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(54) **TETHERED ONE-PIECE CLOSURE**

(57) A closure (1), such as a screw cap, comprising: a first portion, having a tubular first wall segment (3), a helical fastening structure (15, 17) protruding inward from the first wall segment(3) and a retaining portion with a tubular retaining segment (4). The closure comprising further a second portion (2P) connected to each of the first wall segment (3) and the retaining segment (4), and that the second portion (2P) comprising a helical groove structure (5, 6) extending from the first wall segment (3) to the retaining segment (4), and that a part of the helical fastening structure (15, 17) protruding inward from the first wall segment (3) and a part of the helical groove structure (5, 6) of the second portion (2P) are arranged to overlap each other

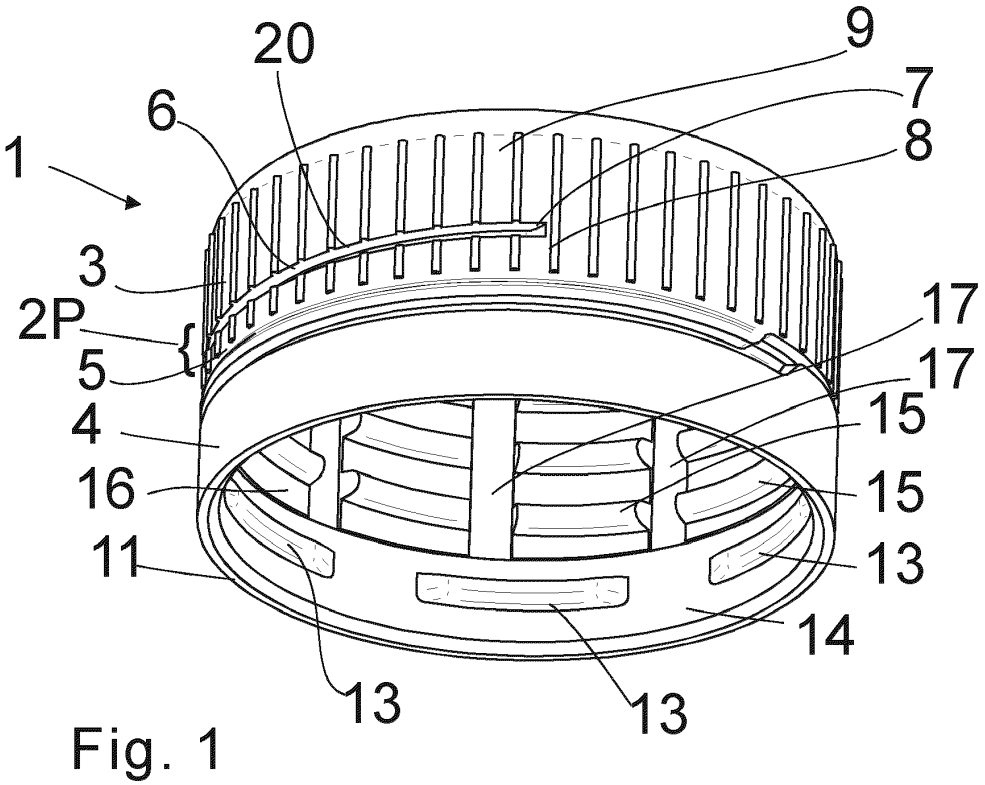


Fig. 1

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates generally to a closure for a package. More specifically, the present invention relates to a closure, such as a screw cap, for a bottle. More specifically, the present invention relates to a tethered one-piece closure to assist in preventing or inhibiting the closure from being separated from the container, and especially from the bottle.

### BACKGROUND OF THE INVENTION

**[0002]** Containers, such as glass and plastic containers, and especially beverage containers, are commonplace today. Once used, the containers that such beverages are served in may cause environmental problems if they are not carefully recycled.

**[0003]** As a result, deposit returns programs have been implemented in certain instances to reduce waste through landfall and the like, and allow for recycling of the returned containers.

**[0004]** However, such programs focus on the bottle container itself, wherein in practice, the product is sold together with a closure, such as a screw cap.

**[0005]** In some countries these caps are usually not collected or returned for recycling, often being disposed of in landfills, or being swept into waterways or the ocean, where they may be mistaken for food by fish or bifdlife, and which may result in injury or death.

**[0006]** Furthermore, recycling programs in some countries encourage the public to unseal caps from bottles so as to allow for the compaction of bottles during the collection and transportation stage of the recycling process, since a sealed empty bottle is more difficult to compress than an unsealed empty bottle.

**[0007]** Significant raw material and manufacturing costs are incurred in the manufacture of such large numbers of caps.

**[0008]** Given the large number of containers sold every year, these caps in themselves may have a significant cost and environmental impact.

**[0009]** As such, a need therefore exists for a manner in which to ensure that bottle caps are not lost during the container life cycle allowing for their return for recycling rather than polluting the environment.

**[0010]** It has been suggested in various countries, for example in the EU, that certain single-use plastic products that have caps and lids made of plastic may be placed on the market only if the caps and lids remain attached to the containers during the products' intended use stage. Such products are for example beverage containers with a capacity of up to three litres, i.e. receptacles used to contain liquid, such as beverage bottles including their caps and lids and composite beverage packaging including their caps and lids.

**[0011]** It is known from prior art closure caps for a bottle having a member, such as a strip, for tethering opened cap to a retaining ring connected to a mouth or a neck of a bottle. However, known solutions make the total height of the closure cap rather high. Also, a member for tethering the cap to the retaining ring can be rather short and/or the opening or the reclosing the closure cap with a member for tethering is difficult.

**[0012]** It is an object of the present invention to provide a closure for a container which overcomes or at least ameliorates some of the above-mentioned disadvantages, or which at least provides the public with a useful choice.

### SUMMARY OF THE INVENTION

**[0013]** According to one aspect, the present invention provides a closure, such as a screw cap, comprising: a first portion, having a tubular first wall segment, a helical fastening structure protruding inward from the first wall segment and a retaining portion with a tubular retaining segment. The closure comprising further a second portion connected to each of the first wall segment and the retaining segment. The second portion comprising a helical groove structure extending from the first wall segment to the retaining segment. A part of the helical fastening structure protruding inward from the first wall segment and a part of the helical groove structure of the second portion are arranged to overlap each other.

**[0014]** The advantage of the invention is that the closure, such as the screw cap, can be used for short necked or for short mouth containers. The closure still can have a long enough tether or stripe formed from the helical groove structure of the second portion of the side wall of the closure. The untampered closure and its helical fastening structure protruding inward from the first wall segment, i.e. threads in the wall, as fitted on the counter threads of the container mouth, withstand pressures of the of the carbonated drinks, such as carbonated beverages when the closure is in a closed position on the mouth of the container. After opening of the closure, the major part of an internal pressure by carbonated beverages exerted to the container and to the closure have been released and a shorter portion of the threads of the closure can still withstand the internal pressure exerted when the closure is reclosed. The closure is easy to open. The chirality of the fastening structure and the chirality of the groove structure correspond each other. A threading of the fastening structure and a threading of the groove structure correspond each other. Threading can be right-handed or left-handed depending of the embodiment. The tether or strip connecting the first section of the closure to the retain section is long enough for making the use of the closure easy.

**[0015]** In an embodiment of the closure, the fastening structure has a first chirality and the groove structure has a second chirality corresponding to the first chirality.

**[0016]** In an embodiment of the closure, the fastening structure has a first chirality and the groove structure has

a second chirality opposite to the first chirality.

**[0017]** In an embodiment of the closure, the groove structure forms at least one turn between the first segment and the retaining segment.

**[0018]** In an embodiment of the closure, a part of the helical fastening structure protruding inwards from the first wall segment and a part of the helical groove structure are aligned.

**[0019]** In an embodiment of the closure, the helical fastening structure protruding inwards from the first wall comprises several protuberances and a void or a groove between each two consecutive protuberances.

**[0020]** In an embodiment of the closure, a part of the helical fastening structure protruding inward comprises several protuberances arranged to a section of the second portion formed between the groove.

**[0021]** In an embodiment of the closure, the retaining section with a tubular retaining section with a tubular retaining segment comprises a coupling element for coupling the closure on a mouth or on a neck of a container.

**[0022]** In an embodiment of the closure, the retaining section with a tubular retaining segment comprises a coupling element for coupling the closure to a mouth of a container and wherein the coupling element comprises several protuberances arranged on a rim of the inner wall and inwards from an inner wall of the tubular retaining segment.

**[0023]** In an embodiment of the closure, the retaining section with a tubular retaining segment comprises a deviation portion comprising a surface, preferable deviating from a pitch of the helical groove.

**[0024]** In an embodiment of the closure, the first wall segment or the second portion comprises a deviation portion comprising a surface deviating from a general pitch of the helical groove and adapted to contact the surface of the deviation portion of the retaining section with the retaining segment during an opening of the closure.

**[0025]** In an embodiment of the closure, the closure comprises a top wall arranged to top end of the tubular first wall segment the top end being an opposite end of the closure to an end of the retaining segment.

**[0026]** In an embodiment of the closure, the helical groove structure extending from the first segment to the second portion comprises a frangible groove(s) adapted to form a strip connecting the first part and the retaining segment of the closure when the closure is in an opened position.

**[0027]** In an embodiment of the closure, the strip tethers the first section of the closure to the retaining section and to the container, when the closure is in an opened position.

**[0028]** In an embodiment of the closure, the fastening structure and a part of the groove structure comprise same handed threading with a substantially same pitch.

It is to be understood that the aspects and embodiments of the invention described above may be used in any combination with each other. Several of the aspects and embodiments may be combined together to form a further embodiment of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0029]** The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate embodiments of the invention and together with the description help to explain the principles of the invention. In the drawings:

Figure 1 shows a closure, such as a screw cap according to one embodiment of the invention,

Figure 2 shows a closure, such as a screw cap according to one embodiment of the embodiment,

Figure 3 shows a container, such as a bottle, provided with a closure, such as a screw cap, in a first, closed, position,

Figure 4 shows a container, such as a bottle, provided with a closure, such as a screw cap, in a second position during opening,

Figure 5 shows a container such as a bottle, provided with a closure, such as a screw cap, in a third, opened, position,

Figure 6 shows a top view of a closure, such as a screw cap according to one embodiment of the invention,

Figure 7 shows a closure, such as a screw cap according to one embodiment of the invention in section VII-VII from Figure 6,

Figure 8 shows a bottom view of a closure, such as a screw cap according to one embodiment of the invention,

Figures 9a, 9b, 9c, 9d show side views of a closure, such as a screw cap according to one embodiment of the invention.

## DETAILED DESCRIPTION

**[0030]** Reference is made to Figures 1 to 9d.

**[0031]** A closure 1, such as a screw cap, for a container 30 having a mouth. Such a container can be for example a bottle. The closure 1 comprises a cylindrical side wall 3 and a top wall 2 on the top end of the closure.

**[0032]** Arranged on the lower edge 11 of the wall 3 of a closure 1, such as screw cap, of this type is a retaining ring 4 that engages in a counter member, such as in a groove, on a container 30 mouth 34 when the closure 1 is arranged to its position on a container mouth 34.

**[0033]** The closure 1, such as a screw cap, has a first portion, having a tubular first wall segment 3 having an outer wall surface and an inner wall surface 16. The closure comprises a helical fastening structure 15, 17 protruding inward from the inner wall surface 16 of the first wall segment 3. The closure 1 comprises a retaining section with a tubular retaining wall segment 4. The closure 1 has a second portion 2P connected to each of the first wall segment 3 and the retaining segment 4. The second

portion 2P of wall comprises a helical groove structure 5, 6 extending from the first wall segment 3 to the retaining segment 4.

**[0034]** On opening the container 30, only the cap 9 portion of the closure 1 is removed as in Figure 5, while the retaining segment 4, i.e. retaining ring, remains connected on a mouth or a neck of the container.

**[0035]** A strip or tether 5 that has formed on opening of the closure from the second portion 2P of the wall connects the retaining segment 4 with the closures first wall segment 3 so that the cap portion 9 will remain connected with the container 30 and cannot be mislaid or discarded separately.

**[0036]** The retaining segment 4 is simultaneously used as an anti-tamper ring for the display of initial opening of the container 30. To this end, the retaining segment 4 may, for example, connected by means of frangible bridge(s) or by frangible bottom section 24 of the groove 6 with the first wall segment 3 or to the second portion 2P of the closure wall.

**[0037]** The retaining segment 4 of the closure may have one or more protuberances 13 radially extending from its inner wall surface 14. The protuberances 13 may be fitted to a counter means, such as a groove on the container mouth when the closure is in position on the container mouth. According to one embodiment the retaining section 4 can rotate in the counter means such as in the groove when the closure is opened i.e. unscrewed.

**[0038]** In an upper end of the closure may be a top wall 2. The top wall may be on a first end of the first tubular wall section 3. On an outer wall surface of the tubular first wall section may be provided with friction enhancing members to make a grabbing surface for the cap.

**[0039]** A part of the helical fastening structure 15, 17, protruding inward from the first wall segment 3, and a part of the helical groove structure 5, 6 of the second portion 2P of the wall, may be arranged to overlap each other. In one embodiment when the closure 1 is opened by unscrewing the closure cap from the mouth 34 of the container 30 the grooves 6 and/or their bottom surfaces 24 may be fractioned and the strip 5 may be formed from the second portion 2P of the wall. The retaining section end of the strip 5 is connected to the retaining section 4 via a connecting portion 10. The cap side end of the strip 5 is connected to the first wall section 3 of the closure via second connection portion 8. In one embodiment a part of the helical fastening structure 15, 17 on second portion 2P of the wall may break up and form the strip 5 along the groove 6 of the wall during the unscrewing the closure. The groove may have a lower side surface 21 and an upper side surface 20. The retaining segment have an upper edge 23 being a lower side surface of the groove 6 on a lower portion of the groove. An opening phase of the closure from the mouth 34 of the container 30 is illustrated in figures 4 and 5. In figure 3 the closure 1 is untampered in closed position on the container mouth. In Figure 4 the closure 1 is partly opened by unscrewing the closure (in a counterclockwise direction) . In Figure 5 the closure 1 is in an opened position.

**[0040]** The fastening structure 15, 17 comprises a threading for connecting the closure on a mouth of the container. The threading may comprise the helical fastening structure 15, 17 protruding inward from the first wall 16. This may comprise several protuberances 15 and a void or a groove 17 between each two consecutive protuberances. The groove 17 may be arranged in cross direction to a helical curve of the consecutive protuberances. The groove 17 may be arranged in a longitudinal direction of the closure. In the embodiment of figures the threading may be arranged so that the closure is opened by turning the closure in a counterclockwise direction. The closure may be re-closed by rotating the closure in clockwise direction.

**[0041]** The fastening structure 15, 17 may have a first chirality and the groove structure 5, 6 has a second chirality corresponding to the first chirality. In one embodiment the helical fastening structure 15, 17 and the groove structure 5, 6 may have the same chirality. In one embodiment the pitch of at least part of the groove structure 5, 6 and the pitch of the fastening structure 15, 17 correspond each other and are same handed (for example both structures right-handed or both structures left-handed).

**[0042]** The fastening structure 15, 17 has a first chirality and the groove structure 5, 6 has a second chirality opposite to the first chirality. In one embodiment the pitch of at least part of the groove structure 5, 6 and the pitch of the fastening structure 15, 17 correspond each other and are not same handed (For example one may be right-handed and the other left-handed) .

**[0043]** The groove structure 5, 6 forms at least one turn between the first segment and the retaining segment. In one embodiment the length of the groove 6 on cylindrical wall 3 may be over 360 degrees. A first end 12 of the groove may be in the retaining segment so that lower side surface of the groove is upper edge of the retaining segment 4. The second end 7 of the groove may be arranged to the first section of the wall 3. The groove may be arranged to rotate spiral-like along cylindrical wall and opening to outer surface of the wall. In one embodiment a part of the helical fastening structure 15, 17 protruding inward from the first wall segment 3 and a part of the helical groove structure 5, 6 may be aligned. Then as explained earlier in one embodiment a part of the helical fastening structure 15, 17 on the second portion 2P of the wall may break up and form the strip 5 along the groove 6 of the wall during an opening the closure, for example by unscrewing the closure cap.

**[0044]** In one embodiment the helical fastening structure 15, 17 protruding inward from the inner surface 16 of the first wall segment may comprise several protuberances 15 and a void or a groove 17 between each two consecutive protuberances.

**[0045]** In one embodiment a part of the helical fastening structure 15, 17 protruding inwards may comprise

several protuberances 15 arranged to a section forming a stripe 5 of the second portion 2P formed between the groove 6 or between a helix of the groove.

**[0046]** In one embodiment the retaining section with a tubular retaining segment 4 may comprise a coupling element 13 for coupling the closure 1 to a mouth 34 or on a neck of a container 30.

**[0047]** In one embodiment the retaining segment 4 may comprise a coupling element 13 for coupling the closure 1 to a mouth 34 of a container 30 and wherein the coupling element 13 comprises several protuberances arranged on a rim of the inner wall (14) inwards from an inner wall 14 of the tubular retaining segment 4.

**[0048]** In one embodiment the retaining section with a tubular retaining segment 4 may comprise a deviation portion comprising a surface 24, preferable deviating from a pitch of the helical groove 6.

**[0049]** In one embodiment the first wall segment 3 or the second portion 2P comprises a deviation portion comprising a surface 25 deviating from a general pitch of the helical groove 6 and adapted to contact the surface 24 of the deviation portion of the retaining section with the retaining segment 4 during an opening of the closure 1.

**[0050]** In one embodiment the closure comprises a top wall 2 arranged to top end of the tubular first wall segment 3 the top end being an opposite end of the closure 1 to an end 11 of the tubular retaining segment 4. Between the top wall 2 and the tubular first wall 3 may be a transition section, for example a rounding or a beveling of a corner between the top wall and the cylindrical side wall.

**[0051]** In one embodiment the helical groove structure 5, 6 of the second portion 2P extending between the first wall segment and the retaining segment 4 comprises a frangible groove(s) 6 adapted to form a strip 5 connecting the first portion and the retaining segment 4 of the closure when the closure is in an opened position.

**[0052]** In one embodiment the strip 5 may tether the first wall section of the closure to the retaining segment 4 and via retaining segment 4 to the container 30, when the closure is in an opened position.

**[0053]** In one embodiment the fastening structure 15, 17 and a part of the groove structure 5, 6 may comprise same handed threading with a substantially same pitch.

**[0054]** In one embodiment the container 30 may be a bottle. The container may have a neck of mouth 34. The mouth 34 may have a mouth edge 31 and an opening 33. The mouth may have a fastening structure such as a thread 32. The closure 1 and its fastening structure 15, 17 is configured to fit to the threads 32 of the container 30.The container mouth or neck may have a shoulder 35.The retaining segment 4 of the closure is configured to fit to a counter member, such as a groove of the container mouth 32.

**[0055]** In one embodiment the closure 1 may be made of plastic.

**[0056]** It is obvious to a person skilled in the art that with the advancement of technology, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not limited to the examples described above, instead they may vary within the scope of the claims.

## Claims

1. A closure (1), such as a screw cap, comprising: a first portion, having a tubular first wall segment (3), a helical fastening structure (15, 17) protruding inward from the first wall segment (3) and a retaining portion with a tubular retaining segment (4), **characterized in that** the closure comprising further a second portion (2P) connected to each of the first wall segment (3) and the retaining segment (4), and that the second portion (2P) comprising a helical groove structure (5, 6) extending from the first wall segment (3) to the retaining segment (4), and that a part of the helical fastening structure (15, 17) protruding inward from the first wall segment (3) and a part of the helical groove structure (5, 6) of the second portion (2P) are arranged to overlap each other.

2. The closure according to claim 1, **characterized in that** the fastening structure (15, 17) has a first chirality and the groove structure (5, 6) has a second chirality corresponding to the first chirality.

3. The closure according to claim 1, **characterized in that** the fastening structure (15, 17) has a first chirality and the groove structure (5, 6) has a second chirality opposite to the first chirality.

4. The closure according to any one of the claims 1 to 3, **characterized in that** the groove structure (5, 6) forms at least one turn between the first segment and the retaining segment.

5. The closure according to any one of the claims 1 to 4, **characterized in that** a part of the helical fastening structure (15, 17) protruding inwards from the first wall segment (3) and a part of the helical groove structure (5, 6) are aligned.

6. The closure according to any one of the claims 1 to 5, **characterized in that** the helical fastening structure (15, 17) protruding inwards from the first wall (16) comprises several protuberances (15) and a void or a groove (17) between each two consecutive protuberances.

7. The closure according to any one of the claims 1 to 6, **characterized in that** a part of the helical fastening structure (15, 17) protruding inwards comprises several protuberances (15) arranged to a section (5) of the second portion (2P) formed between the groove (6).

8. The closure according to any one of the claims 1 to 7, **characterized in that** the retaining section with a tubular retaining segment (4) comprises a coupling element (13) for coupling the closure (1) on a mouth (34) or on a neck of a container (30).

9. The closure according to any one of the claims 1 to 8, **characterized in that** the retaining section with a tubular retaining segment (4) comprises a coupling element (13) for coupling the closure (1) to a mouth (34) of a container (30) and wherein the coupling element (13) comprises several protuberances arranged on a rim of the inner wall (14) and inwards from an inner wall (14) of the tubular retaining segment (4).

10. The closure according to any one of the claims 1 to 9, **characterized in that** the retaining section with a tubular retaining segment (4) comprises a deviation portion comprising a surface (24), preferable deviating from a pitch of the helical groove (6).

11. The closure according to any one of the claims 1 to 10, **characterized in that** the first wall segment (3) or the second portion (2P) comprises a deviation portion comprising a surface (25) deviating from a general pitch of the helical groove (6) and adapted to contact the surface (24) of the deviation portion of the retaining section with the retaining segment (4) during an opening of the closure (1).

12. The closure according to any one of the claims 1 to 11, **characterized in that** the closure comprises a top wall (2) arranged to top end of the tubular first wall segment (3) the top end being an opposite end of the closure (1) to an end (11) of the tubular retaining segment (4).

13. The closure according to any one of the claims 1 to 12, **characterized in that** the helical groove structure (5, 6) of the second portion (2P) extending between the first wall segment and the retaining segment (4) comprises a frangible groove(s) (6) adapted to form a strip (5) connecting the first portion and the retaining segment (4) of the closure when the closure is in an opened position.

14. The closure according to any one of the claims 1 to 13, **characterized in that** the strip (5) tethers the first wall section of the closure to the retaining segment (4) and via retaining segment (4) to the container (30), when the closure is in an opened position.

15. The closure according to any one of the claims 1 to 14, **characterized in that** the fastening structure (15, 17) and a part of the groove structure (5, 6) comprise same handed threading with a substantially same pitch.

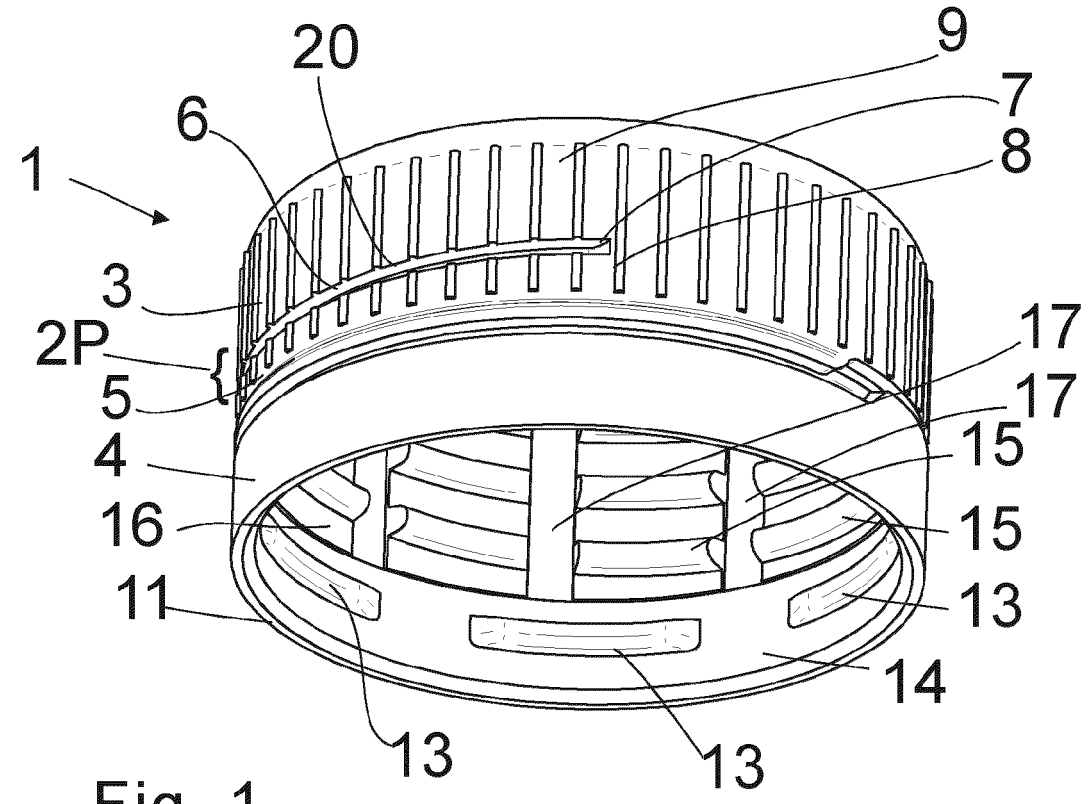
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Fig. 1

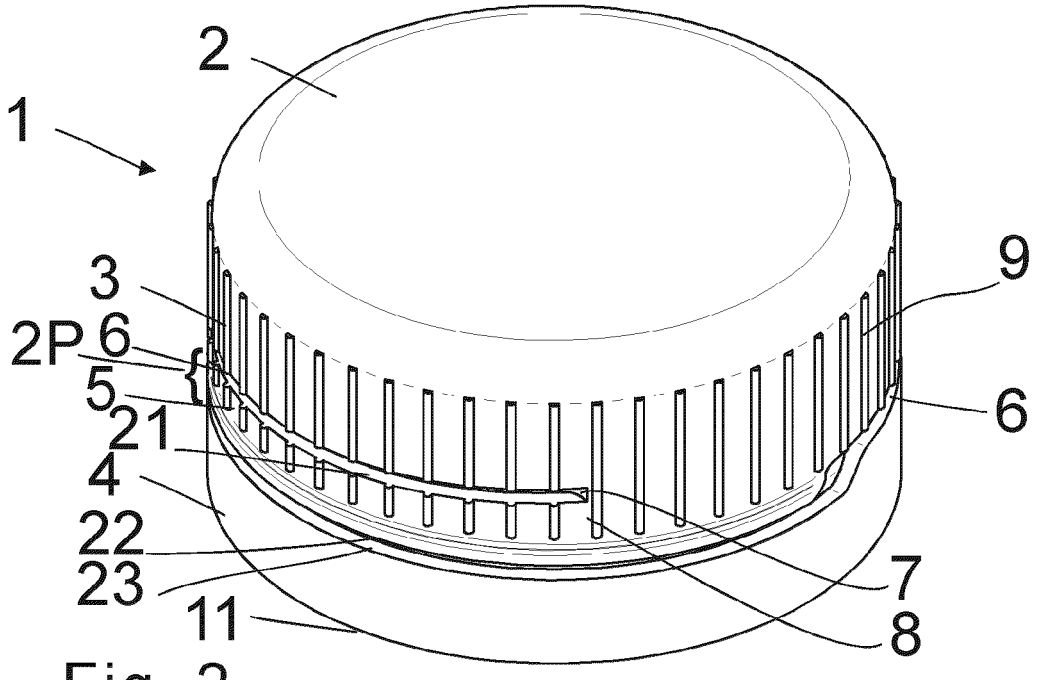
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Fig. 2

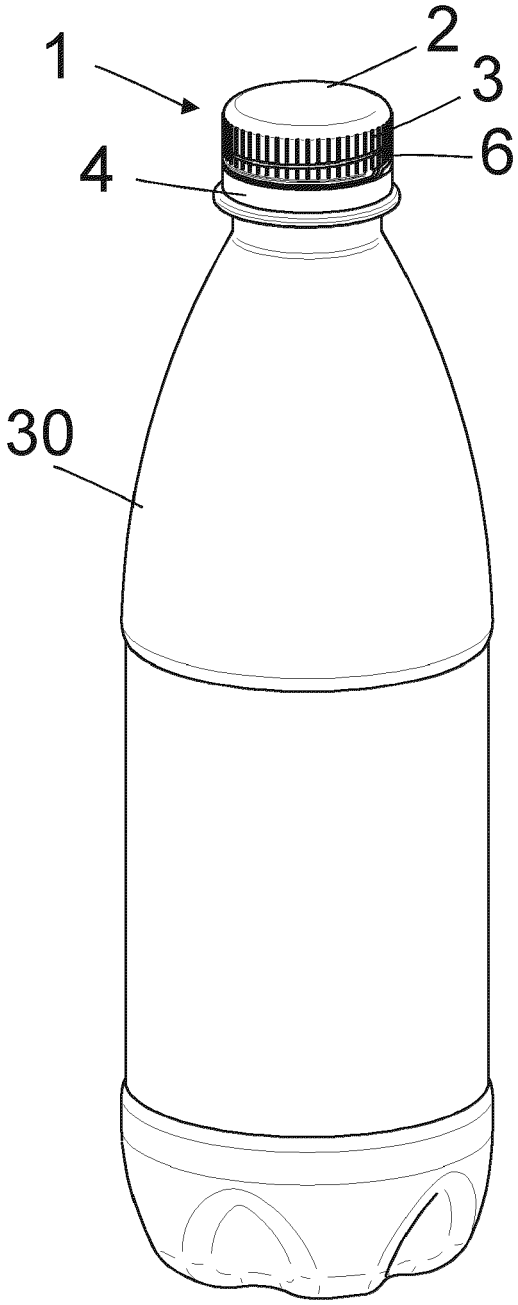


Fig. 3

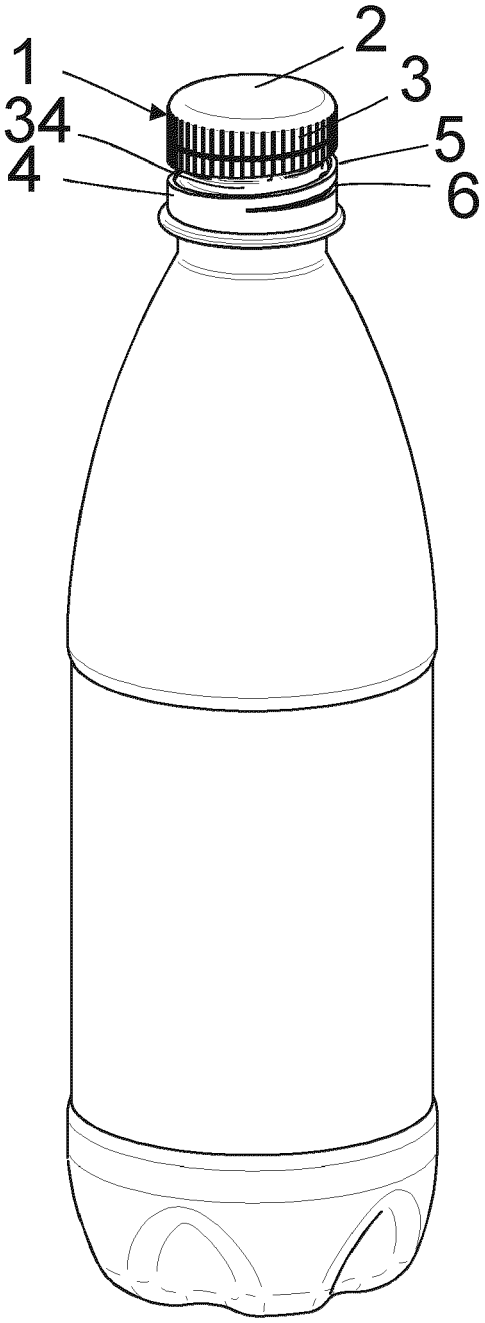


Fig. 4

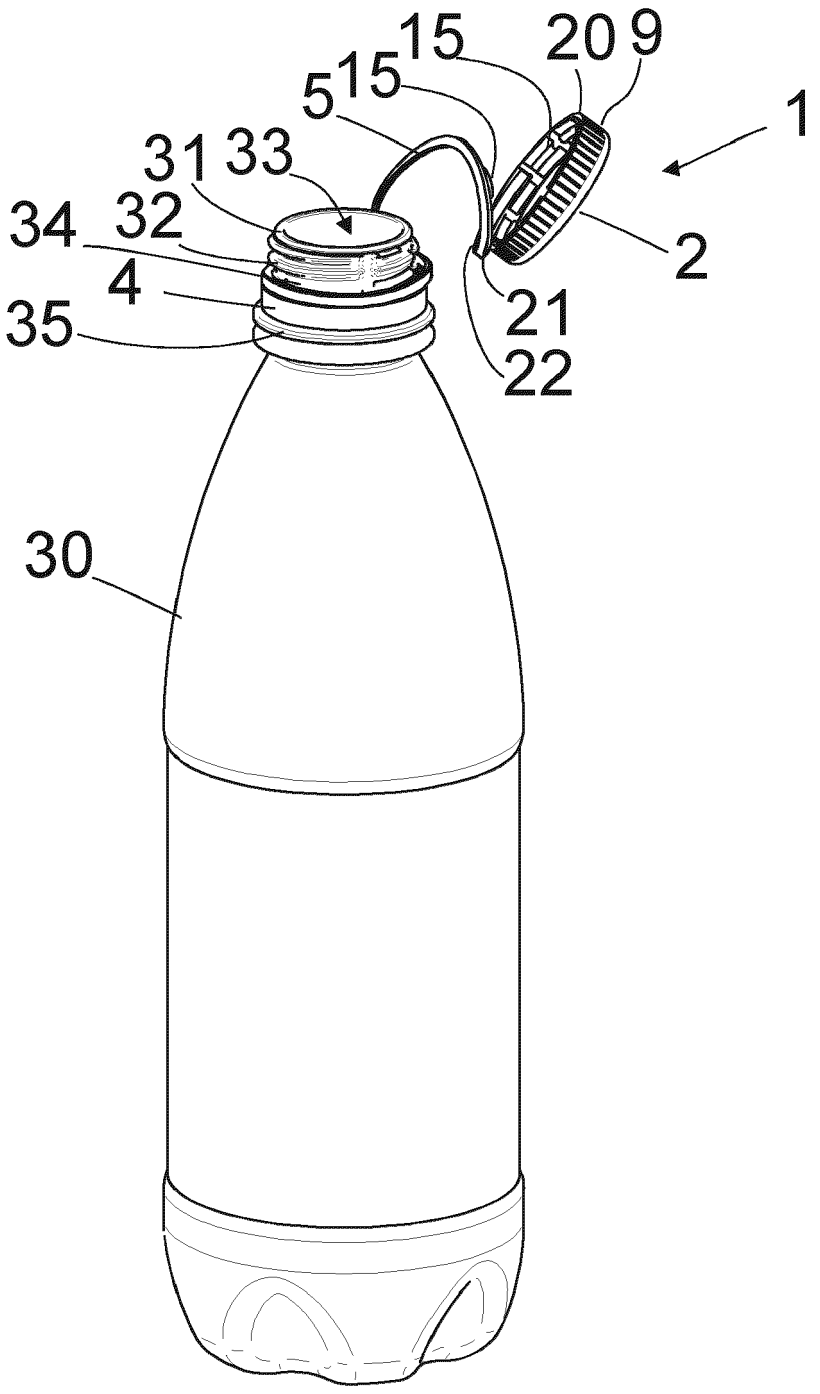


Fig. 5

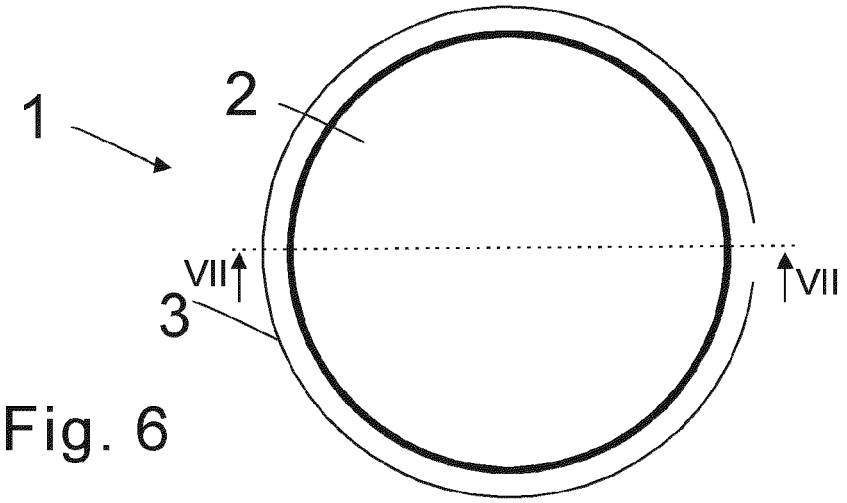


Fig. 6

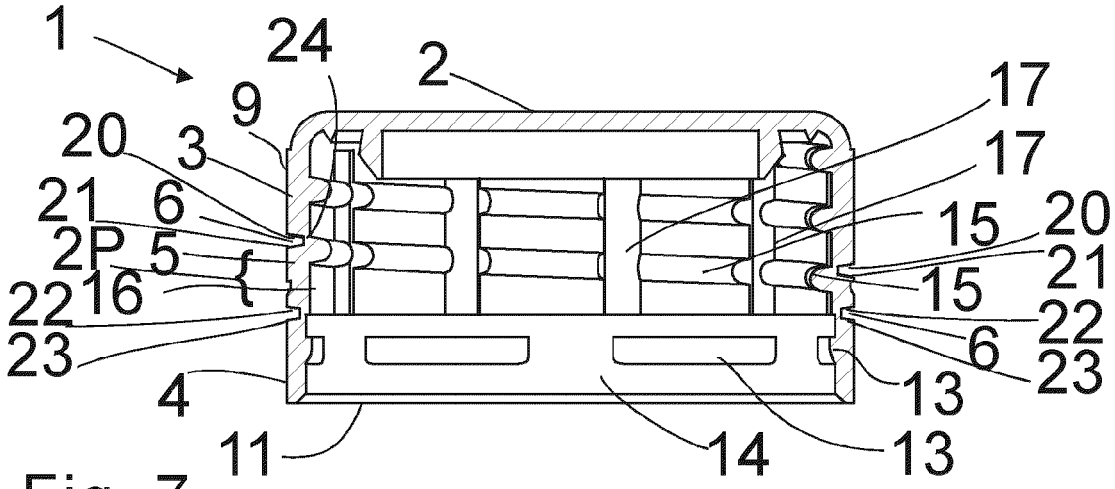


Fig. 7

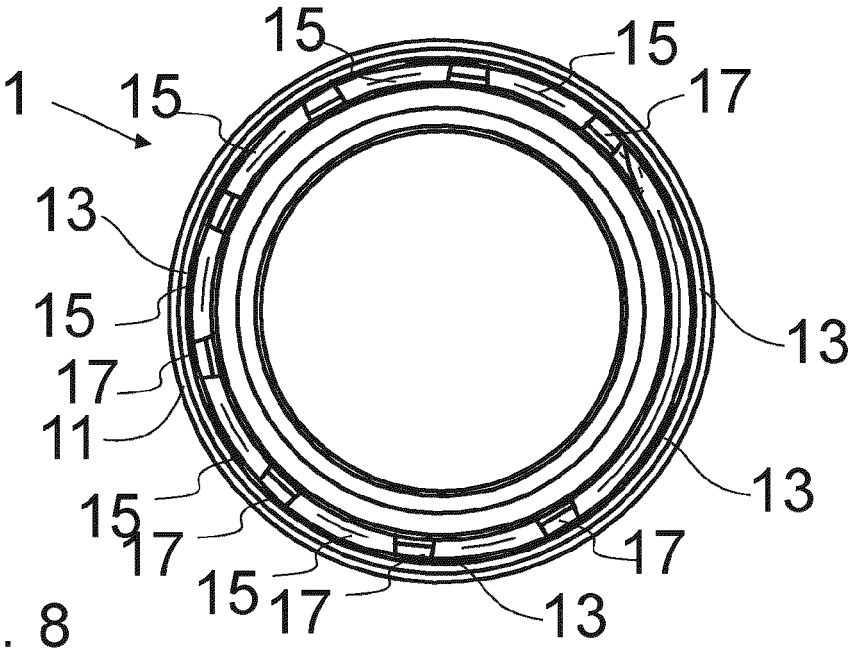


Fig. 8

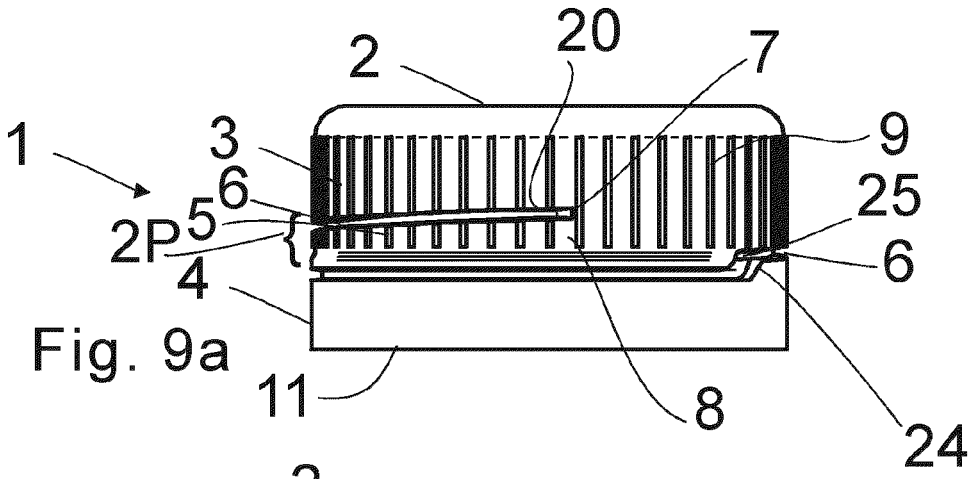


Fig. 9a

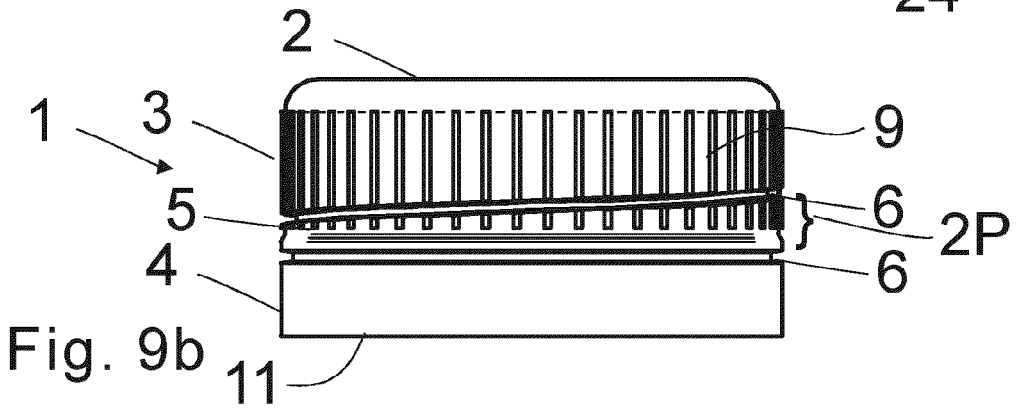


Fig. 9b

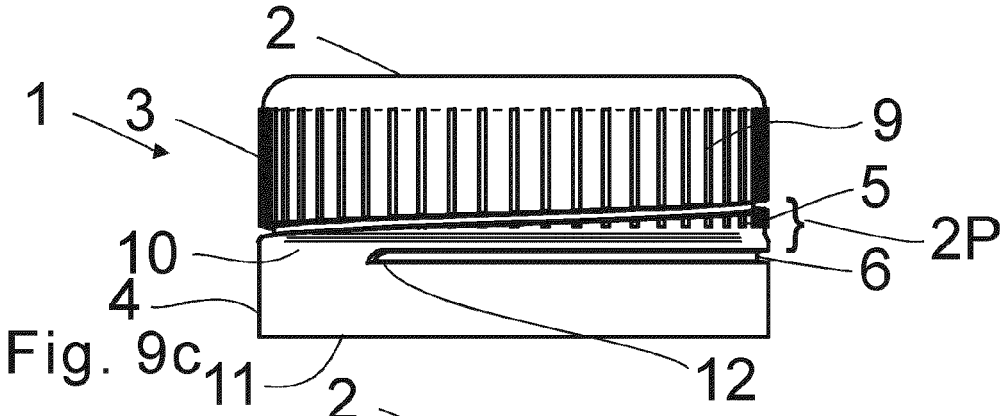


Fig. 9c

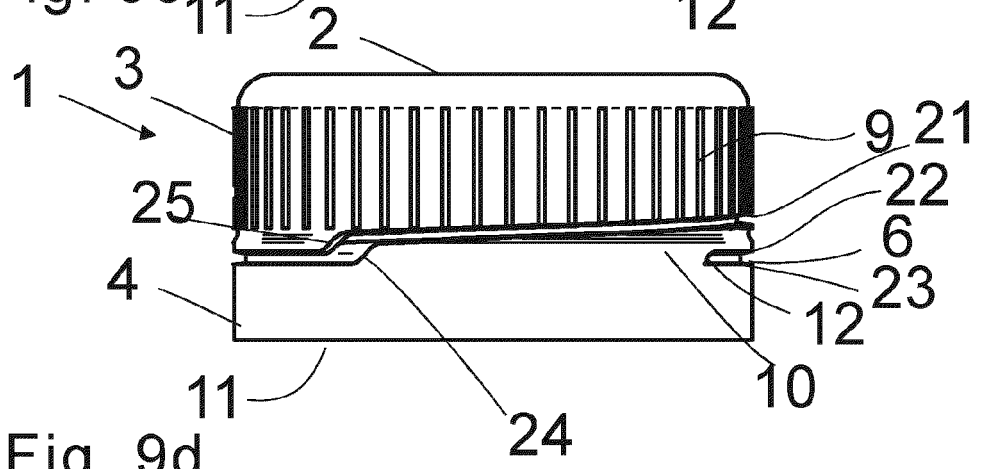


Fig. 9d

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# EUROPEAN SEARCH REPORT

Application Number
EP 21 16 2518

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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