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(54) CLOSURE PROVIDED WITH A LINK AND A GUIDE WALL FOR A CONTAINER

(57) A closure (10) for a container comprises an annular base (18) defining a reference axis (100), a cap (25) having a top wall (14) and an annular skirt (20), a link (21) permanently connecting the cap (25) to the base (18) and allowing the cap (25) to pivot relative to the base (18) between a closed position of the closure (10) and an open position of the closure (10), and a guide wall (60), which protrudes from the top wall (14), radially inside the annular skirt (20). The link (21) and at least a part of the guide wall (60) are located on the same side of a reference plane (Q) containing the reference axis (100). The guide wall (60) is symmetrical with respect to a plane of symmetry (PS) which is perpendicular to the reference plane (Q) and contains the reference axis (100). The guide wall (60) has, as seen in a cross-sectional plane perpendicular to the reference axis (100), an arcuate cross-section with a concavity facing the reference axis (100).

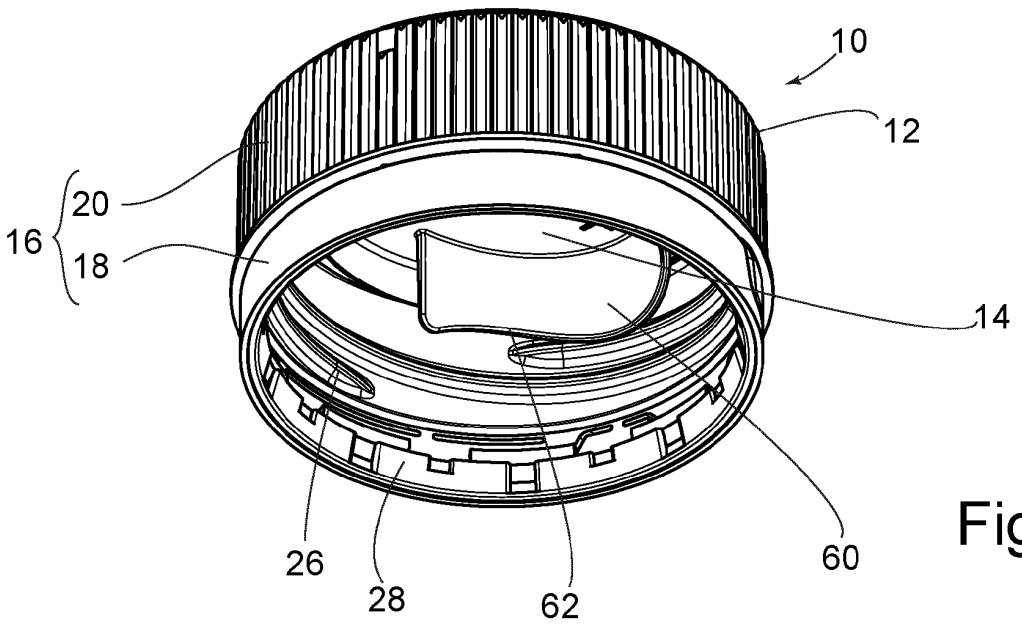

Fig.4

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a closure for a container provided with a permanent link between a cap and a base, so as to remain attached to the container after opening.

BACKGROUND ART

[0002] A plastic closure designed to remain attached to the container after opening is known from WO2021/021095 A1. 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 and a second straps. A first parting line and a second parting line delineate the safety ring and the straps. A tab extending from the cap into a gap of the safety ring can be added in a shape that holds the cap in the open position. The elasticity of the straps and the shape and location of the tab hold the lid in a flipped position where a top plate of the lid faces in a downward direction. While the opening of the closure is intuitive and ergonomic, the closing movement proves less easy, because of a lack of guidance as long as the lid is not engaged with the container neck.

[0003] A closure device for a container neck having a cap which is pivotable between closed open configurations, comprising: a base; an outer wall extending circumferentially around the base; a plug seal extending from the base, at an inner face of the cap, and spaced from the outer wall to define a channel for receiving the container neck and for forming a seal against an inner wall of the container neck when the cap is in the closed configuration is known from WO2021/189127. A lifting member extending from the base and positioned radially inwardly from the plug seal, is positioned at a pivot-side of the cap and has a contact face at a free end of the lifting member for contacting a top end of the container neck before the top end contacts the plug seal during actuation of the cap from the open configuration to the closed configuration.

[0004] This solution may prove satisfactory if the position of the pivot axis is well defined during the closing movement, i.e. if the hinge between the cap and the base has a plane of symmetry perpendicular to the hinge axis. It is, however, less suitable for closure provided with straps that do not provide a symmetrical hinge and a well-defined pivot axis.

SUMMARY OF THE INVENTION

[0005] The invention aims to provide a tethered closure which is easy to close.

[0006] According to a first aspect of the invention, there is provided a closure for a container, comprising: an annular base defining a reference axis, a cap having a top wall and an annular skirt, a link permanently connecting the cap to the base and allowing the cap to pivot relative to the base between a closed position of the closure and an open position of the closure, and a guide wall, which protrudes from the top wall, radially inside the annular skirt, wherein the link and at least a part of the guide wall are located on the same side of a reference plane containing the reference axis, wherein the guide wall is symmetrical with respect to a plane of symmetry which is perpendicular to the reference plane and contains the reference axis, and the guide wall has, as seen in a cross-sectional plane perpendicular to the reference axis, an arcuate cross-section with a concavity facing the reference axis.

[0007] Thanks to its symmetry, the guide wall provides two symmetric contact points with the container neck during the initial phase of contact between closure and the container neck when the closure is moved from an open to a closed position, and the position of the cap formed by the top wall and the annular skirt is well defined even though the link may offer insufficient guidance. Moreover, the symmetrical arcuate shape of the guide wall increases its resistance to deformation when pushed sideways by the cap.

[0008] The closure is particularly adapted to closures with links which do not define a precise instantaneous axis of rotation of the annular skirt relative to the safety ring from the open to the close position. This is the case in particular when the link is not symmetric relative to a geometric plane containing the reference axis.

[0009] In one embodiment, the arcuate cross-section has a radius of curvature which, at an intersection with the plane of symmetry, is smaller than a distance between the intersection and the reference axis. Preferably, the radius of curvature of the arcuate cross-section continuously increases with the distance to the intersection with the plane of symmetry. These shapes prove particularly resistant to deformation and ensure symmetric contact points that are ideally spaced apart for guiding the closure movement of the cap. The shape of the cross-section is preferably parabolic or elliptic.

[0010] In one embodiment, the guide wall has a free edge, and a distance between the top wall and the free edge, measured parallel to the reference axis, varies continuously along the free edge. The variation can be monotonic along the free edge, or can include increases and decreases. In a preferred embodiment, the distance between the top wall and the free edge passes through a relative maximum at an intersection between the free edge and the plane of symmetry. This intersection is the last point of contact between the free edge and the container neck before the guide wall enters the container neck. In a preferred embodiment, the distance between the top wall and the free edge passes through a relative minimum at two symmetric points located at a distance from the plane of symmetry. These two symmetric points are ideally the first points of contact between the free edge and the container neck.

[0011] The plane of symmetry is more or less perpendicular to an instantaneous axis of rotation of the cap between the open and the closed position, compatible with the link.

[0012] In one embodiment, the closure comprises an annular plug seal, which protrudes from the top wall in an axial direction parallel to a reference axis for forming a seal against an inner wall of a container neck of the container when the closure is in the closed position. Preferably, the guide wall is located radially inwardly from the annular plug seal, at a distance thereof. In one embodiment, closure comprises an annular sealing lip which protrudes from the top wall in the axial direction and surrounds the annular plug at a distance thereof.

[0013] In one embodiment, the link comprises a first and a second straps (22, 24) each permanently connecting the annular skirt to the base. The annular skirt may be provided with an inner thread defining an unscrewing direction of rotation about the reference axis, wherein in a closed position of the closure, each of the first and second straps extends in the unscrewing direction from a connection area with the annular skirt to a connection area with the base. Preferably, the connection area of the second strap with annular skirt is at an angle from the connection area of the first strap with the base, measured in the unscrewing direction, which is larger than an angle from the connection area of the second strap with the base to the connection area of the second strap with the annular skirt, measured in the unscrewing direction.

[0014] In one embodiment, the connection area of the second strap with the annular skirt and the connection area of the first strap with the safety ring are on opposite sides of the plane of symmetry. Preferably, the second strap and the first strap are on opposite sides of the plane of symmetry.

[0015] In a preferred embodiment, the closure consists of a one-piece body, and is preferably moulded in the closed position.

[0016] In one embodiment, the closure has an annular wall, which projects from a periphery of the top wall in an axial direction parallel to a reference axis of the closure, the annular wall comprising the annular skirt, the base at a free end of the annular wall, as well as the link.

[0017] In one embodiment, the base comprises or consists of a safety ring for permanently engaging a tamper-evident bead of a container neck.

[0018] In one embodiment, the base of the safety ring is provided with hook-shape resilient portions projecting towards the reference axis. When the closure is engaged with the neck of a container, the resilient hook-shaped portions snap under an annular retention bead formed on the neck of the container to prevent the safety ring from being torn off.

[0019] The length of the straps is preferably chosen so as to enable a flipping movement of the annular skirt relative to the safety ring.

[0020] Obviously, the above-mentioned embodiments can be combined.

[0021] According to another aspect of the invention, there is provided a combination of a container neck having a rim and a tamper-evident bead with the closure of any one of the preceding claims, wherein the base engages the tamper-evident bead.

[0022] According to another aspect of the invention, there is provided a closure for a container, comprising a one-piece body, the one-piece body comprising: a top wall, an annular wall which projects from a periphery of the top wall in an axial direction parallel to a reference axis of the closure, the annular wall comprising an annular skirt, a safety ring at a free end of the annular wall, as well as a first and a second straps each permanently connecting the annular skirt to the safety ring, and a guide wall, which protrudes from the top wall, radially inside the annular wall, wherein the guide wall and the first and second straps are located on the same side of a reference plane containing the reference axis. The guide wall is symmetrical with respect to a plane of symmetry which is perpendicular to the reference plane and contains the reference axis, and the guide wall has, as seen in a cross-sectional plane perpendicular to the reference axis, an arcuate cross-section with a concavity facing the reference axis.

BRIEF DESCRIPTION OF THE FIGURES

[0023] Other advantages and features of the invention will then become more clearly apparent from the following description of specific embodiments of the invention given as non-limiting examples only and represented in the accompanying drawings in which:

- Figure 1 is a rear view of a closure in accordance with an embodiment of the invention, in a closed position;
- Figure 2 is a side view of the closure of figure 1 in the closed position;
- Figure 3 is a bottom view of the closure of figure 1 in the closed position;
- Figure 4 is an isometric view of the closure of figure 1 in the closed position;
- Figure 5 is a cross-section through the plane A-A of figure 3;
- Figure 6 is a cross-section through the plane B-B of figure 3;
- Figures 7A through 7G illustrate successive steps of closing the closure of figure 1.

[0024] Corresponding reference numerals refer to the same or corresponding parts in each of the figures.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] With reference to figures **1** to **6**, a plastic closure **10** for a container consists of a one-piece body **12** comprising a top wall **14** and an annular side wall **16**, which projects from a periphery of the top wall **14** in an axial direction parallel to a reference axis **100** of the closure **10.**

[0026] The annular side wall **16** forms a safety ring **18** at its free end axially opposed to the top wall **14,** an annular skirt **20** between the top wall **14** and the safety ring **18** as well as an articulation link **21** consisting of a first and a second straps **22**, **24** for permanently connecting the annular skirt **20** to the safety ring **18.** The top wall **14** and annular skirt **20** forms a lid **25** of the closure **10,** whereas the safety ring **18** forms a base, which in this embodiment is designed to be permanently fixed to a container neck.

[0027] The annular skirt **20** is provided with an inner thread **26** depicted in figure **5,** which defines an unscrewing direction of rotation **200** (see figure **3**) about the reference axis **100,** which will also be referred to as the unscrewing direction of the closure **10.** The safety ring **18** may be provided with one or more hook-shaped resilient portions **28** projecting radially towards the reference axis **100** to snap under an annular bead of a container neck and secure the closure **10** to the container.

[0028] The straps **22, 24** and the safety ring **18** are delineated by a first parting line **30** and a second parting line **40,** which have no intersection. The first parting line **30** extends in the unscrewing direction over an angle, which is greater than 180°, e.g. greater than 220°, about the axis of refence **100** between a first end **31** and a second end **32** of the first parting line **30** while the second parting line **40** extends, in the direction opposed to the unscrewing direction, over an angle, which may be greater than 50° and less than 180° about the axis of refence **100** between a first end **41** and a second end **42** of the second parting line **40.**

[0029] The first strap **22** is delineated by a first set of one or more line segments **33** of the first parting line **30** and a first set of one or more line segments **43, 44** of the second parting line **40,** which at least partially overlaps with the first set of one or more line segments **33** of the first parting line **30** in the unscrewing direction of rotation **200.** The first set of line segments **33** of the first parting line consists of a terminal segment, which lies in a first reference plane **P1** perpendicular to the reference axis **100** and extends from the first end **31** of the first parting line **30** in the unscrewing direction **200** towards the second end **32** of the first parting line **30,** while the first set of line segments of the second parting line **40** consists of a terminal segment **43,** which lies in a second reference plane **P2** parallel to and distant from the first reference plane **P1** and extends from the first end **41** of the second parting line **40** in the direction opposed to the unscrewing direction **200,** and of an adjacent line segment **44.** As a result, the first strap extends **22** in the unscrewing direction **200** from a connection area **221** with the annular skirt **20** to a connection area **222** with the safety ring **18.**

[0030] The second strap **24** is delineated by a second set of one or more line segments **35, 36** of the first parting line **30** and a second set of one or more line segments **48, 49** of the second parting line, which at least partially overlap with the second set of line segments **35, 36** of the first parting line **30** in the unscrewing direction of rotation **200.** More specifically, the second set of line segments of the first parting line **30** consists of a terminal segment **36,** which lies in the second reference plane **P2** and extends from the second end **32** of the first parting line **30** in the direction of rotation opposed to the unscrewing direction **200** towards the first end **31** of the first parting line **30,** and of an adjacent line segment **35,** while the second set of line segments of the second parting line **40** consists of a terminal segment **49,** which lies in the first reference plane **P1** and extends from the second end **42** of the second parting line **40** in the unscrewing direction **200** towards the first end **41** of the second parting line **40**, and of an adjacent line segment **48**. Hence, the second strap **24** extends in the unscrewing direction **200** from a connection area **241** with the annular skirt **20** to a connection area **242** with the safety ring **18**.

[0031] The length of the straps **22**, **24** in the unscrewing direction **200** is defined by the overlap between the first and second parting lines **30**, **40**. The length of the first and second straps **22, 24** is preferably the same, which means that an overlap angle between the first set of one or more line segments **33** of the first parting line **30** and the first set of one or more line segments **43, 44** of the second parting line measured about the reference axis **100** is equal to an overlap angle between the second set of one or more line segments **35, 36** of the first parting line **30** and the second set of one or more line segments **48, 49** of the second parting line **40** measured about the reference axis **100.** This overlap angle is preferably greater than 5°, more preferably greater than 10°, and preferably less than 60°, more preferably less than 30°.

[0032] The first parting line **30** further comprises a set of one or more intermediate line sections **34,** which do not overlap with the second parting line **40** and connect the first set of line sections **33** of first parting line **30** with the second set of line sections **35, 36** of the first parting line **30.** These one or more intermediate line sections **34** delineate a separation between a front part of the annular skirt **20** and the safety ring **18.** In the present embodiment, the set of one or more intermediate sections consists of one line section **34** only, which lies in the first reference plane **P1,** but other configurations are also possible.

[0033] The second parting line **40** further comprises a set of one or more intermediate line section **45, 46, 47,** which do not overlap with the first parting line **30** and connect the first set of line sections **43, 44** of second parting line **40** with the second set of line sections **48, 49** of the second parting line **40.** These intermediate line sections **45, 46, 47** delineate a separation between a rear

or hinged part of the annular skirt **20** and the safety ring **18.** In the present embodiment, the intermediate line sections include at least one intermediate line section **47** which lies in a third reference plane **P3** perpendicular to the reference axis **100** and one intermediate line section **45** which lies in a fourth reference plane **P4** perpendicular to the reference axis, to form a tab **50** of the annular skirt, which lies between the first and second straps **22**, **24** and protrudes towards the safety ring **18** and an adjacent tab **52** of the safety ring **18**, which protrudes towards the annular skirt **20** and lies between the tab **50** of the annular skirt **20** and the first strap **22**. The tabs **50**, **52** preferably have a trapezoidal shape, which converges towards their free end, i.e. towards the third and fourth reference planes **P3, P4,** respectively.

[0034] The set of intermediate line sections **34** of the first parting line is provided with frangible bridges **54,** which link the front part of the annular skirt **20** to the safety ring **18** before the first opening of the closure and break when the closure is unscrewed.

[0035] When the closure **10** is moved in the unscrewing direction **200** of rotation relative to the container, the lid **25** and the safety ring **18** move away from each other in the axial direction and the frangible bridges **54** break without difficulty, because they link parts of the safety ring **18** and of the lid **25** which are rigid, i.e. more rigid than the straps **22, 24.** As the lid **25** continues to rotate and to move away from the safety ring **18** in the axial direction, the straps **22, 24** unfold, which causes the safety ring **18** to rotate relative to the lid **25** in the direction opposed to the unscrewing direction **200**. Once the lid **25** is unscrewed, the user can flip the lid **25** relative to the safety ring **18** about an instantaneous hinge axis which at each instant lies in a plane perpendicular to the reference axis **100** at a distance from the reference axis **100**.

[0036] The length and elasticity of the first and second straps **22**, **24** are such that the first and second straps **22, 24** are stretched when the lid **25** reaches the flipped position against the safety ring, thereby providing a stable open position.

[0037] In this particular embodiment, the second and third reference plane **P2**, **P3** are coplanar, but more generally, the third reference plane **P3** can be located anywhere between the first reference plane **P1** and the second reference plane **P2** or closer to the second reference plane **P2** than to the first reference plane **P1** so that the length and position of the tab **50** of the annular skirt **20** can be adapted. Similarly, the fourth reference plane **P4** in this particular embodiment is coplanar with the first reference plane **P1** but could be located anywhere at a distance from the third reference plane **P3** between the third reference plane **P3** and the first reference plane **P1** or closer to the first reference plane **P1** than to the third reference plane **P3**, so that the length and position of the tab **52** of the safety ring **18** can be adapted.

[0038] Each of the first and second parting lines **30**, **40** consists of a series of consecutive line segments. The parting lines **30**, **40** are preferably obtained by specific shapes of a moulding cavity of a mould for the one-piece closure **10**. Alternatively, they can be obtained with blades after the closure has been moulded.

[0039] The top wall **14** of the closure **10** is provided with an annular plug seal **56** and an annular sealing lip **58**, which both protrude from the top wall **14** in an axial direction parallel to a reference axis **100**. The plug seal **56** forms a seal against an inner wall of a container neck when the closure is in the closed position, while the annular sealing lip **58** surrounds the annular plug at a distance thereof to seal a top rim of the container neck. The plug seal **56** and the sealing lip **58** are surrounded by the annular wall **20**.

[0040] The one-piece closure **10** is further provided with a guide wall **60**, which protrudes from the top wall **14**, radially inside the plug seal **56**, preferably at a distance thereof. The guide wall **60** is symmetrical with respect to a plane of symmetry **PS**, which contains the reference axis **100** and is located between the connection area **241** of the second strap **24** with the annular skirt **20** and the connection area **222** of the first strap **22** with the safety ring **18,** and preferably between the connection area **242** of the second strap **24** with the safety ring **18** and the connection area of the first strap **22** with the annular skirt **20.** While the position of instantaneous hinge axis of the cap **25** relative to the safety ring **18** between the closed and the open position is not constant and not well defined, it can be said that the plane of symmetry **PS** is substantially perpendicular to this imaginary hinge axis.

[0041] The guide wall **60** is entirely located on the same side of a plane **Q** perpendicular to the plane of symmetry **PS** and containing the reference axis **100** as the straps **22, 24.** As illustrated in figure **3,** the guide wall **60** has an arcuate cross-section through a cross-sectional plane perpendicular to the reference axis **100,** with a concavity facing the reference axis **100** and a radius of curvature **R** which, at an intersection **64** with the plane of symmetry **PS**, is smaller than the distance between the intersection **64** and the reference axis **100.** The arcuate cross-section faces away from the link **21** and has a radius of curvature, which increases with the distance to the intersection with the plane of symmetry, and has a parabolic shape.

[0042] The guide wall **60** has a free edge **62** at an end opposed to the top wall **14.** The distance **D** between the top wall **14** and the free edge **62,** measured in the direction of the reference axis **100,** varies continuously along the free edge **62.** This distance **D** passes through a relative maximum at the intersection **64** between the guide wall **60** and the plane of symmetry and through a relative minimum at two points **66** located at a distance from the plane of symmetry **PS**. The distance **D** increases continuously from the relative minima **66** towards the relative maximum **64,** and, in the opposite direction, towards a free end **68** of the edge **62.**

[0043] The thickness of the guide wall **60** decreases continuously from the top wall **14** to the free edge **62.**

[0044] The guide wall **60** guides the closing motion of

the cap **25** relative to the safety ring **18,** as illustrated in Figure **7A** to **7G,** corresponding to successive steps A to G.

[0045] In step A, the closure **10** is shown in a semi opened position, in which the safety ring **18** is snapped under an annular bead **70** of a container neck **72** and a first contact is made between the cap **25** at the edge **62** of the guide wall **60** and a rim **74** of a container neck **72.** The points of contact are close to the relative minima **66** and the position is relatively stable. The drawings of steps A to G of figure **6** are a cross sections through the plane of symmetry **PS,** between the first and second straps **22, 24.** Hence, the first strap **22** is hidden by the container neck **72** and the second strap **24** is not visible.

[0046] When the cap **25** is pushed sideways towards the container neck **72** in step B, the edge **62** of the guide wall **60** slides against the rim **74** of the of the container neck **72,** with two contact points, one on each side of the plane of symmetry **PS,** until the relative maximum **64** is reached in step C and passed in step **D.** In this phase from step A through step B to step C, the straps **22, 24** are progressively stretched but the position of the cap **25** relative to the container neck **72** is stabilised by the two contact points with the edge **62** of the guide wall **60** on each side of the plane of symmetry **PS.** Once this position is passed, the subsequent contact between the cap **25** and the container neck **72** is made between the inner side of the annular skirt **20** and the rim **74** in step **D.** The annular skirt **20** of the cap **25** now surrounds the rim **74** and the straps **22, 24,** which were stretched during steps A to **D,** tend to move the cap **25** such that the top wall **14** gets closer to the rim **74** from step **D** to step F. The cap **25** is progressively realigned with the container neck and the inner thread **26** of the cap **25** engages an outer thread **76** of the container neck **72** in step F. The cap **25** can then be screwed on the container neck in step F until the closed position is reached in step G. During the screwing movement, the safety ring **18** rotates with the cap **25.** In the closed position in step G, the plug seal **56** is engaged with an inner wall **78** of the container neck and the sealing lip **58** is engaged with the rim **74** of the container neck **72.**

[0047] The invention is not limited to the embodiment illustrated in figures **1** to **7.** The shape of the of the edge **62** of the guide wall **60** may vary and depends in particular from the length and flexibility of the straps **22, 24.** In some cases, the distance **D** from the top wall **14** to the free edge **62** of the guide wall **60** may decrease towards the intersection **64** of the guide wall **60** with the plane of symmetry **PS.**

[0048] More generally, the link **21** between the safety ring **18** and the cap 25 does not necessarily consist in a pair of straps **22, 24.** The guide wall **60** of the invention can be equally advantageous for types of link allowing a pivoting movement between a closed and an open position, such as conventional butterfly hinges or link arrangements with a main hinge and an auxiliary hinge. The safety ring **18** is but one embodiment of a base for permanently fixing the closure to the container neck and other types of base can be equally used.

Claims

1. A closure (10) for a container, comprising:

- an annular base (18) defining a reference axis (100),
- a cap (25) having a top wall (14) and an annular skirt (20),
- a link (21) permanently connecting the cap (25) to the base (18) and allowing the cap (25) to pivot relative to the base (18) between a closed position of the closure (10) and an open position of the closure (10), and
- a guide wall (60), which protrudes from the top wall (14), radially inside the annular skirt (20), wherein the link (21) and at least a part of the guide wall (60) are located on the same side of a reference plane (Q) containing the reference axis (100),

characterised in that the guide wall (60) is symmetrical with respect to a plane of symmetry (PS) which is perpendicular to the reference plane (Q) and contains the reference axis (100), and the guide wall (60) has, as seen in a cross-sectional plane perpendicular to the reference axis (100), an arcuate cross-section with a concavity facing the reference axis (100).

2. The closure of claim 1, wherein the arcuate cross-section has a radius of curvature (R) which, at an intersection (64) with the plane of symmetry (PS), is smaller than a distance between the intersection (64) and the reference axis (100).

3. The closure of claim 2, wherein the radius of curvature (R) of the arcuate cross-section continuously increases with the distance to the intersection (64) with the plane of symmetry (PS).

4. The closure of any one of the preceding claims, wherein the guide wall (60) has a free edge (62), and a distance (D) between the top wall (14) and the free edge (62), measured parallel to the reference axis (100), varies continuously along the free edge (62).

5. The closure of claim 4, wherein one or more of the following holds true:

- the distance (D) between the top wall (14) and the free edge (62) passes through a relative maximum at an intersection (64) between the free edge (62) and the plane of symmetry (PS); and/or
- the distance between the top wall (14) and the

free edge (62) passes through a relative minimum at two symmetric points (66) located at a distance from the plane of symmetry (PS).

6. The closure of any one of the preceding claims, further comprising an annular plug seal (56), which protrudes from the top wall (14) in an axial direction parallel to a reference axis (100) for forming a seal against an inner wall (78) of a container neck (72) of the container when the closure (10) is in the closed position.

7. The closure of claim 6, wherein one or more of the following holds true:

- the guide wall (60) is located radially inwardly from the annular plug seal (64), at a distance thereof; and/or
- the closure further comprises an annular sealing lip (56) which protrudes from the top wall (14) in the axial direction and surrounds the annular plug (54) at a distance thereof.

8. The closure of any one of the preceding claims, wherein the link (21) is not symmetrical relative to any plane containing the reference axis (100).

9. The closure of any one of the preceding claims, wherein the link (21) comprises a first and a second straps (22, 24) each permanently connecting the annular skirt (20) to the base (18).

10. The closure of claim 9, wherein the annular skirt (20) is provided with an inner thread (26) defining an unscrewing direction of rotation (200) about the reference axis (100), wherein in a closed position of the closure, each of the first and second straps (22, 24) extends in the unscrewing direction (200) from a connection area (221, 241) with the annular skirt (20) to a connection area (222, 242) with the base (18).

11. The closure of claim 10, wherein the connection area (241) of the second strap (24) with annular skirt (20) is at an angle from the connection area (222) of the first strap (22) with the base (18), measured in the unscrewing direction (200), which is larger than an angle from the connection area (242) of the second strap (24) with the base (18) to the connection area (221) of the first strap (22) with the annular skirt (20), measured in the unscrewing direction (200).

12. The closure of claim 11, wherein one or more of the following holds true:

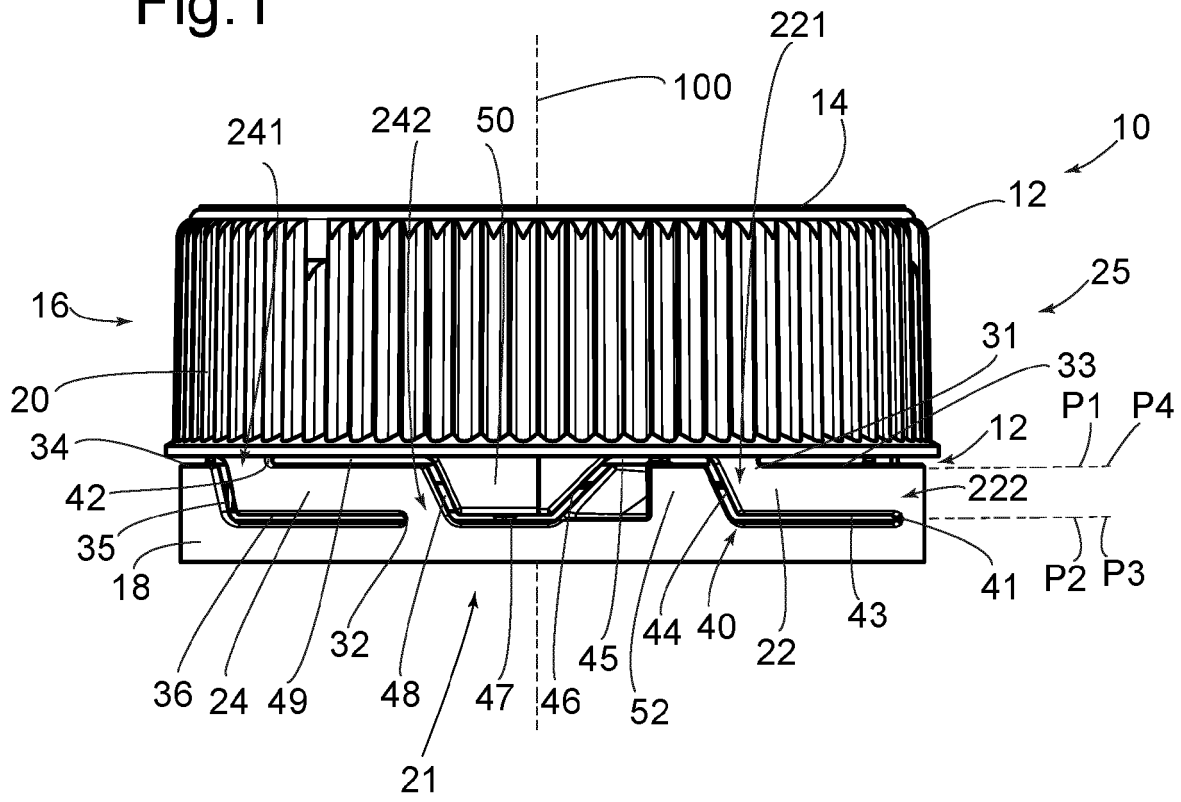
- the connection area (241) of the second strap (24) with the annular skirt (20) and the connection area (222) of the first strap (22) with the base (18) are on opposite sides of the plane of symmetry (PS), and/or
- the second strap (24) and the first strap (22) are on opposite sides of the plane of symmetry (PS).

13. The closure of any one of the preceding claims, wherein one or more of the following holds true:

- the closure consists of a one-piece body (12); and/or
- the closure has an annular wall (16), which projects from a periphery of the top wall (14) in an axial direction parallel to a reference axis (100) of the closure (10), the annular wall comprising the annular skirt (20), the base (18) at a free end of the annular wall (16), as well as the link (21), and/or
- the base (18) comprises or consists of a safety ring;
- the base (18) is provided with hook-shape resilient portions (28) projecting towards the reference axis (100).

14. A combination of a container neck (72) having a rim (74) and a tamper-evident bead (70) with the closure of any one of the preceding claims, wherein the base (18) engages the tamper-evident bead.

Fig.1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100
14
241
242
50
10
12
25
16
31
33
20
P1
P4
12
34
222
42
35
18
41
P2
P3
36
24
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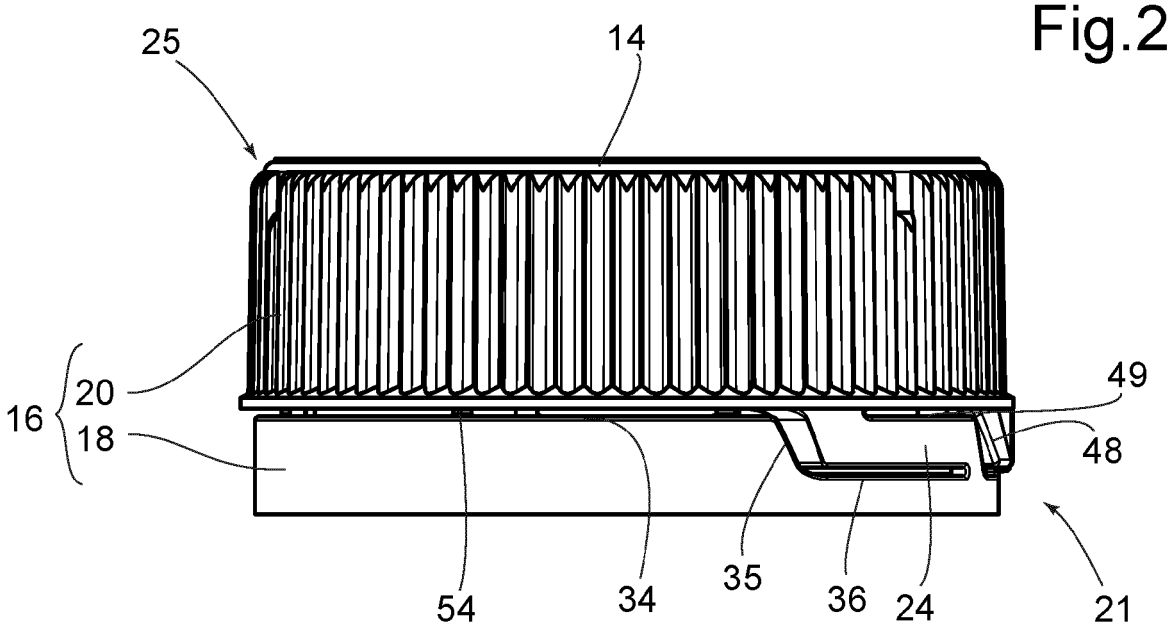
32
48
47
46
45
52
44
40
22
43
21

Fig.2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36
24
21

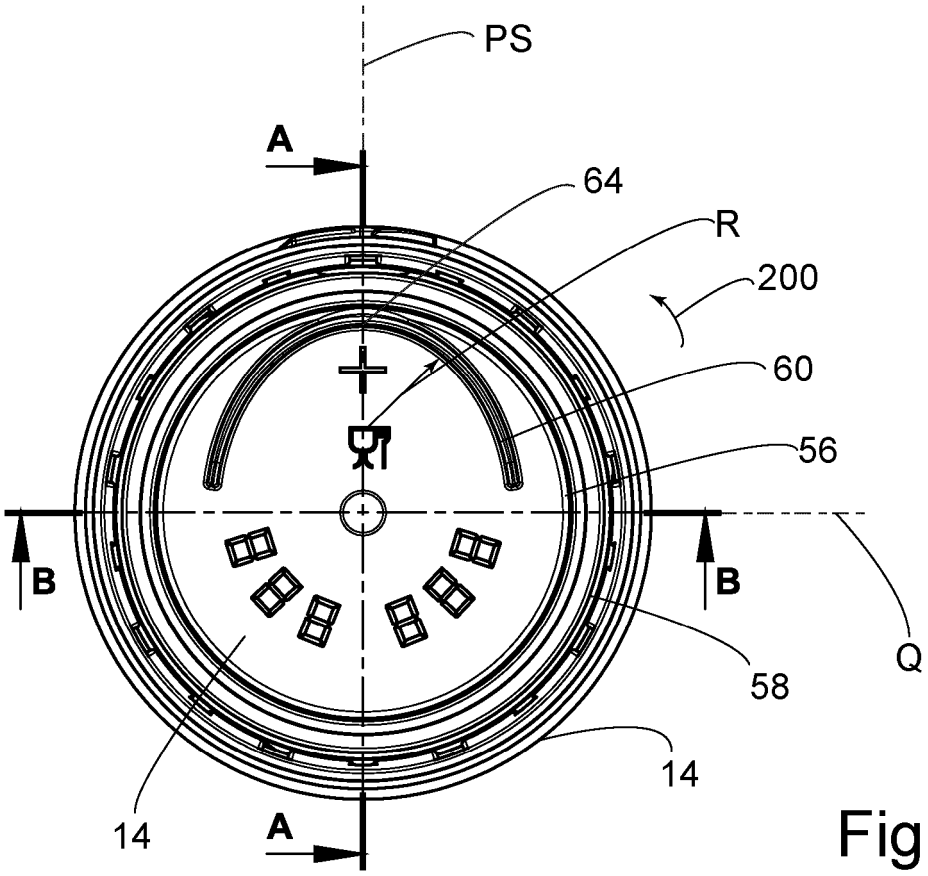


Fig.3

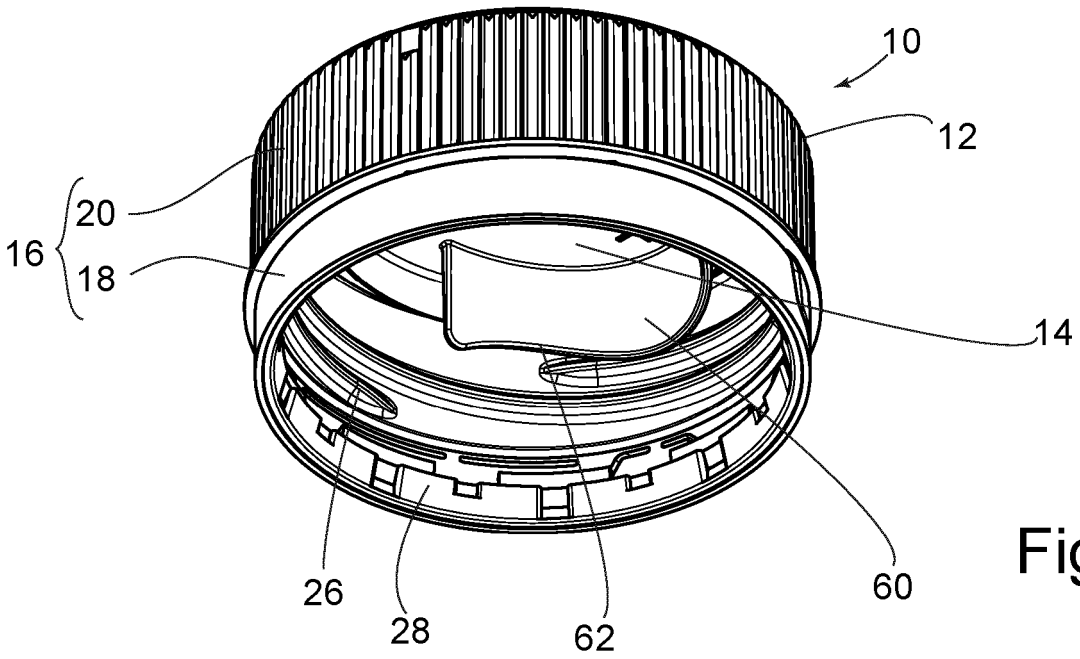
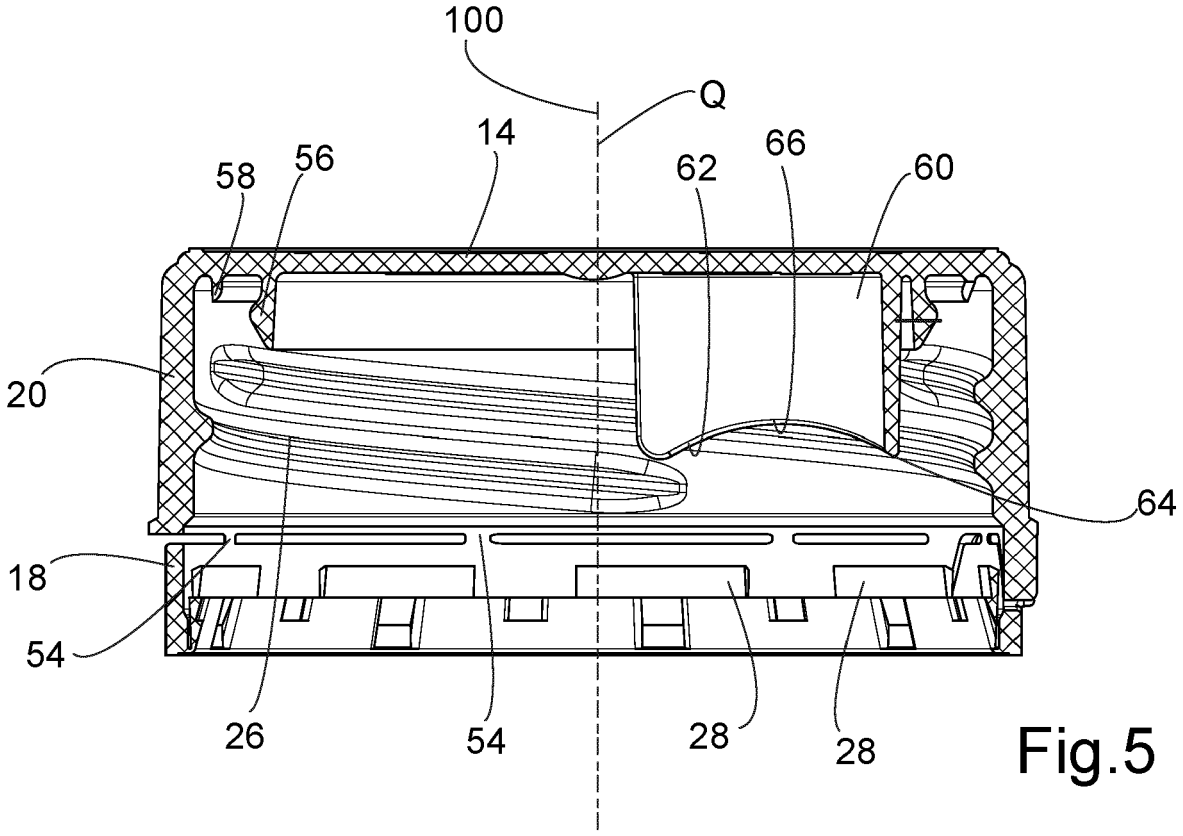


Fig.4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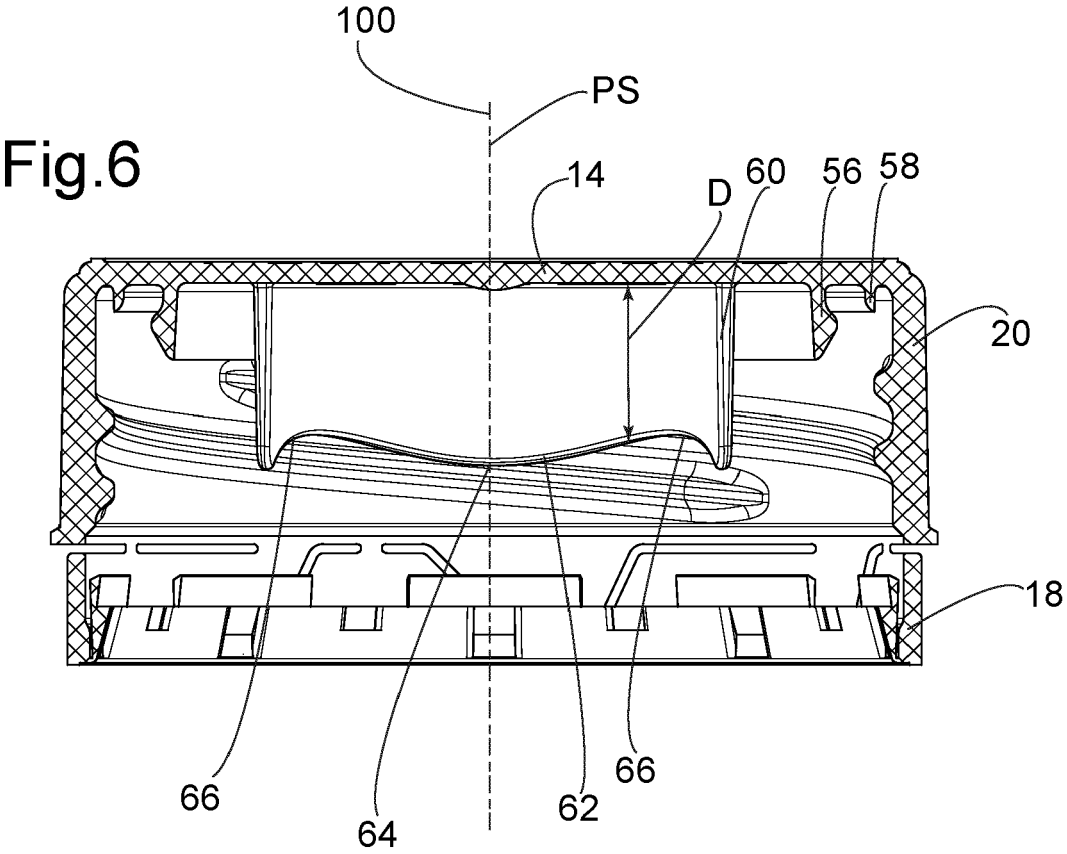
28

Fig.5

Fig.6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62
66

Fig.7A

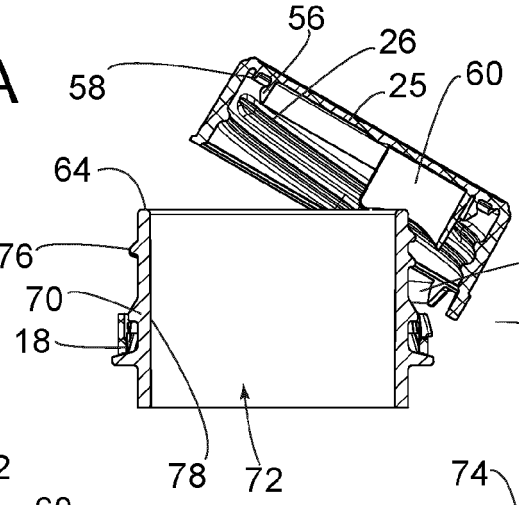


Fig.7B

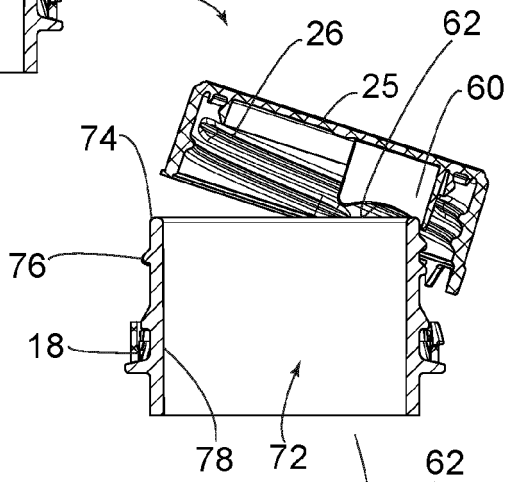


Fig.7C

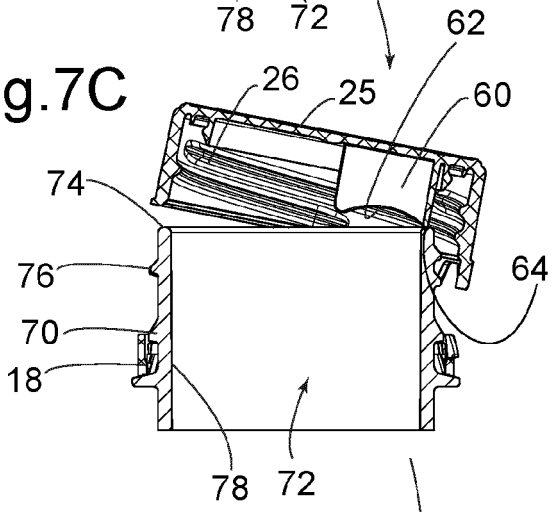


Fig.7D

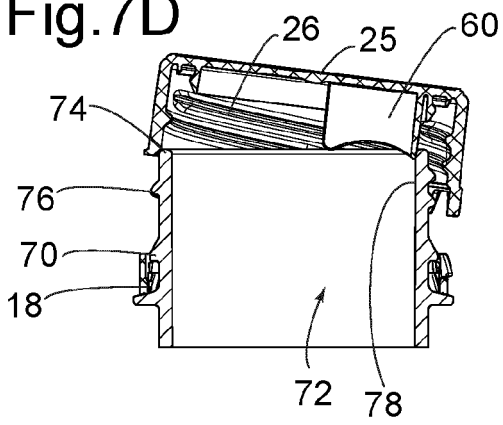


Fig.7E

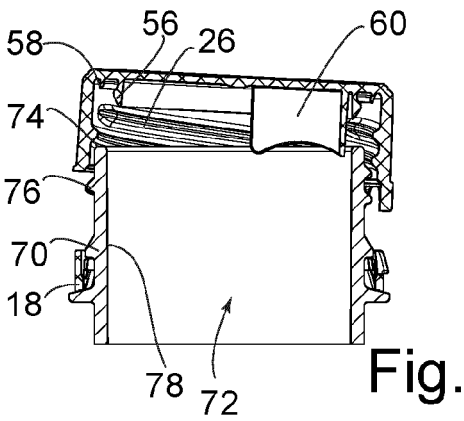


Fig.7F

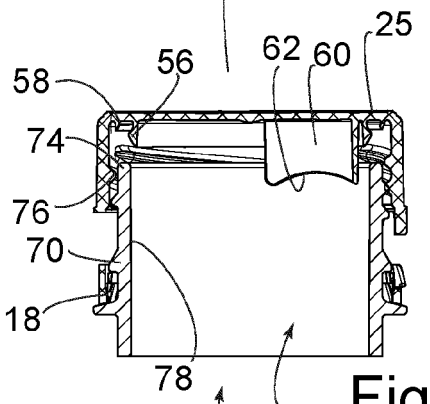
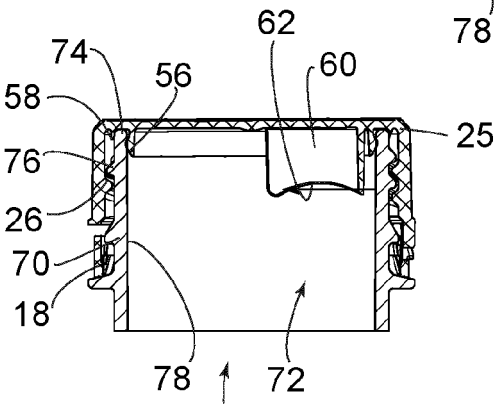


Fig.7G



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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 4528

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	WO 2019/192714 A1 (APTAR FREYUNG GMBH [DE]) 10 October 2019 (2019-10-10) * figures 1-6 *	1,4,5 8-14	INV. B65D55/16
X Y	GB 1 265 008 A (DALE LTD J) 1 March 1972 (1972-03-01) * page 2, lines 94-102 *	1,4,5 8-14	
X Y	US 3 991 904 A (DAVIS EUGENE EDWARD ET AL) 16 November 1976 (1976-11-16) * column 2, line 67 - column 3, line 11; figures 1-3 *	1,4-7 8-14	
A,D	WO 2021/189127 A1 (HUSKY INJECTION MOLDING SYSTEMS LTD [CA]) 30 September 2021 (2021-09-30) * figures 4-6 *	1-14	
A	US 2022/002021 A1 (KRAUTKRAMER GUNTER [DE]) 6 January 2022 (2022-01-06) * figure 15 *	1-14	TECHNICAL FIELDS SEARCHED (IPC)
Y,D	WO 2021/021095 A1 (THISCAP INC [US]) 4 February 2021 (2021-02-04) * figures 1-34 *	8-14	B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 April 2023	Dominois, Hugo

CATEGORY OF CITED DOCUMENTS

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19-04-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2019192714 A1	10-10-2019	AR 115337 A1	23-12-2020
		BR 112019011128 A2	10-11-2020
		CN 110573433 A	13-12-2019
		EP 3573901 A1	04-12-2019
		ES 2836198 T3	24-06-2021
		JP 2021517541 A	26-07-2021
		KR 20190117478 A	16-10-2019
		PL 3573901 T3	06-04-2021
		RU 2019120189 A	05-05-2022
		US 2021002044 A1	07-01-2021
		WO 2019192714 A1	10-10-2019
GB 1265008 A	01-03-1972	NONE	
US 3991904 A	16-11-1976	NONE	
WO 2021189127 A1	30-09-2021	CA 3164876 A1	30-09-2021
		CN 114787045 A	22-07-2022
		EP 4126690 A1	08-02-2023
		WO 2021189127 A1	30-09-2021
US 2022002021 A1	06-01-2022	BR 112021007456 A2	20-07-2021
		CN 113015683 A	22-06-2021
		EP 3880574 A1	22-09-2021
		EP 3995410 A1	11-05-2022
		US 2022002021 A1	06-01-2022
		US 2023090849 A1	23-03-2023
		WO 2020099200 A1	22-05-2020
WO 2021021095 A1	04-02-2021	BR 112022001463 A2	22-03-2022
		CA 3148920 A1	04-02-2021
		CN 114423683 A	29-04-2022
		EP 4003851 A1	01-06-2022
		JP 2022545169 A	26-10-2022
		KR 20220038429 A	28-03-2022
		WO 2021021095 A1	04-02-2021

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Patent documents cited in the description

- WO 2021021095 A1 **[0002]**
- WO 2021189127 A **[0003]**