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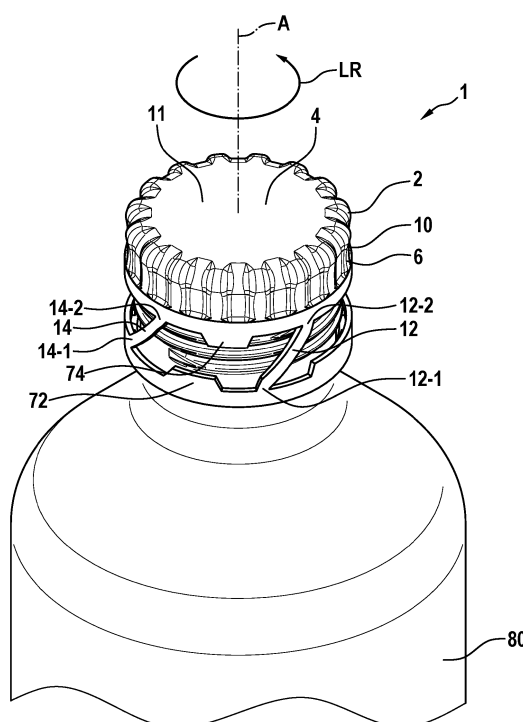
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(54) **CLOSURE FOR A CONTAINER**

(57) A closure (1; 1.1; 1.2) with an annular sidewall (6) comprising an annular skirt (10), a safety ring (8) as well as a first and a second tethers (12, 14) permanently connecting the annular skirt (10) to the safety ring (8) delineated by a first incision line (30) and a second incision line (50), which do not converge with one another. The annular skirt (8) is provided with inner threads or lugs (18) defining an unscrewing direction (LR) of rotation

about a reference axis (A) defined by the safety ring (8). At least in the region of the tethers (12, 14), the orthogonal projections, in the direction of a reference axis, of the incision lines (30, 50) overlap and define the first and second tethers (12, 14) which extend in the unscrewing direction (LR) from a respective first connection area (12-1, 14-1) with the safety ring (8) to a respective second connection area (12-2, 14-2) with the annular skirt (10).

Fig. 8



Description

TECHNICAL FIELD

[0001] The present invention relates to a closure for a container. More specifically, the present invention relates to a closure that remains attached to the container after opening.

BACKGROUND ART

[0002] WO 2021/021095 A1 shows a plastic closure designed to remain attached to the container after opening. The closure is made in one piece and comprises a lid and a safety ring projecting from the lid. The safety ring is permanently connected to the lid by a first tether and a second tether. A first incision line and a second incision line delineate the safety ring and the tethers. Frangible bridges are provided along the first and second incision lines and designed to break when the lid is removed from the container for opening.

[0003] WO 2021/116468 A1 shows another tethered closure including two separation lines which delineate together two tethers between an annular skirt of the main body of the closure and a safety ring. Each of the separation lines is provided with frangible bridges in the region of the tethers, which are broken when the annular skirt is moved relative to the safety ring.

[0004] Besides remaining attached to the container after opening, it is desired that the closure can be maintained in an arrangement to the finish of the container, herein called "hold-open" arrangement, such that both pouring or drinking from the container is not affected by the closure kept attached to the container.

SUMMARY

[0005] It is an object of the present invention to provide a tethered closure which allows a controlled unfolding of the tethers defined by incision lines within the closure during opening. Preferably, by means of the unfolded tethers the closure can be moved into a hold-open arrangement in which the closure is kept lateral to the finish of the container with the open end of the closure oriented into the same direction as the finish of the container.

[0006] The object is achieved by the features of the embodiment defined in the independent claim 1.

[0007] Further embodiments and developments are defined in the dependent claims.

[0008] According to a first aspect of the invention, a tethered closure for a container is provided.

[0009] A "container" as addressed herein to be used with the herein described closure may be, for example, without being restricted to, a bottle, flask, jug, jar, tube, or can. Preferably, the container is for storage of a fluid, for example, a drinkable fluid such as beverages, e.g., soft drinks or water, but not restricted thereto. Such bev-

erages may be stored in the container under pressure, as in the case of sparkling beverages, or basically pressureless, as in the case of still beverages. Another example may be a container for petrochemical fluids such as motor oil, but not restricted thereto. In other words, in the sense of this application, a fluid is considered any material that may flow; thus, a material like fine sand may be a fluid as well. The part of the container to which the closure is usually applied is called the finish. The finish is the opening or orifice of the container from which the fluid can be poured out or through which it can be filled in at first. The finish is typically located at the container neck. The container neck can be provided with either continuous outer threads or lugs configured for cooperation with a corresponding inner thread of a screw closure that by means of the threaded connection can be screwed on and off. In addition, the neck of the container has typically an annular bead, annular bulge, annular edge or annular cantilevered tongue configured to engage hook means on the safety ring inside the closure when the closure is screwed onto the finish of the container the first time.

[0010] A "closure" as addressed herein is to be understood as a device used to close or seal the finish of the container. The closure described herein may also be called a cap or lid. A screw closure is a mechanical device which is typically screwed on and off of a corresponding threaded finish at the associated container. To this effect, the closure can be provided with either continuous inner threads or lugs. Preferably, the closure is a one-piece-body screw closure with internal threads or lugs configured to be screwed on the container finish provided with corresponding external threads or lugs configured to match with the internal threads or lugs of the screw closure. In addition, as mentioned in conjunction with the container, the closure has hook means at the safety ring inside the closure which hook means are configured to engage with a corresponding annular bead, annular bulge, annular edge or annular cantilevered tongue at the neck of the container when the closure is the first time screwed onto the container finish. Preferably, the herein addressed closure is made as a one-piece-body of molded polymer.

[0011] The closure consists of a one-piece body. The one-piece body comprises an annular sidewall. The annular sidewall comprises an annular skirt, a safety ring, as well as a first tether and a second tether.

[0012] The "safety ring" addressed herein may also be called a tamper-evident ring or security ring; alternatively, the ring may be called a band. The safety ring is to serve as a tamper resistant or tamper evident function to the closure. The safety ring provides a tamper warning: if the connection in form of frangible bridges between the safety ring and the annular skirt are broken, an indication is provided that the closure has been opened. To this effect, the frangible bridges are preferably designed as to be clearly visible in their broken state after the closure has been opened for the first time. Thus, even if re-closed

the broken bridges provide a clear indication of the first opening of the closure.

[0013] The first tether and the second tether are permanently connecting the annular skirt to the safety ring.

[0014] The safety ring defines a reference axis of the one-piece body.

[0015] The one-piece body has a first incision line and a second incision line, which do not converge with one another.

[0016] "Do not converge" in the context of the first incision line and the second incision line means that the first incision line and the second incision line are not connected to each other, do not cross each other, i.e., do not overlap each other in a radial direction with respect to the reference axis. This definition is clearly to be distinguished from any other definition herein based on the orthogonal projection in a given projection direction.

[0017] "Incision line" addressed herein, particularly in the context of the first incision line and the second incision line, means a line that is the result of an incising process, such as a cutting process by means of an correspondingly configured incision means, such as a blade or a cutting edge. This is in clear contrast to lines comprised in a closure which lines are produced during a molding process of the closure. It will be appreciated that albeit a line may be cut such that the resulting width may be similar to a molded line, a incised line is usually much thinner than it can be produced by an injection molding process.

[0018] The orthogonal projections, in the direction of the reference axis, of one or more first line segments of the first incision line and of one or more first line segments of the second incision line at least partly overlap, whereby the one or more first line segments of the first incision line and the one or more first line segments of the second incision line define the first tether.

[0019] The orthogonal projections, in the direction of the reference axis, of one or more second line segments of the first incision line and of one or more second line segments of the second incision line at least partly overlap, whereby the one or more line second segments of the first incision line and the one or more second line segments of the second incision line define the second tether.

[0020] In a particular implementation, the one or more first line segments of the first incision line run parallel in a circumferential direction of the closure to the one or more first line segments of the second incision line. Further, the one or more second line segments of the first incision line run parallel in a circumferential direction of the closure to the one or more second line segments of the second incision line.

[0021] The one or more first line segments of the first incision line do not belong to the one or more second line segments of the first incision line. Also, the one or more first line segments of the second incision line do not belong to the one or more second line segments of the second incision line.

[0022] Preferably, a respective one of the one or more first line segments of the first incision line and the second incision line, respectively, defines a first (terminal) end of the corresponding incision line. Also, a respective one of the one or more second line segments of the first incision line and the second incision line, respectively, defines a second (terminal) end of the corresponding incision line.

[0023] The length of the tethers is preferably chosen to enable a flipping movement of the annular skirt relative to the safety. Thereby, the closure can be moved away from the finish of the container and, if desired, into the hold-open position or arrangement.

[0024] The first incision line has one or more first intermediate line segments. The one or more first intermediate line segments do not belong to the first line segments and the second line segments of the first incision line. The orthogonal projections, in the direction of the reference axis, of the one or more first intermediate line segments and of the second incision line do not overlap.

[0025] The second incision line has one or more second intermediate line segments. The one or more second intermediate line segments do not belong to the first or second line segments of the second incision line. The orthogonal projections, in the direction of the reference axis, of the one or more second intermediate line segments and of the first incision line do not overlap.

[0026] The one or more first intermediate line segments of the first incision line have one or more first frangible bridges between the annular skirt and the safety ring.

[0027] The one or more second intermediate line segments of the second incision line include one or more second frangible bridges between the annular skirt and the safety ring.

[0028] The annular skirt is provided with inner threads or lugs defining an unscrewing direction of rotation about the reference axis. The unscrewing direction is directed into one of the two circumferential directions (i.e., clockwise and counter clock-wise) defined by the annular skirt.

[0029] Both the first tether and the second tether extends from a respective first connection area with the safety ring, into the unscrewing direction, to a respective second connection area with the annular skirt.

[0030] When the closure is unscrewed from the finish of the container for the first time, the safety ring is prevented from following the upward motion of the annular skirt, so that the frangible bridges break by tensile force. In other words, when the closure is unscrewed from the finish of the container, the first and second tethers defined in the annular sidewall by means of the first incision line and the second incision line are unfolded in the direction of the reference axis.

[0031] Thereby, the unscrewing operation of the closure results into controlled unfolding of the tethers. During the unscrewing and thus, during this unfolding, the tethers are subject to a pulling force in their longitudinal direction, i.e., not to subject to a compressing or heading

force. In other words, due to the special orientation of the tethers in the unscrewing direction of the closed closure, by turning the closure in the unscrewing direction of rotation about the reference axis, both the first and second tethers are subject, in their longitudinal direction, to a pulling force of the closure regarding the safety ring. Thereby, the tethers are not subject to compression or heading during the first unfolding of the tethers.

[0032] The inventor surprisingly found that this pulling force to the tethers affects the tethers resulting in an improved hold-open configuration of the open closure relative to the safety ring still attached to the finish, more precisely to the neck, of the container.

[0033] In the following, particular details and further developments of the closure are discussed. If not explicitly otherwise stated, each of the further features described herein below can be used in connection with all or some of the other features described as desired.

[0034] Preferably, the frangible bridges directly link the annular skirt to the safety ring, which are both rigid portions of the body. This ensures a controlled breaking of the frangible bridges when the annular skirt is moved away from the safety ring during unscrewing the closure from the finish of the container.

[0035] Preferably, the frangible bridges are distributed along both the first and the second incision lines, i.e., more evenly around the perimeter of the annular sidewall than if only the first incision line were provided with frangible bridges. This ensures that no part of the annular skirt or safety ring protrudes outwardly when the closure is assembled on the finish of the container.

[0036] Preferably, the frangible bridges are located in intermediate regions of the first incision line and the second incision line, at a distance from the first tether and the second tether. This ensures that the frangible bridges do not impede the unfolding of the tethers during the opening.

[0037] In any implementation of the closure, the first and second line segments of the first incision line and of the second incision line may extend right through the annular sidewall without frangible bridges.

[0038] In any implementation of the closure, the one or more second frangible bridges of the one or more second intermediate line segment of the second incision line preferably may have a width or widths that is/are smaller than the width or widths of the one or more first frangible bridges of the one or more first intermediate line segments of the first incision line.

[0039] In a preferred embodiment, each of the first and second line segments of the first incision line and the second incision line lies in an associated reference plane perpendicular to the reference axis. This makes it possible to cut the line segments with blades which extend perpendicularly to the reference axis and are less subject to stress and wear.

[0040] In a particular configuration, each of the first and second intermediate line segments of the first incision line and the second incision line lies in an associated

reference plane perpendicular to the reference axis. Preferably, most of the one or more first intermediate line segments of the first incision line are located in a common first reference plane perpendicular to the reference axis.

5 This way, the first reference plane defines a main separation plane between the annular skirt and the safety ring. If necessary, at least one of the second intermediate line segments of the second incision line lies in a second reference plane perpendicular to the reference axis, located at a distance from the first reference plane.

10 **[0041]** In any implementation of the closure, the first incision line may extend over an angle greater than 180° and less than 270° in the circumferential direction about the reference axis from a first end of the first incision line to a second end of the first incision line.

15 **[0042]** In any implementation of the closure, the orthogonal projections, in the direction of the reference axis, of the one or more first line segments of the first incision line and the second incision line can overlap each other over an angle of more than 5°, preferably more than 10°, and less than 60°, preferably less than 30°, about the reference axis.

20 **[0043]** In any implementation of the closure, the orthogonal projections, in the direction of the reference axis, of the one or more second line segments of the first incision line and the second incision line can overlap each other over an angle of more than 5°, preferably more than 10° and less than 60°, preferably less than 30° about the reference axis.

25 **[0044]** Preferably, the fore-going described overlaps of the orthogonal projections, in the direction of the reference axis, of the one or more first line segments of the first incision line and the second incision line and the fore-going described overlaps of the orthogonal projections, in the direction of the reference axis, of the one or more second line segments of the first incision line with the second incision line are the same.

30 **[0045]** In any implementation of the closure, the one or more second intermediate line segments of the second incision line can extend over an angle of more than 30° and less than 90° about the reference axis.

35 **[0046]** In any implementation of the closure, the second incision line can extend over an angle less than 180° in the circumferential direction about the reference axis from a first end of the second incision line to a second end of the second incision line.

40 **[0047]** In any implementation of the closure, the safety ring can be provided with at least one first tab protruding towards the annular skirt, and the annular skirt can be provided with at least one second tab protruding towards the safety ring.

45 **[0048]** Preferably, at least one of the first and second tabs is defined by one or more third line segments of the one or more second intermediate line segments of the second incision line. Preferably, the one or more third line segments of the one or more second intermediate line segments of the second incision line includes at least one of the one or more second frangible bridges. Each

frangible bridge ensures that once the closure is assembled on the finish of the container, i.e., in the closed position, the associated tab may be hindered from protruding radially outwards. In some instances, one frangible bridge on one of the two tabs may be sufficient. In a particular implementation, the third line segments of the one or more second intermediate line segments of the second incision line are configured so that the tabs have side edges running angular with respect to the reference axis, but it should be noted that it is also possible that the side edges run parallel to the reference axis.

[0049] In any implementation of the closure, at least some, and preferably all, of the line segments of the first and second line segments and/or of the first and the second intermediate line segments of the first and/or the second incision lines have adjoining incision side walls.

[0050] In a particular implementation of the closure, the one-piece body further comprises a top wall, from which the annular skirt projects to form a lid or cap of the closure. Here, the tethered connection through the first tether and the second tether functions as a main hinge to open and close the lid or cap.

[0051] In another particular implementation of the closure, the annular sidewall is part of a base of the closure, which further comprises a lid hinged to the base. Access to the contents of the container through the finish is usually gained by opening the cap or lid by the hinge. More exceptionally, for example, if the container is to be completely emptied, access to the contents of the container through the finish is gained by separating the annular skirt from the safety ring which, however, are still connected to each other by means of the first and second tethers. Preferably, the cap or lid and the base are parts of the one-piece body.

[0052] In any implementation of the closure, the safety ring is preferably provided with hook-shape resilient portions projecting towards the reference axis. This is a structural implementation example for hook means. To have the closure engage at the neck of the container, the hook means inside the closure engage with corresponding annular retention means at the neck of the container. The annular retention means may be an annular retention bead, bulge, edge, or cantilevering tongue.

[0053] For example, resilient hook-shaped portions may snap under an annular retention bead formed on the neck of the container to prevent the safety ring from being torn off. Thereby, the annular retention means at the neck of the container and the hook means of the safety ring implement the tamper-evidence function of the safety ring.

[0054] In a particular implementation of the closure, each of the first incision line and the second incision line may be a broken line which consists of a series of consecutive line segments, portions of each lying in an associated blade plane. Such broken incision lines are obtained by incising or cutting the sidewall of the closure with incision or cutting means, such as correspondingly configured blades with blade segments, which are

essentially flat and therefore much easier to manufacture than curved incision or cutting means, e.g. curved blades.

[0055] Preferably, the incision lines are obtained by a cutting process with incision or cutting means, such as blades, that preferably do not remove material from the closure. In a preferred embodiment, at least some, and preferably all, of the line segments of the first and second line segments and/or of the first and the second intermediate line segments of the first incision line and/or second incision line have adjoining incision side walls. Adjoining incision side walls contribute to the sealing of the closure.

[0056] As described above, the separately discussed features of the closure can be combined within an implementation of the closure as needed if not otherwise described as incompatible.

BRIEF DESCRIPTION OF THE FIGURES

[0057] Other advantages and features of the invention become more apparent from the following description of specific embodiments given as non-limiting examples only and illustrated in the accompanying drawing figures, in which:

- 25 Figure 1 shows a first side view of a closure in accordance with a first embodiment, in a closed position;
- Figure 2 shows a second side view of the closure of Figure 1, in the closed position;
- 30 Figure 3 shows a cross-section through the plane III-III of the closure shown in Figure 2, in the closed position;
- 35 Figure 4 shows an isometric view of the closure of Figure 1, in the closed position;
- 40 Figure 5 shows a top view of the closure of Figure 1, in an open position;
- Figure 6 shows a cross-section through the plane V-V of the closure shown in Figure 4, in the open position;
- 45 Figure 7 shows an isometric view of the closure of Figure 1, in the closed position, screwed to a container;
- 50 Figure 8 shows the unfolding of the tethers in the isometric view of the closure shown in Figure 8, during the unscrewing operation, from the closed position towards the open position;
- 55 Figure 9 shows the hold-open position of the unscrewed closure in the isometric view of the closure shown in Figure 8, after the un-

screwing operation, with the closure flipped over by about 180°, from the orientation in the closed position towards the hold-open position lateral to the safety ring;

Figure 10 shows a rearview of a closure in accordance with a second embodiment, in a closed position;

Figure 11 shows a rearview of a closure in accordance with a third embodiment, in a closed position; and

Figure 12 shows a side view of the closure shown in Figure 11, in the closed position.

[0058] Throughout the Figures, corresponding reference signs or numerals refer to the same or corresponding parts in each of the Figures.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0059] With reference to the Figures 1 to 6, a first embodiment of a closure 1 for a container consists of a one-piece body 2 comprising a top wall 4 and an annular sidewall 6, which projects from a periphery of the top wall 4 in an axial direction parallel to a reference axis A of the closure 1.

[0060] The annular sidewall 6 forms a safety ring 8 at its free end axially opposed to the top wall 4, an annular skirt 10 between the top wall 4 and the safety ring 8 as well as a first tether 12 and a second tether 14 for permanently connecting the annular skirt 10 to the safety ring 8. The top wall 4 and annular skirt 10 form a cap or lid 16 of the closure 1.

[0061] The annular skirt 10 is provided with an inner thread 18 depicted in Figure 3, which defines the unscrewing direction LR of rotation about the reference axis A. The unscrewing direction LR of rotation corresponds also in the shown embodiment to the counter clock-wise circumferential direction CD of the closure 1. More precise, the circumferential direction CD of the closure 1 is defined by the perimeter of the annular skirt 10. It goes without saying that all here described principles are also valid for a screw closure with an internal thread or lugs that define the unscrewing direction into the clock-wise circumferential direction. All relevant features of the closure just have to be adapted accordingly. It will be appreciated that since reference is made to the unscrewing direction the here given description holds true for both configurations.

[0062] In the particular embodiment shown, the safety ring 8 is provided with one or more hook-shaped resilient portions 20 as hook means projecting radially towards the reference axis A configured to snap under a corresponding annular bead, edge or cantilevering tongue as retention means at a container neck to secure the closure

1 to the container.

[0063] The first and second tethers 12, 14 and the safety ring 8 are defined or delineated by a first incision line 30 and a second incision line 50, which have no intersection or connection. That is to say, the first incision line 30 and the second incision line 50 do not converge.

[0064] As particularly shown in Figure 4, in the shown embodiment, the first incision line 30 extends over an angle, which is about 280°, from a first end 32 in the unscrewing direction of rotation LR to a second end 34 of the first incision line 30. Preferably, the angle is greater than 180°, e.g., greater than 220° about the reference axis A between the first end 32 and the second end 34 of the first incision line 30.

[0065] As also particularly shown in Figure 4, in the shown embodiment, the second incision line 50 extends over an angle of about 150°, from a first end 52 in the unscrewing direction of rotation LR to a second end 54 of the second incision line 30. Preferably, the angle may be greater than 50° and less than 180° about the reference axis A between the first end 52 and the second end 54 of the second incision line 50.

[0066] The first tether 12 is defined or delineated by one first line segment 36 of the first incision line 30 and one first line segment 56 of the second incision line 50. The orthogonal projections of the first line segment 36 of the first incision line 30 and the first line segment 56 of the second incision line 50, into the direction of the reference axis A, at least partially overlap.

[0067] More specifically, the first line segment 36 of the first incision line 30 consists of a terminal segment, which lies in a first reference plane P1 perpendicular to the reference axis A and extends from a first (terminal) end 32 of the first incision line 30 into the unscrewing direction LR towards a second (terminal) end 34 of the first incision line 30.

[0068] The first line segment 56 of the second incision line 50 consists of a terminal segment, which lies in a second reference plane P2. The second reference plane P2 is parallel to and distant from the first reference plane P1.

[0069] The first line segment 56 of the second incision line 50 extends from a first (terminal) end 52 of the second incision line 50 in the direction opposed to the unscrewing direction LR towards a second (terminal) end 54 of the second incision line 50.

[0070] By this configuration, the first tether 12 extends in the unscrewing direction LR from a first connection area 12-1 with the safety ring 8 to a second connection area 12-2 with the annular skirt 8.

[0071] The second tether 14 is defined or delineated by a second line segment 38 of the first incision line 30 and a second line segment 58 of the second incision line 50. The orthogonal projections of the second line segment 38 of the first incision line 30 and the second line segment 58 of the second incision line 50, into the direction of the reference axis A, at least partially overlap.

[0072] More specifically, the second line segment 38

of the first incision line **30** consists of a terminal segment, which lies in the second reference plane **P2** and extends from the second (terminal) end **34** of the first incision line **30** in the direction of rotation opposed to the unscrewing direction **LR** towards the first (terminal) end **32** of the first incision line **30**.

[0073] The second line segment **58** of the second incision line **50** consists of a terminal segment, which lies in the first reference plane **P1** and extends from the second (terminal) end **54** of the second incision line **50** in the unscrewing direction **LR** towards the first (terminal) end **52** of the second incision line **40**.

[0074] Hence, the second tether **14** extends in the unscrewing direction **LR** from a first connection area **14-1** with the safety ring **8** to a second connection area **14-2** with the annular skirt **10**.

[0075] As illustrated in Figure 4 the length of the first tether **12** and the second tether **14** in the circumferential direction **CD** is defined by the overlap of the orthogonal projections, in the direction of the reference axis **A**, of the first incision line **30** and the second incision line **50**.

[0076] Preferably and as in the shown embodiment, the length of the first tether **12** and the length of the second tethers **14** is the same. Thereby, the respective overlap angle α between the first line segment **36** of the first incision line **30** and the first line segment **56** of the second incision line **50** measured about the reference axis **A** is equal to an overlap angle β between the second line segments **38** of the first incision line **30** and the second line segment **58** of the second incision line **50** measured about the reference axis **A**. These overlap angles α , β are preferably configured to be greater than 5° , more preferably greater than 10° , and preferably less than 60° , more preferably less than 30° .

[0077] As shown in Figure 2, the first incision line **30** further comprises one or more intermediate line segments **40**, the orthogonal projection of which, in the direction of the reference axis **A**, does not overlap with the orthogonal projection, in the direction of the reference axis **A**, of the second incision line **50**.

[0078] As shown in Figure 2 in conjunction with Figure 1, the one or more intermediate line segments **40** of the first incision line **30** connect the first line segment **34** of first incision line **30** with the second line segment **36** of the first incision line **30**. Thereby, the one or more intermediate line segments **40** delineate or define a separation between a front part of the annular skirt **10** and the safety ring **8**. In the shown embodiment, the one or more intermediate segments **40** consist of several line segments **40**, which are located in the second reference plane **P2**, but other configurations are also possible.

[0079] Now, with reference to Figures 1 and 4, the second incision line **50** further comprises several intermediate line segments **60**, the projection of which, in the direction of the reference axis **A**, do not overlap with the first incision line **30**. Further, the several intermediate line segments **60** of the second incision line **50** connect the first line segment **54** of second incision line **50** with the

second line segment **56** of the second incision line **50**.

[0080] The intermediate line segments **60** delineate or define a separation between a rear or hinged part of the annular skirt **10** and the safety ring **8**.

5 [0081] In the shown embodiment, the intermediate line segments **62**, **64** of the second incision line **50** include at least one intermediate line segment **62** which lies in the second reference plane **P2** perpendicular to the reference axis **A** to define a first tab **72** of the safety ring **8**, which protrudes towards the annular skirt **10**.

10 [0082] The intermediate line segments **62**, **64** of the second incision line **50** include at least one intermediate line segment **64** which lies in the first reference plane **P1** perpendicular to the reference axis **A** to form a second tab **74** of the annular skirt **10**, which protrudes towards the safety ring **8**.

15 [0083] The first tab **72** and the second tab **74** lie adjacent to each other between the first tether **12** and second tether **14**. The tabs **72**, **74** preferably have a trapezoidal shape, which converges towards their respective free end, i.e., towards the first and second reference planes **P1**, **P2**, respectively. In the shown embodiment, the side edges of the tabs run angular with respect to the reference axis **A**. However, the shape of the tabs **72**, **74** is not restricted to a trapezoidal shape, in principle the tabs **72**, **74** may also have a square or rectangular shape; in this case, the side edges of the tabs would run parallel to the reference axis **A**. However, the tabs **72**, **74** having the trapezoidal shape may improve the separation of the annular skirt **10** and safety ring **8** in the unscrewing operation.

25 [0084] The intermediate line segments **40** of the first incision line **30** are provided with first frangible bridges **60**, which link the front part of the annular skirt **10** to the safety ring **8** before the first opening of the closure **1**. The first frangible bridges **42** break when the closure **1** is unscrewed, the first time.

35 [0085] The intermediate line segments **62**, **64** of the second incision line **50** are provided with second frangible bridges **66**, which link the rear part of the annular skirt **10** to the safety ring **8** before the first opening of the closure **1**. The second frangible bridges **66** also break when the closure **1** is unscrewed, the first time.

40 [0086] All frangible bridges **60**, **66** cross the line segments that lie in one of the planes **P1**, **P2** perpendicular to the reference axis **A**.

45 [0087] Preferably, the second frangible bridges **66** of the second incision line **50** have a width, measured in the circumferential direction **CD**, which is preferably smaller than a width of the first frangible bridges **60**.

50 [0088] Preferably, the first and second line segments **36**, **56**, **38**, **58** of the first and the second incision line **30**, **50**, which delineate the first and the second tether **12**, **14**, are without frangible bridges.

55 [0089] As shown in Figures 5 to 9, when the closure **1** is moved in the unscrewing direction **LR** of rotation relative to the container **80**, which in the shown embodiment is a bottle or flask, the cap or lid **11** and the safety ring **8**

move away from each other in the axial direction **A**.

[0090] By the unscrewing operation, the first and second frangible bridges **60**, **66** break without difficulty because they link parts of the safety ring **8** and of the lid **11** which are rigid, preferably more rigid than the first and the second tether **12**, **14**.

[0091] As the lid **11** continues to rotate and to move away from the safety ring **8** in the axial direction **A**, the first and the second tethers **12**, **14** unfold in a controlled manner, which also causes the safety ring **8** to rotate relative to the container **80** also in the unscrewing direction **LR**. Thereby, the first and the second tethers **12**, **14** are subject to a pulling force in their longitudinal direction, which also results in the described rotation of the safety ring **8**.

[0092] As shown in Figure 9, once the lid **11** is unscrewed, the user can flip the lid **11** relative to the safety ring **8** about an instantaneous hinge axis which at each instant lies in a plane perpendicular to the reference axis **A** at a distance from the reference axis **A**.

[0093] Once the lid **11** has reached the opened position as also shown in the Figures **5** and **6**, the second tab **74** of the annular skirt **10** bears against the first tab **72** of the safety ring **8** thereby maintaining the closure **1** in the opened position, i.e., within the herein called "hold-open" arrangement or position. As discussed herein above, it was found that the particular arrangement of the first and the second tether **12**, **14** resulting in the application of a pulling force upon unscrewing the closure **1** from the container **80**, the intended effect of the "hold-open" arrangement or position is improved.

[0094] In Figure 9 some features of the container **80** are denoted: The container **80** being in the shown embodiment a bottle has a bottleneck **86** on which one or more outer threads or lugs **82** are provided. The outer threads or lugs **82** are configured to match to or fit with the inner threads or lugs **18** of the closure **1**. As an orifice or opening, the container **80** has a finish **84** which can be closed by means of the closure **1**, i.e., by screwing the closure **1** with the inner threads **18** and the outer threads **82** engaging onto the bottleneck **86**. In turn, the container **1** can be opened as described above by unscrewing the closure **1** from the bottleneck **86** with the unscrewing operation.

[0095] For sake of completeness, once the closure **1** has been subjected to the first unscrewing operation, the closure **1** may nevertheless be screwed back onto the container **1** for closing the finish **84**. During this closing or on-screwing operation the first tether **12** and the second tether **14** are folded back nearly into their original position so that with the next unscrewing operation the tethers will be unfolded again as described above. As a result, the container **80** remains closable also after first opening it with the closure **1** always staying attached to it via the first and second tether **12**, **14** connecting the lid or cap **11** to the safety ring **8** that stays permanently assembled to the bottleneck **86**.

[0096] The length and elasticity of the first and the sec-

ond tether **12**, **14** are such that the first and the second tether **12**, **14** are stretched when the lid **11** reaches the flipped "hold-open" position against the safety ring **8**, thereby supporting a stable "hold-open" arrangement or position.

[0097] Figure 10 shows a further development of the first embodiment of the closure **1** discussed herein above with the Figure 1 to 9. The further development is a second embodiment showing a closure **1.1**. Because the closure **1.1** is in most details identical to the closure **1** discussed herein above with the Figure 1 to 9, only the relevant differences shall be described herein below, i.e., regarding all not described features of the second embodiment reference is made to the description of the Figures 1 to 9.

[0098] In Figure 10, further two reference planes, namely a third and a fourth reference plane **P3**, **P4** are shown. All reference planes **P1**, **P2**, **P3**, and **P4** are coplanar.

[0099] The fourth reference plane **P4** is located between the first reference plane **P1** and the second reference plane **P2**. Basically, the fourth reference plane **P4** can be located anywhere between the first reference plane **P1** and the second reference plane **P2** to adjust the height of the first tab **72** of the safety ring **8** as needed. Preferably, the fourth reference plane **P4** is located closer to the second reference plane **P2** than to the first reference plane **P1** so that the height and position of the first tab **72** of the safety ring **8** is set so that the first tab **72** offers a sufficient area for contacting with an area provided by the second tab **74** of the annular skirt **10**, in the hold-open arrangement or position.

[0100] Similarly, the third reference plane **P3** in the shown embodiment is located at a distance from the second reference plane **P2** and preferably, below the first reference plane **P1**, thereby closer to the first reference plane **P1** than to the second or fourth reference plane **P2**, **P4**. By setting the position of the third reference plane **P3**, the height and position of the second tab **74** of the annular skirt **10** can be adapted. Similarly, as with the fourth reference plane **P4**, the third reference plane is set so that the second tab **74** offers a sufficient area for contacting with the area provided by the first tab **72** of the safety ring **8**, in the hold-open position.

[0101] Basically, the third reference plane **P3** can be located anywhere at a distance from the second and fourth reference planes **P2**, **P4** below the first reference plane **P1**.

[0102] Note, if the second reference plane **P2** and the fourth reference plane **P4** are set equal, and if at the same time, the first reference plane **P1** and the third reference plane **P3** are set equal, the closure **1.1** of the second embodiment can be transferred into the closure **1** of the first embodiment described herein above in conjunction with the Figures 1 to 9. Thus, the description of the Figures 1 to 9 applies correspondingly to the embodiment of Figure 10.

[0103] Now with respect to all Figures 1 to 12, each of

the first and the second incision line **30, 50** consists of a series of consecutive line segments.

[0104] The incision lines **30, 50**, contrary to any closure with structure produced by corresponding features of a more or less complex molding form, are obtained by incision or cutting means, such as correspondingly configured blades or cutting edges, that are adapted to incise or cut partially or totally through the sidewall **6** of the closure **1, 1.1**. The incising or cutting is done preferably without removing plastic material, thereby resulting in the line segments of the first and the second incision line having adjoining incision walls.

[0105] A suitable cutting process is described in WO 2021/021095 A1 which is herewith incorporated by reference.

[0106] To this effect, the closures **1** (Figures 1 to 9), the closure **1.1** (Figure 10), and the closure **1.2** (Figures 11 and 12, to be briefly described herein below) can be mounted on spindles so that their reference axis **A** is coaxial with the rotation axis of the spindles. This way, the closures can be rolled along incision or cutting means to produce the first and the second incision lines **30, 50**. Thereby, each line segment of each of the first and the second incision line **30, 50** is associated with a corresponding blade segment. The first and the second frangible bridges **60, 70** can be formed by dents in the blade segments. The blades can either incise or cut right through the sidewall **6** of the closure **1, 1.1, 1.2** that forms the annular skirt **10** and the safety ring **8**, which is the preferred option. Alternatively, a frangible film of material may be left at the bottom of the line segments. The blade segments are preferably flat rather than curved.

[0107] Most preferably, each of the first and the second incision line **30, 50** corresponds to a broken line, i.e., a line made of a series of consecutive "rectilinear" line segments. This way, line segments lie each in an associated blade plane.

[0108] Finally, Figures 11 and 12 show a third embodiment, which is a further development of the closures **1** and **1.1** of the first and second embodiments shown and described about Figures 1 to 10. It will be appreciated that the closure **1.1** in Figure 10 may be used in the embodiment of Figures 11 and 12 as well.

[0109] The third embodiment differs from the first and second embodiment in Figures **1** to **10** in that the closure **1.2** comprises a lid **90** hinged to a base **3** which has the annular wall **6** with the first and the second incision lines **30, 50**, described herein above which both delineate the annular skirt **10**, the safety ring **8** and the first and the second tethers **12, 14**. The function and effects achieved are basically identical to what was described before.

[0110] Summarizing the here described closures **1, 1.1, 1.2** are provided with the annular sidewall **6** comprising the annular skirt **10**, the safety ring **8** as well as the first and the second tethers **12, 14** that permanently connect the annular skirt **10** to the safety ring **8** and that are defined or delineated by the first incision line **30** and the second incision line **50**, which do not converge with

one another. The annular skirt **8** is provided with inner threads or lugs **18** defining the unscrewing direction **LR** of rotation about the reference axis **A** defined by the safety ring **8**. At least in the region of the first and second tethers **12, 14**, the orthogonal projections, in the direction of a reference axis **A**, of the incision lines **30, 50** overlap and define the first and second tethers **12, 14** which extend in the unscrewing direction **LR** from the respective first connection area **12-1, 14-1** with the safety ring **8** to a respective second connection area **12-2, 14-2** with the annular skirt **10**.

Claims

1. A closure (1; 1.1; 1.2) for a container (8), comprising a one-piece body (2), the one-piece body (2) comprising an annular sidewall (6), the annular sidewall (6) comprising an annular skirt (10), a safety ring (8) as well as a first tether (12) and a second tether (14) permanently connecting the annular skirt (10) to the safety ring (8), the safety ring (8) defining a reference axis (A) of the one-piece body (2), the one piece body (2) having a first incision line (30) and a second incision line (50), which do not converge with one another, wherein

the orthogonal projections, in the direction of the reference axis (A), of one or more first line segments (36) of the first incision line (30) and of one or more first line segments (56) of the second incision line (50) at least partly overlap in a circumferential direction (CD) of the closure (1; 1.1; 1.2), whereby the one or more first line segments (36) of the first incision line (30) and the one or more first line segments (56) of the second incision line (50) define the first tether (12), the orthogonal projections, in the direction of the reference axis (A), of one or more second line segments (38) of the first incision line (30) and of one or more second line segments (58) of the second incision line (50) at least partly overlap in the circumferential direction (CD) of the closure (10), whereby the one or more second line segments (38) of the first incision line (30) and the one or more second line segments (58) of the second incision line (50) define the second tether (14),

the first incision line (30) has one or more first intermediate line segments (40), which do not belong to the first and second line segments (36, 38) of the first incision line (30) and the orthogonal projection of which, in the direction of the reference axis (A), does not overlap with the second incision line (50),

the second incision line (50) has one or more second intermediate line segments (62, 64), which do not belong to the first and second line

- segments (56, 58) of the second incision line (50) and the orthogonal projection of which, in the direction of the reference axis (A), does not overlap with the first incision line (30), the one or more first intermediate line segments (40) of the first incision line (30) are defined by one or more first frangible bridges (60) between the annular skirt (10) and the safety ring (8), the one or more second intermediate line segments (62, 64) of the second incision line (50) are defined by one or more second frangible bridges (66) between the annular skirt (10) and the safety ring (8), the annular skirt (8) is provided with inner threads or lugs (18) defining an unscrewing direction (LR) of rotation about the reference axis (A), and the first tether (12) and the second tether (14) extend in the unscrewing direction (LR) from a respective first connection area (12-1, 14-1) with the safety ring (8) to a respective second connection area (12-2, 14-2) with the annular skirt (10).
2. The closure (1; 1.1; 1.2) of claim 1, wherein the first and second line segments (36, 56) of the first and the second incision lines (30, 50) extend right through the annular sidewall (6) without frangible bridges; and/or each of the first and the second frangible bridges (60, 66) of the first and the second incision lines (30, 50) lies in an associated reference plane (P1, P2, P3, P4) perpendicular to the reference axis (A).
3. The closure (1; 1.1; 1.2) of claim 1 or 2, wherein most of the one or more first intermediate line segments (40) of the first incision line (30) are located in a common second reference plane (P2) perpendicular to the reference axis (A); and preferably: at least one of the second frangible bridges (66) of the second incision line (50) lies in the second reference plane (P2).
4. The closure (1; 1.1; 1.2) of claim 3, wherein at least one of the second frangible bridges (66) of the second incision line (50) lies in a first reference plane (P1) perpendicular to the reference axis (A), located at a distance from the second reference plane (P2).
5. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein the first incision line (30) extends over an angle greater than 180° and less than 270° in the circumferential direction (CD) about the reference axis (A) from a first end (32) of the first incision line (30) to a second end (34) of the first incision line (30).
6. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein the orthogonal projections, in the direction of the reference axis (A), of the one or more first line segments (36, 56) of the first and the second incision lines (30, 50) overlap each other over an angle of more than 5°, preferably more than 10°, and less than 60°, preferably less than 30°, about the reference axis (A); the orthogonal projections, in the direction of the reference axis (A), of the one or more second line segments (38, 58) of the first and the second incision lines (30, 50) overlap each other over an angle of more than 5°, preferably more than 10° and less than 60°, preferably less than 30° about the reference axis (A); and the one or more second intermediate line segments (62, 64) of the second incision line (50) extend over an angle of more than 30° and less than 90° about the reference axis (A).
7. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein the second incision line (50) extends over an angle less than 180° in the circumferential direction (CD) about the reference axis (A) from a first end (52) of the second incision line (50) to a second end (54) of the second incision line (50).
8. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein the safety ring (8) is provided with at least one first tab (72) protruding towards the annular skirt (10), and the annular skirt (10) is provided with at least one second tab (74) protruding towards the safety ring (8).
9. The closure (1; 1.1; 1.2) of claim 8, wherein at least one of the first and the second tabs (72, 74) is defined by one or more third line segments (68) of the one or more second intermediate line segments (62, 64) of the second incision line (50).
10. The closure (1; 1.1; 1.2) of claim 9, wherein the one or more third line segments (68) of the one or more second intermediate line segments (62, 64) of the second incision line (50) include at least one of the one or more second frangible bridges (66).
11. The closure (1; 1.1; 1.2) of any one of claims, wherein at least some, and preferably all, of the first and second line segments (36, 56) and/or of the first and second intermediate line segments (60, 62, 64) of the first and/or the second incision lines (30, 50) have adjoining incision side walls.
12. The closure (1; 1.1) of any one of the preceding

claims, wherein the one-piece body (2) further comprises a top wall (4) from which the annular skirt (10) projects to form a cap or lid (11) of the closure (1; 1.1).

13. The closure (1.2) of any one of claims 1 to 11, wherein the annular sidewall (6) is part of a base (3) of the closure (1.2), which further comprises a cap or lid (90) hinged to the base (3), wherein preferably: the cap or lid (90) and the base (3) are parts of the one-piece body (2). 5 10
14. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein the safety ring (8) is provided with hook-shaped resilient portions (20) projecting towards the reference axis (A). 15
15. The closure (1; 1.1; 1.2) of any one of the preceding claims, wherein each of the first and second incision lines (30, 50) is a broken line which consists of a series of consecutive line segments, portions of each 20 lying in an associated blade plane.
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- 50
- 55

Fig. 1

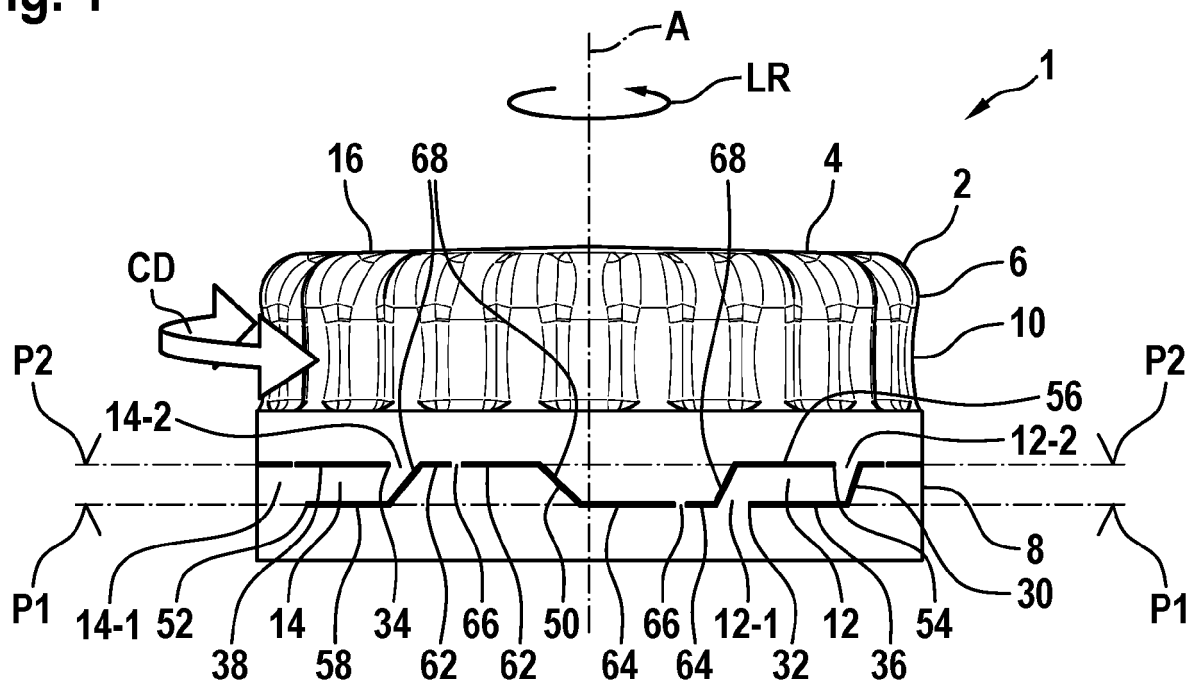


Fig. 2

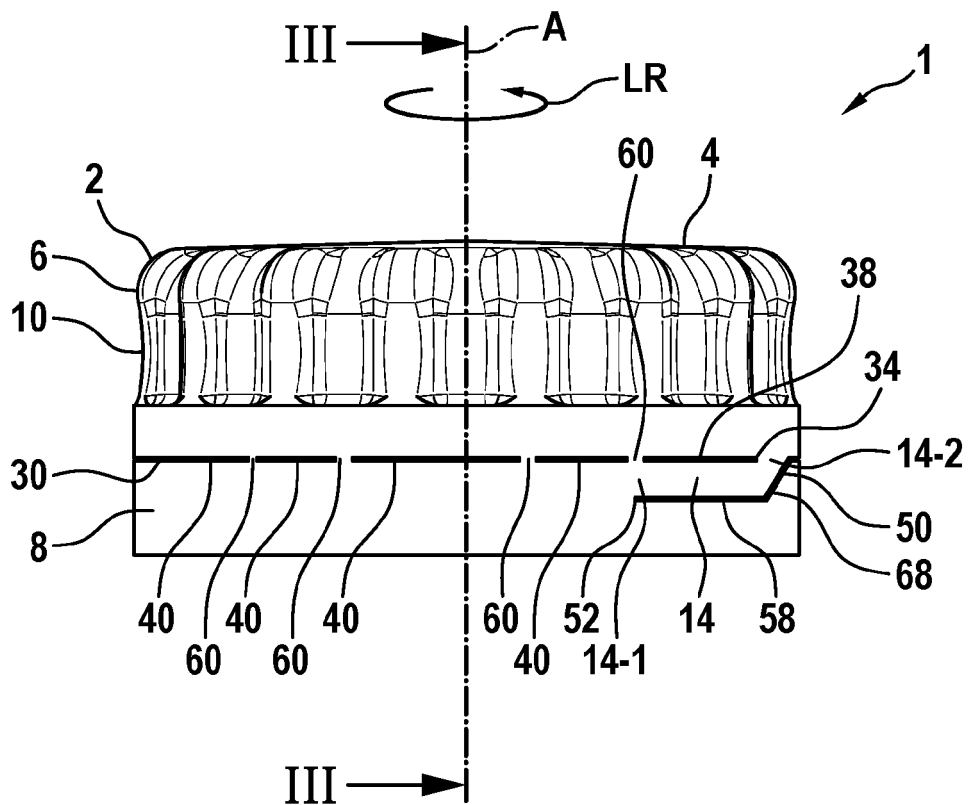


Fig. 3

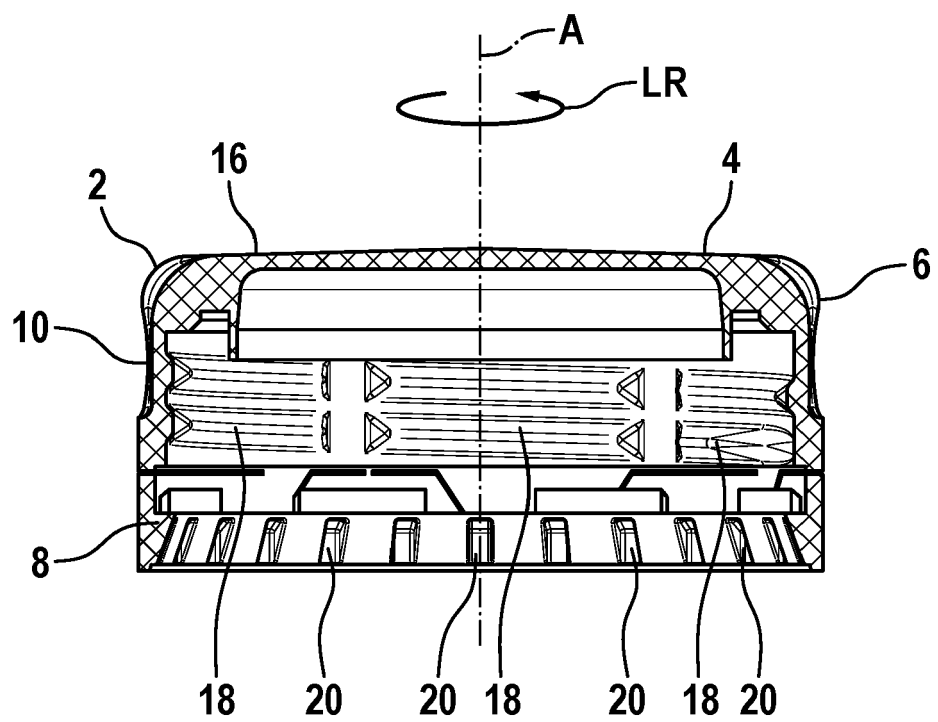


Fig. 4

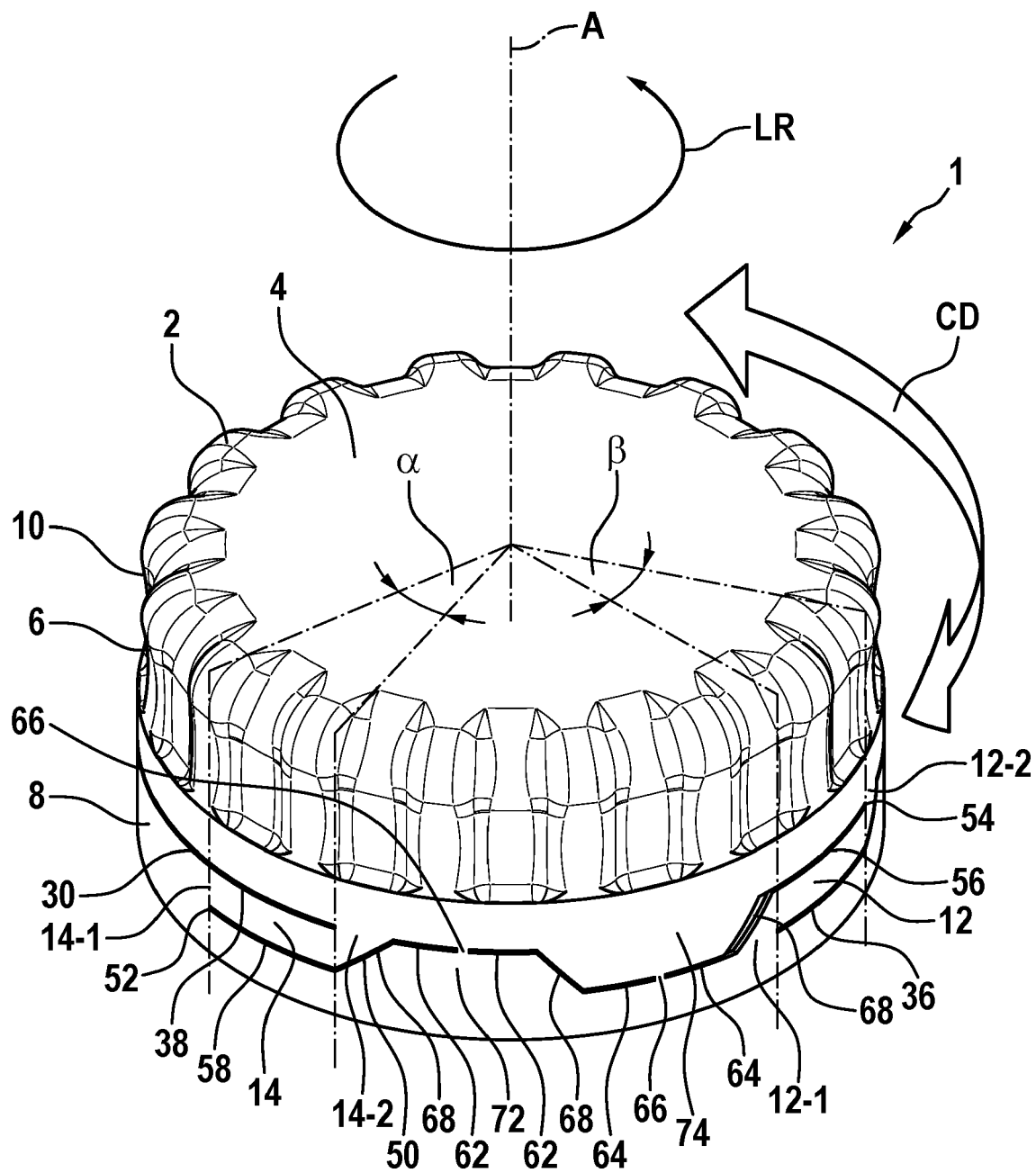


Fig. 5

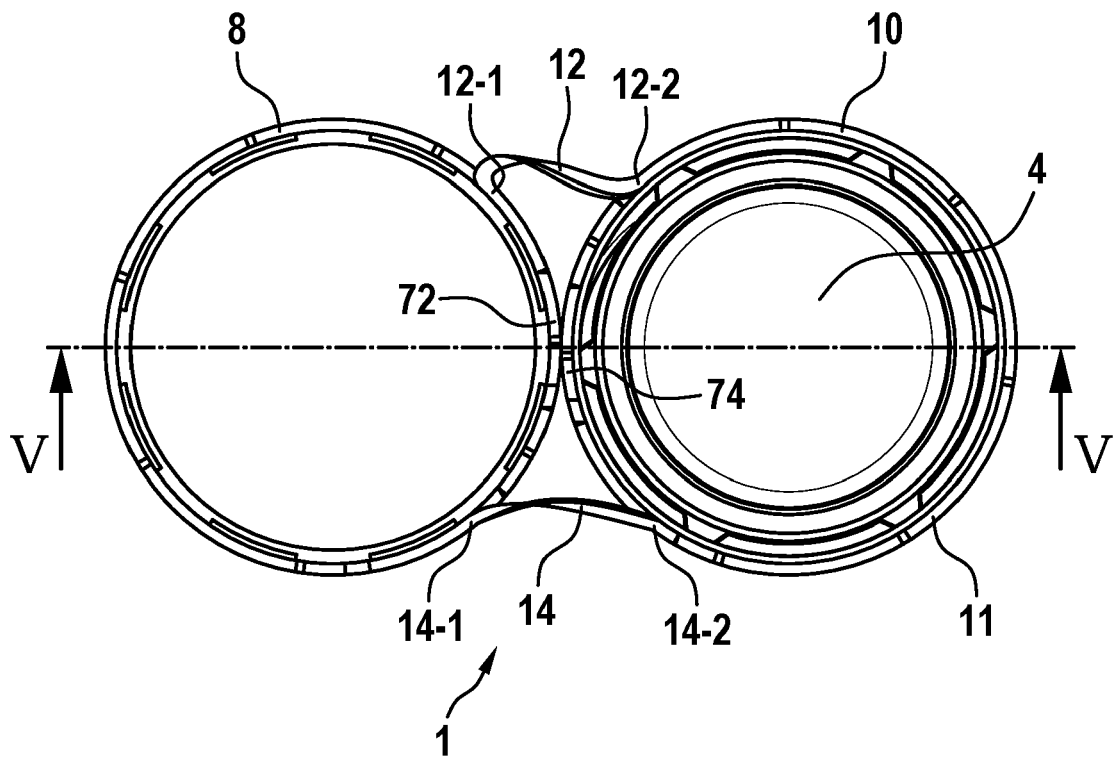


Fig. 6

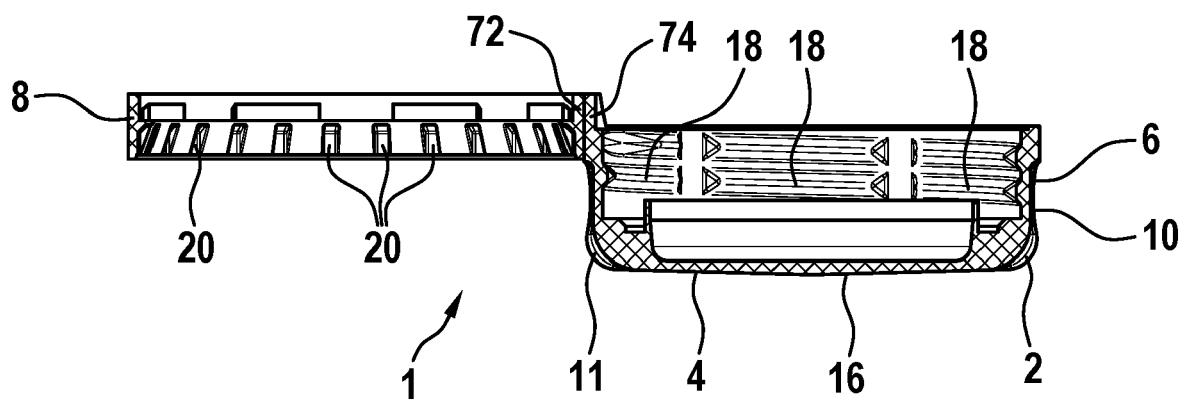


Fig. 7

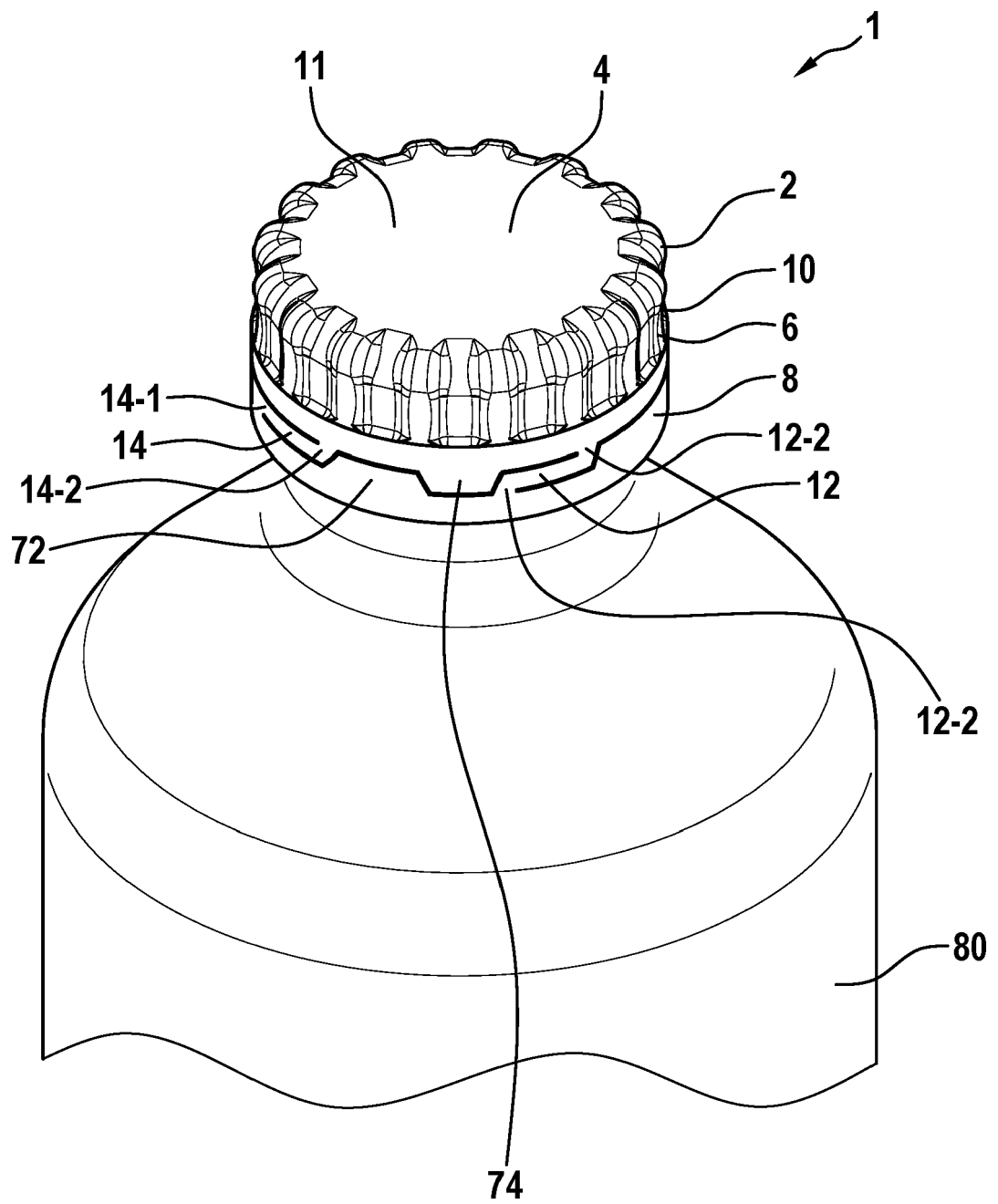


Fig. 8

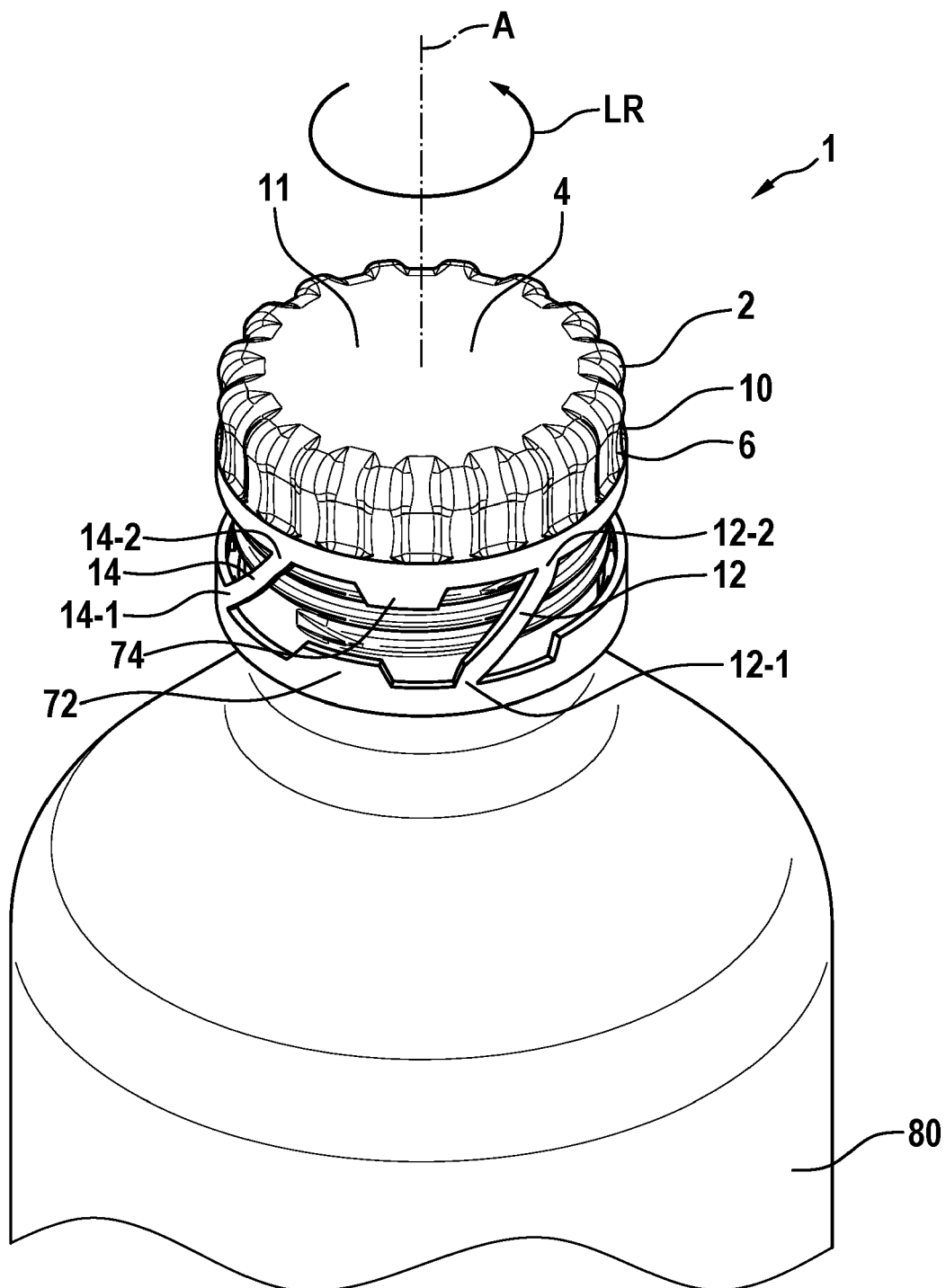


Fig. 9

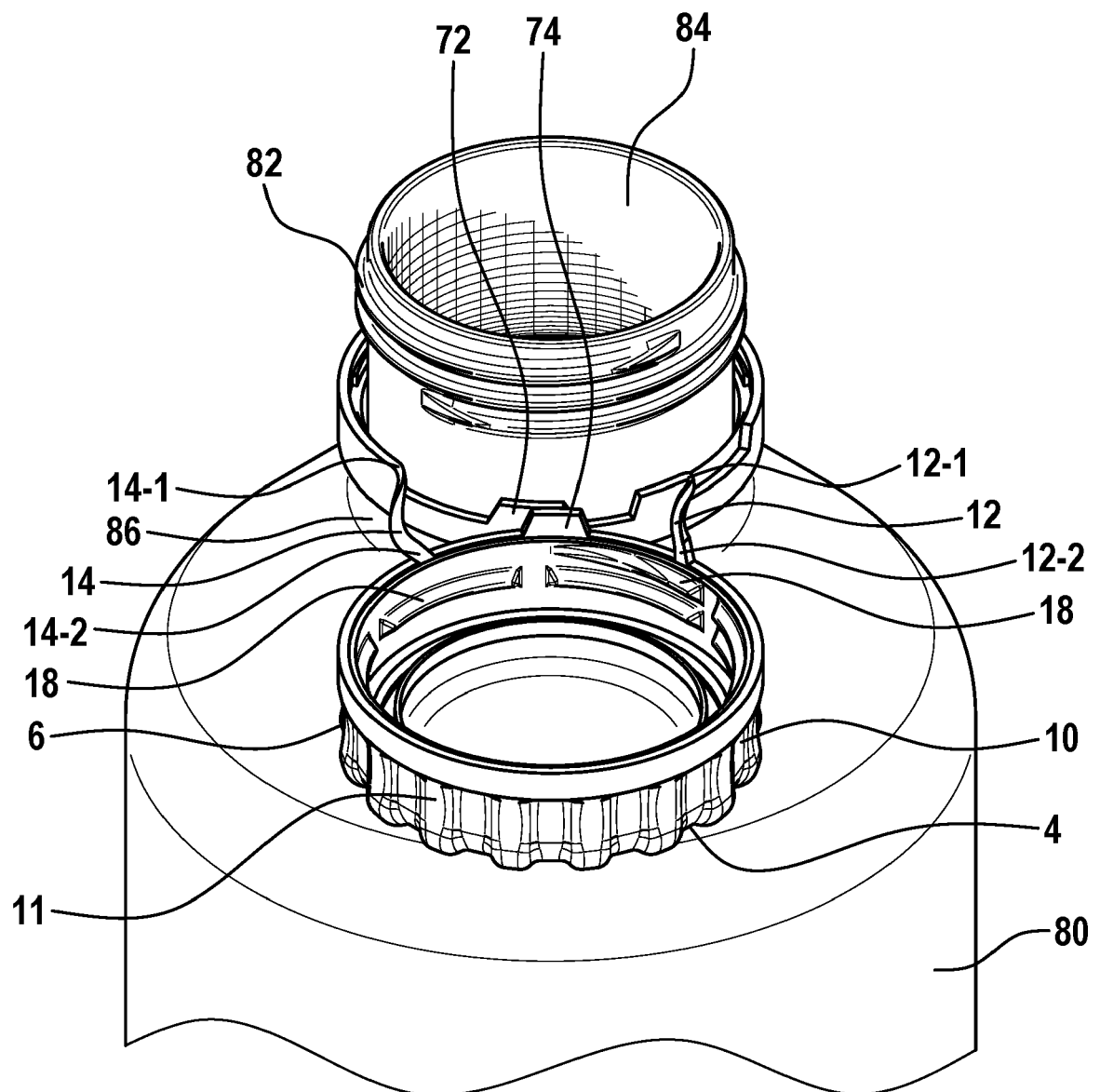


Fig. 10

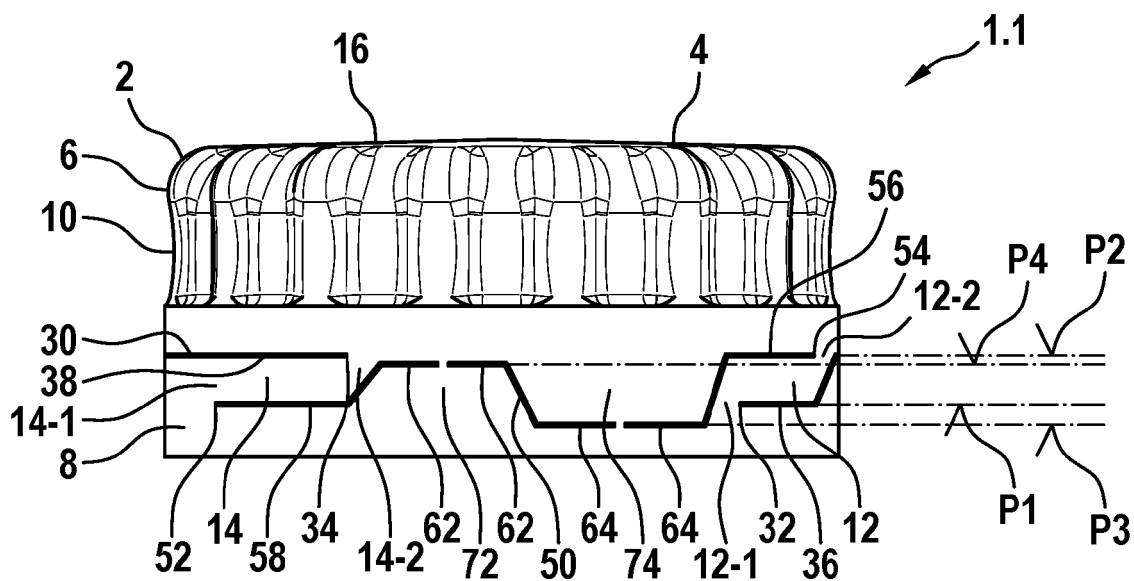


Fig. 11

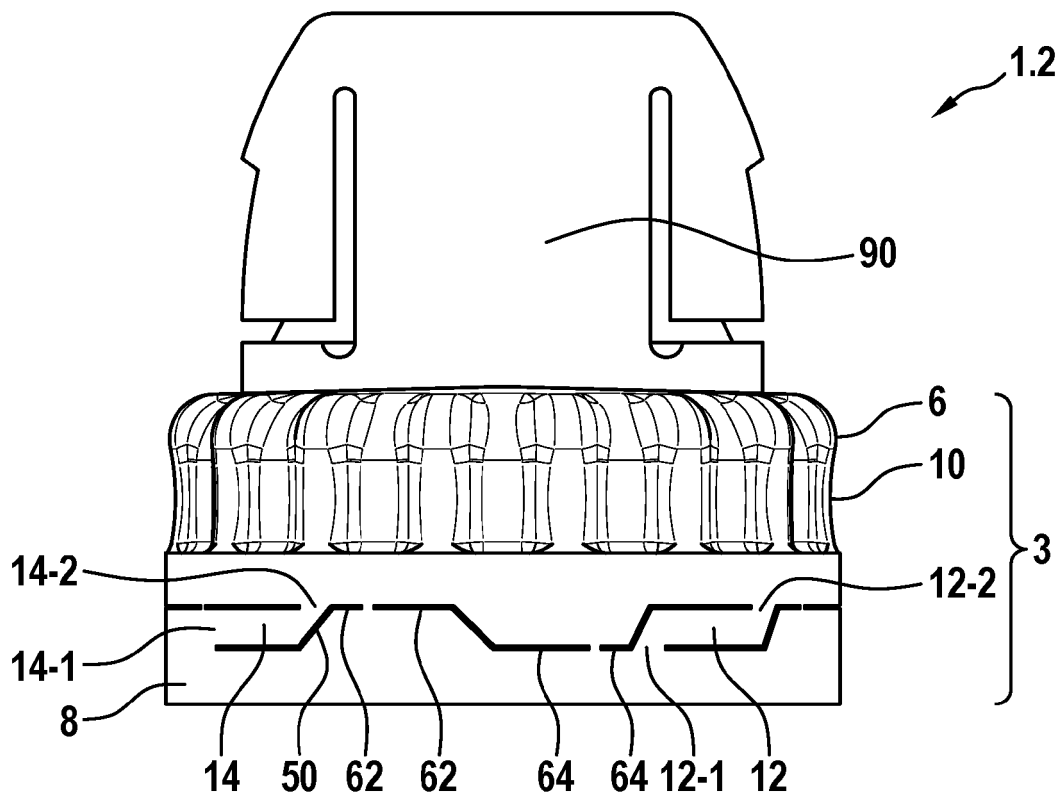
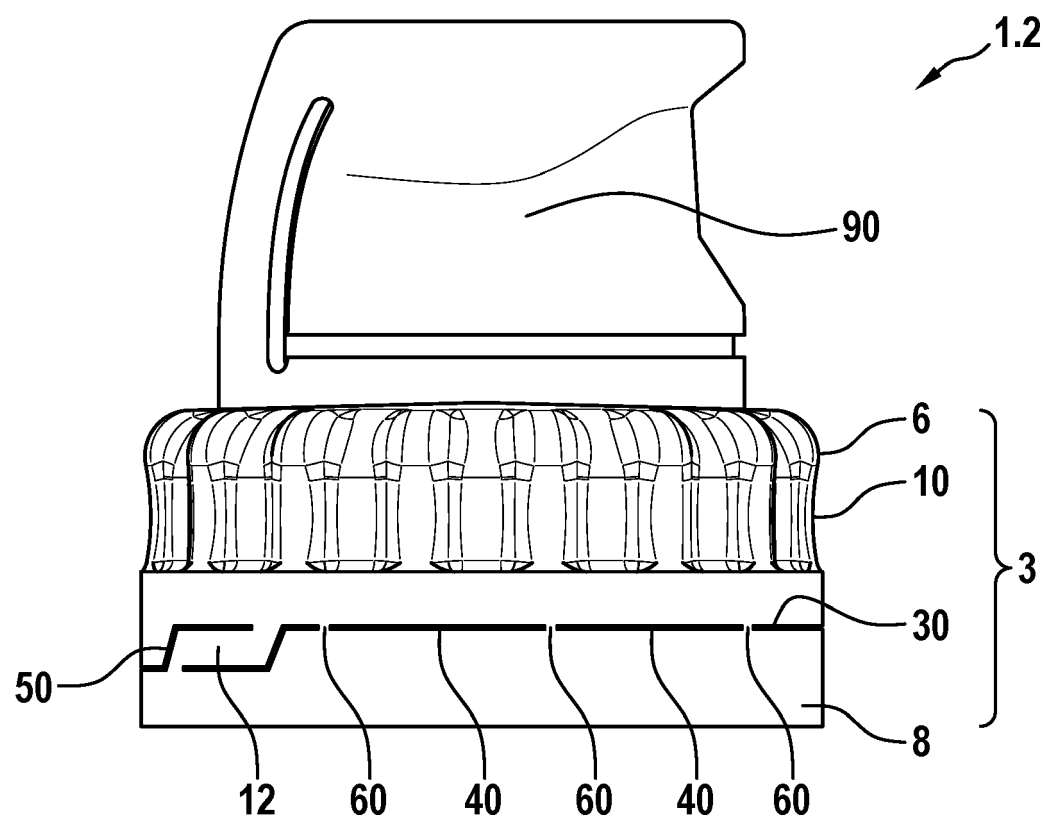


Fig. 12





EUROPEAN SEARCH REPORT

Application Number

EP 23 15 9480

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EPO FORM 1503 03.82 (P04C01)

Place of search

The Hague

Date of completion of the search

3 August 2023

Examiner

Le Bihan, Nicolas

CATEGORY OF CITED DOCUMENTS

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03-08-2023

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