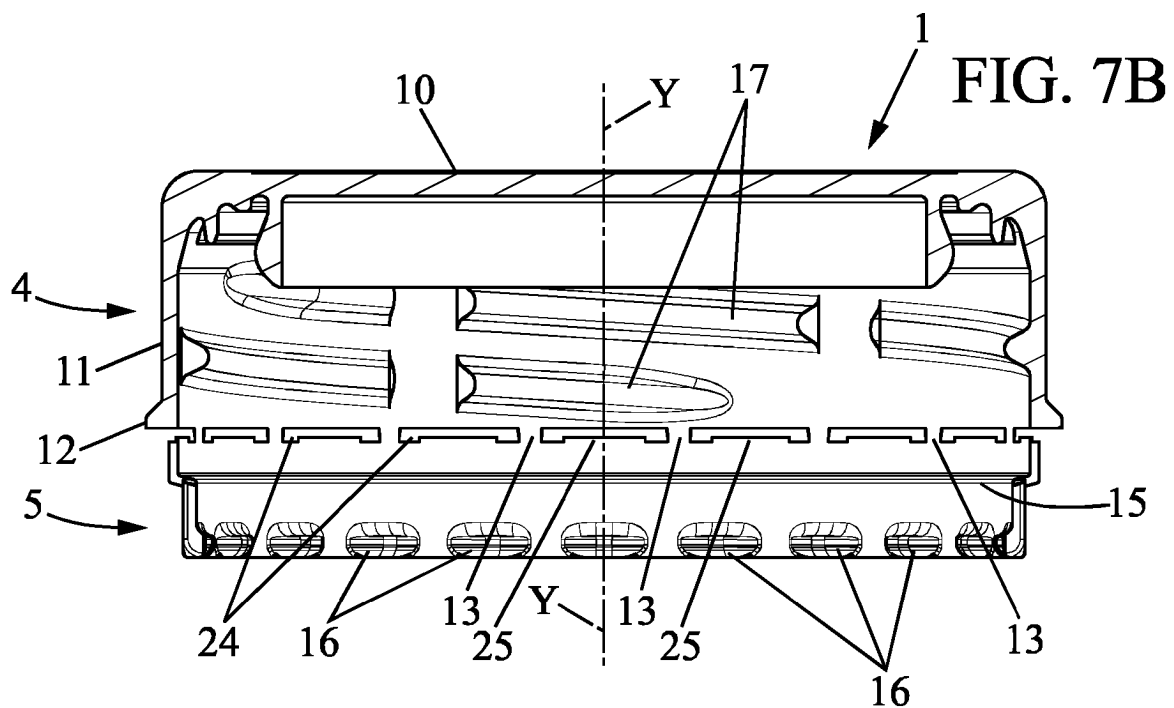
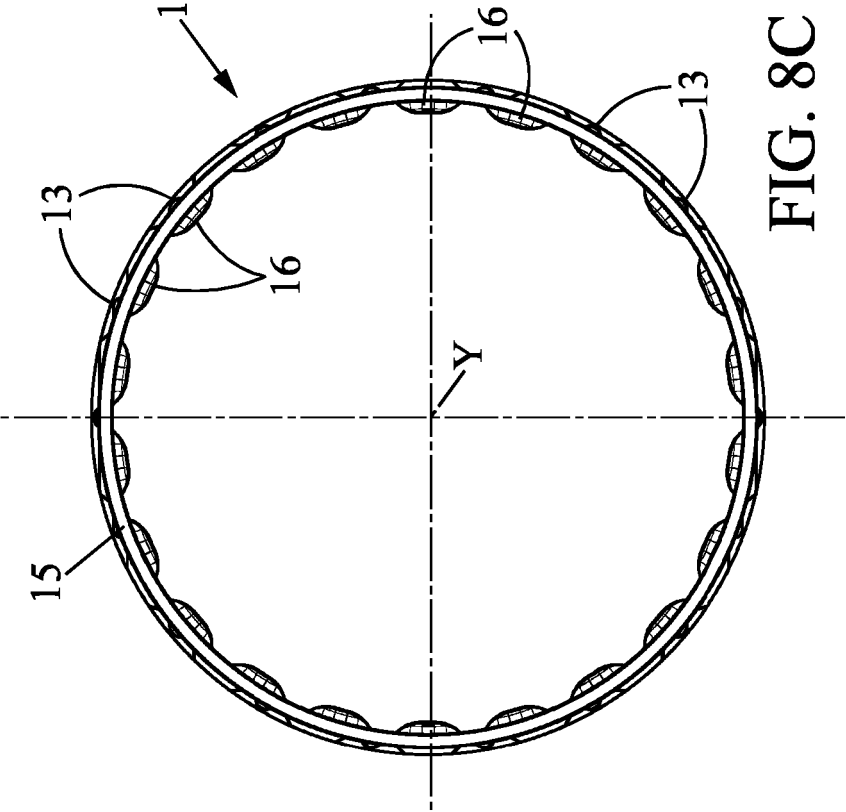
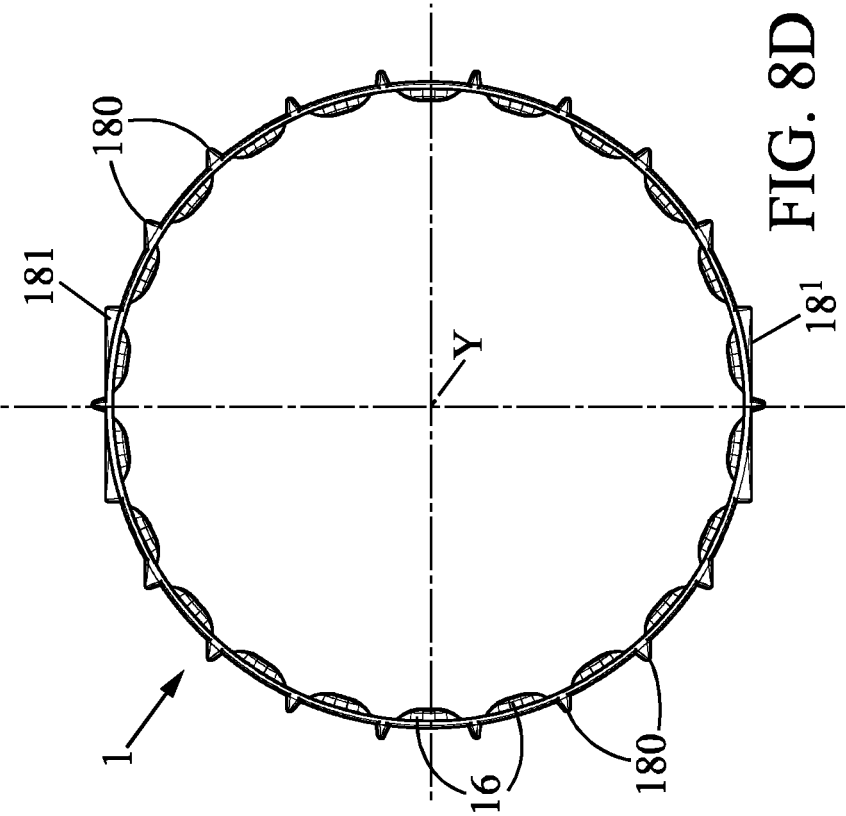
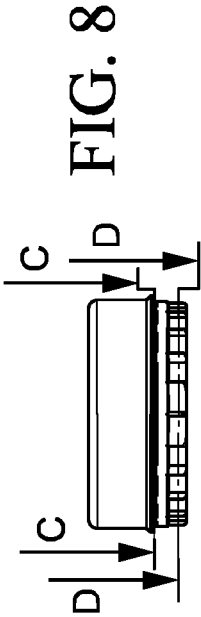
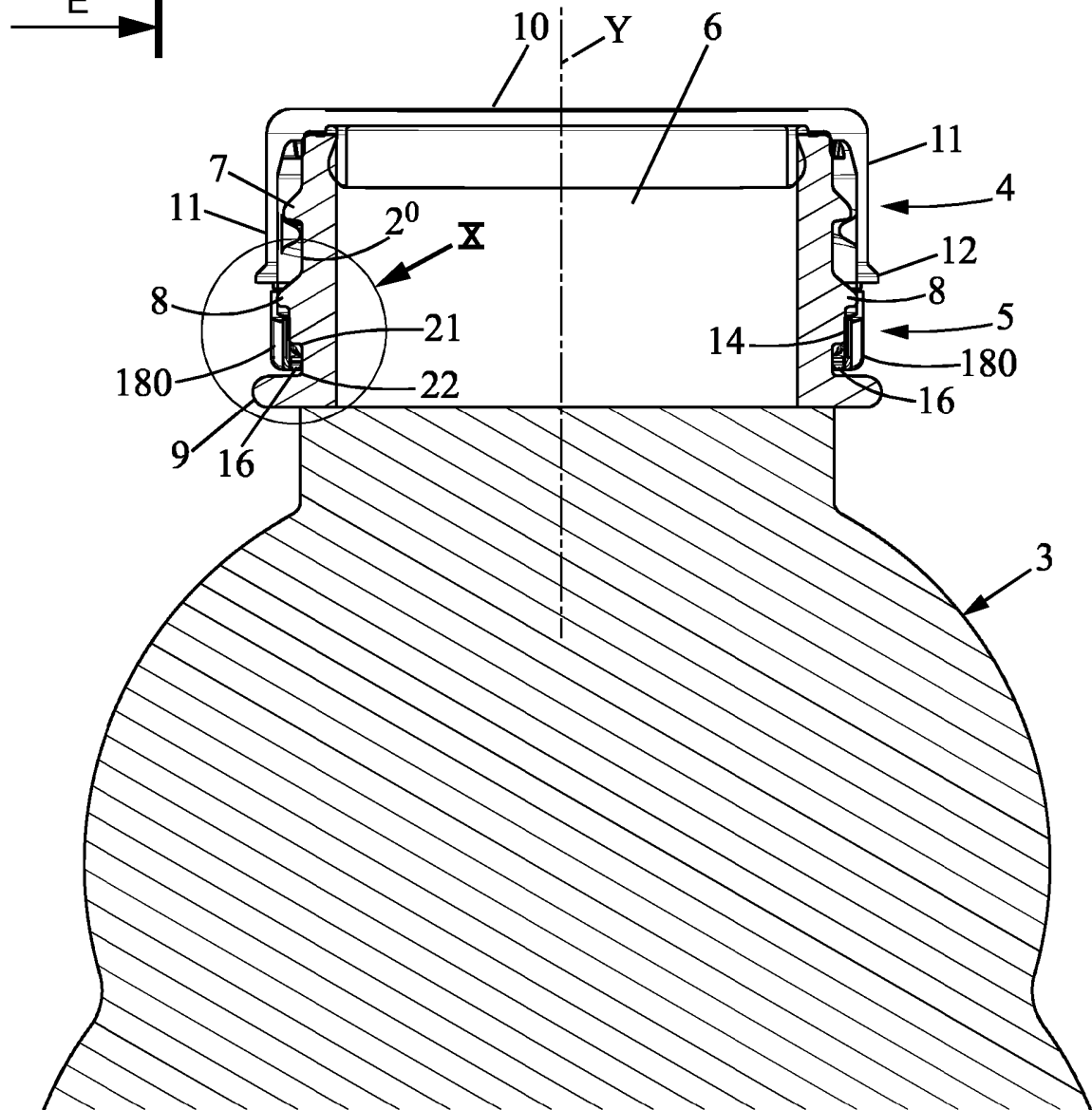
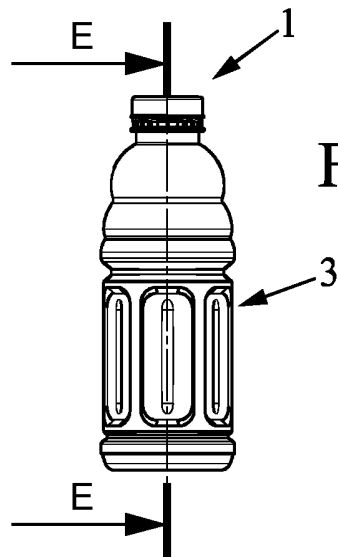


FIG. 7B





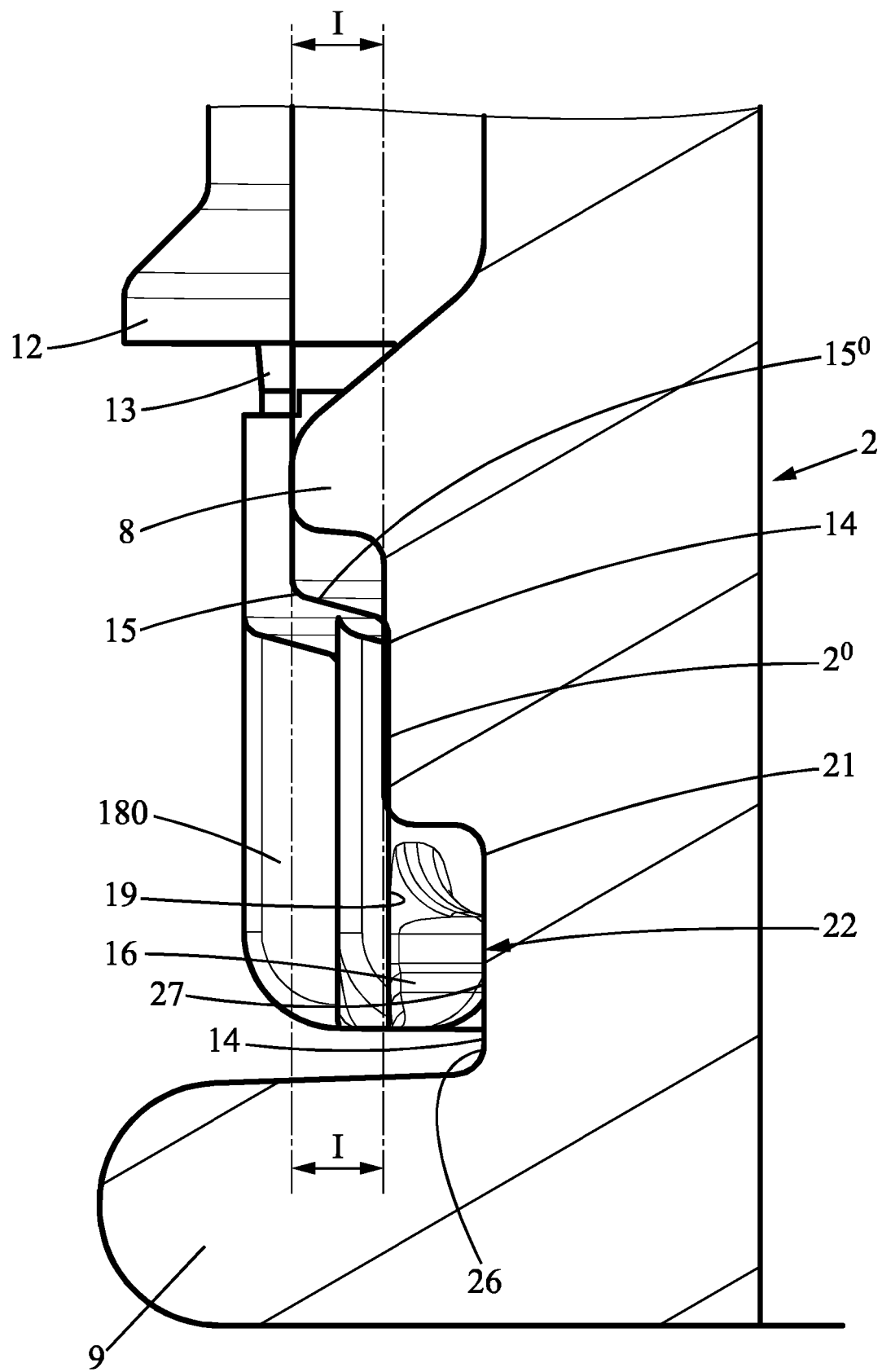


FIG. 10

FIG. 11

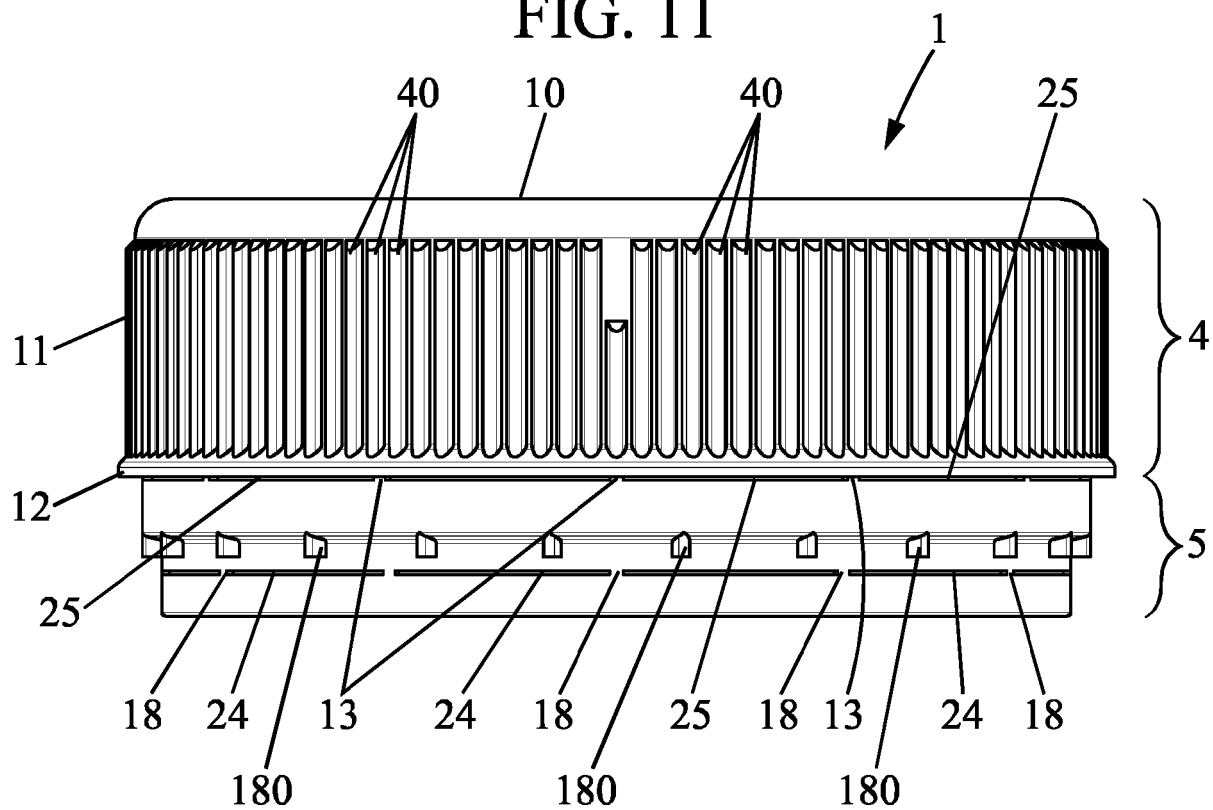


FIG. 12

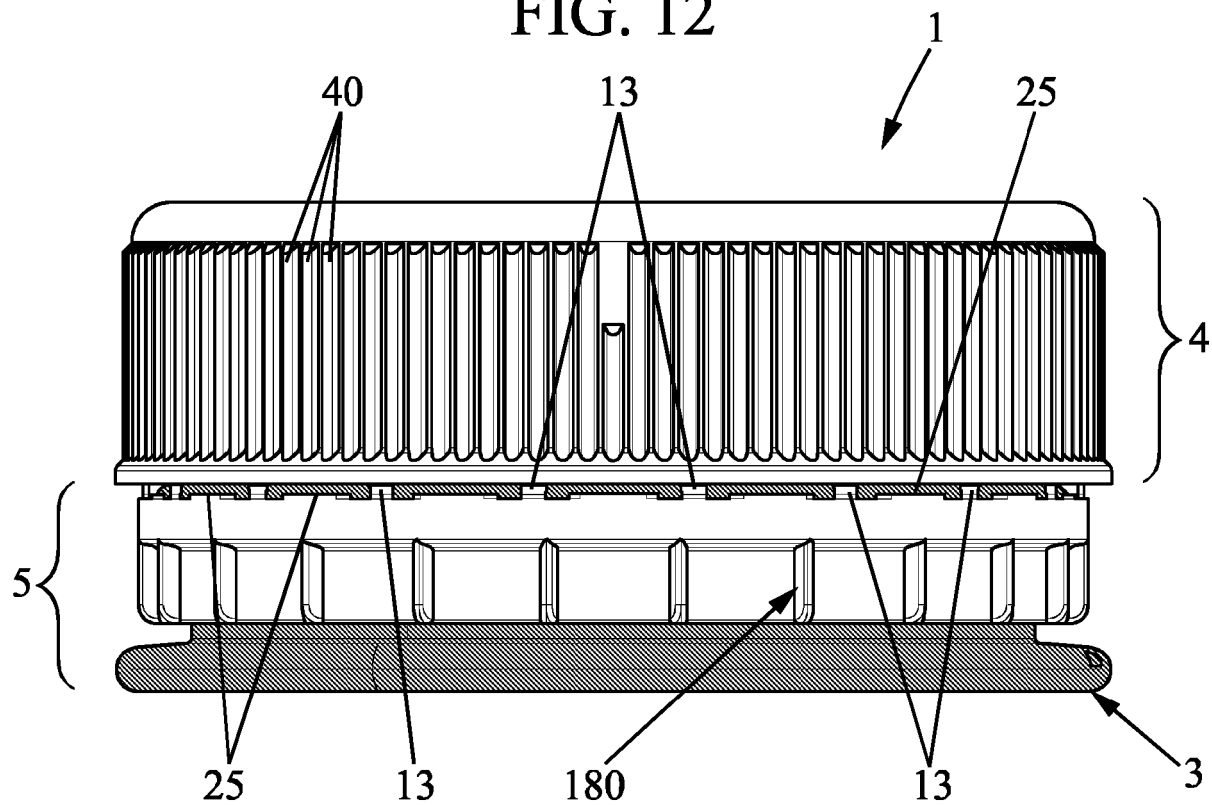


FIG. 13A

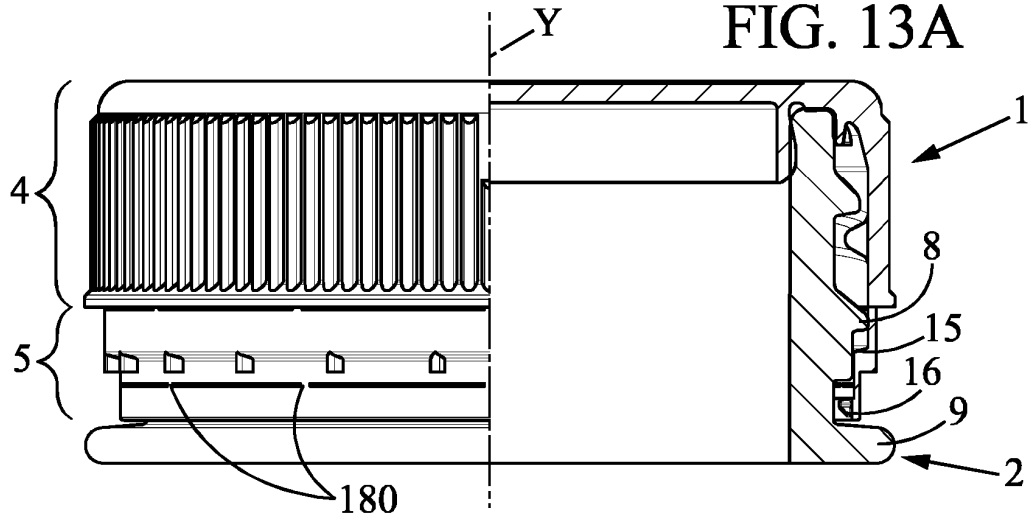


FIG. 13B

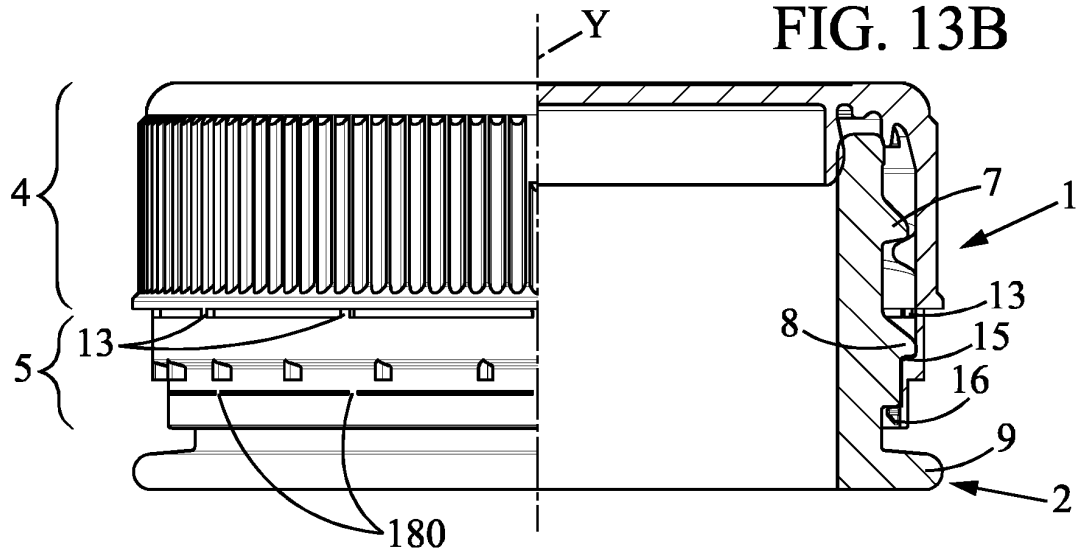
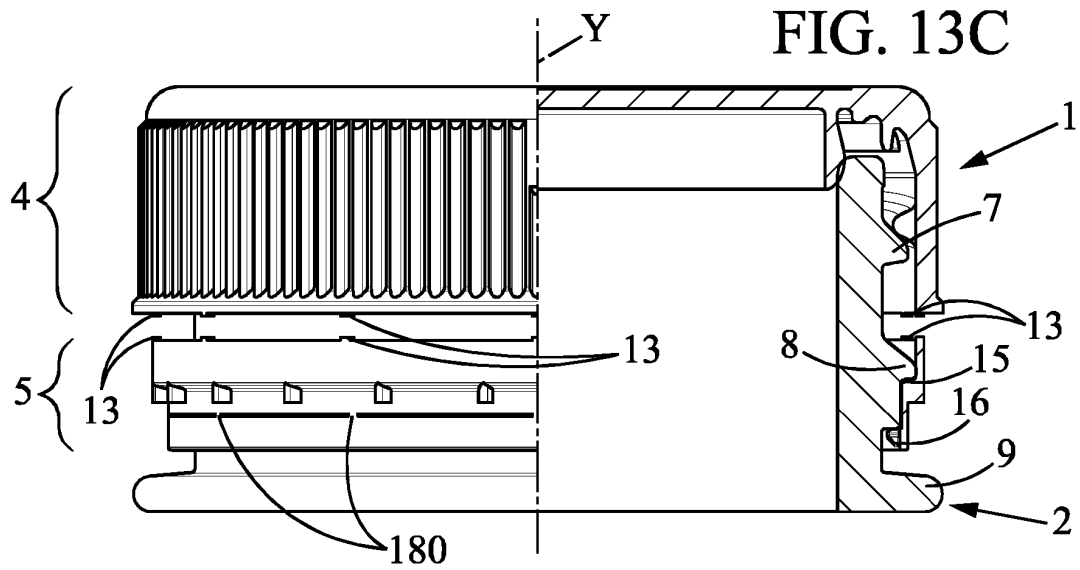


FIG. 13C



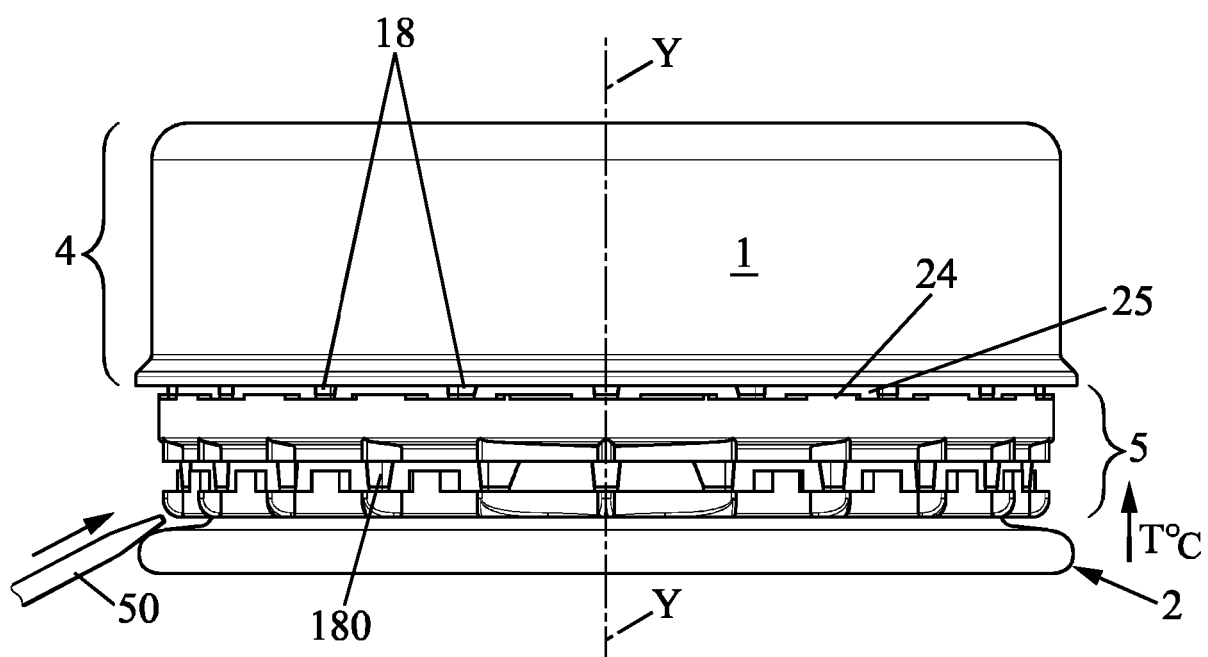


FIG. 14A

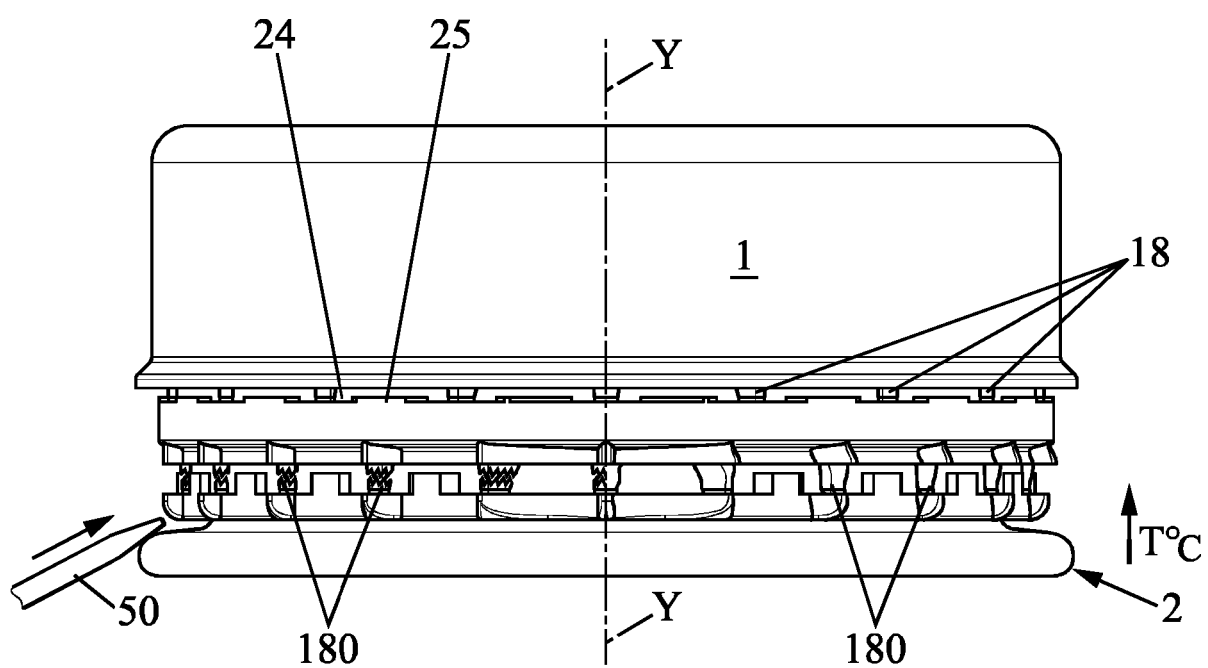


FIG. 14B

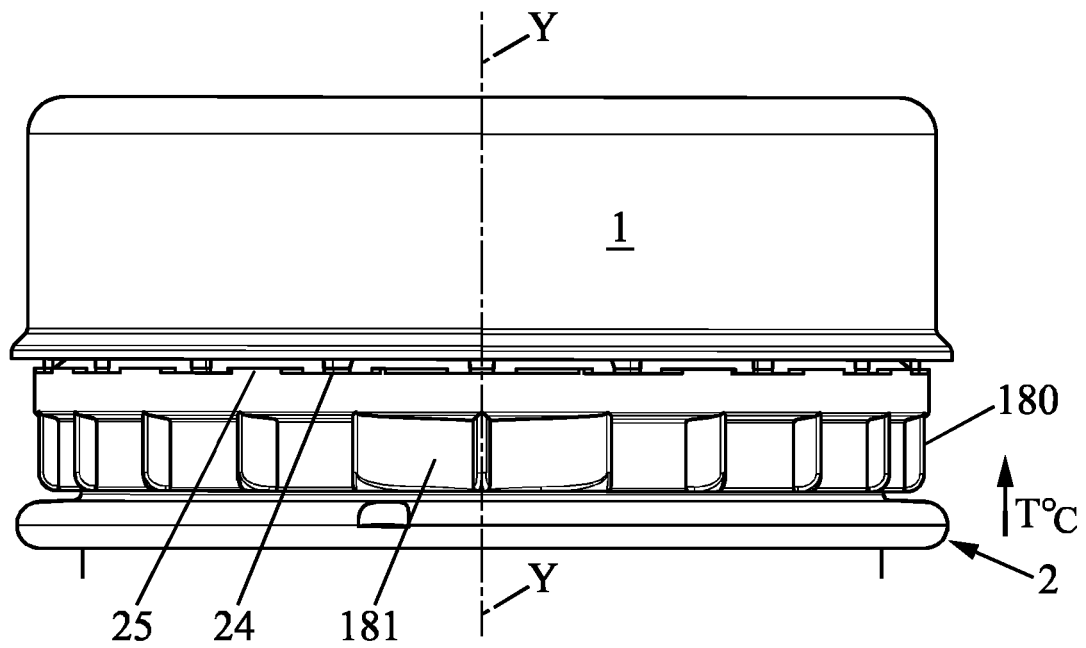


FIG. 15A

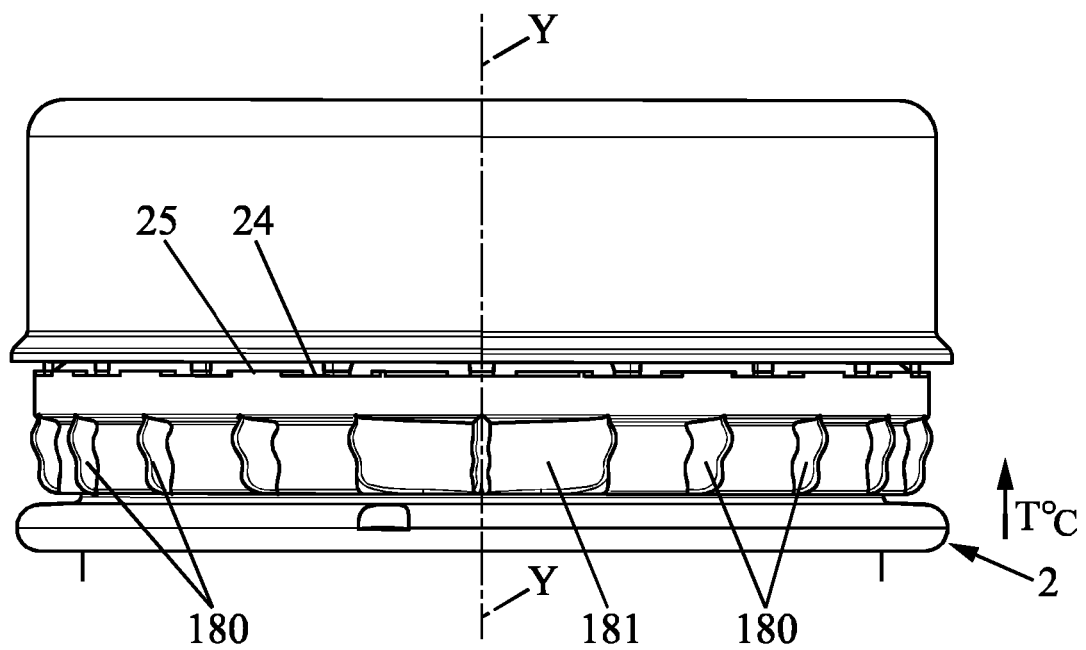


FIG. 15B

REFERENCES CITED IN THE DESCRIPTION

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