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(54) **A CAP FOR CLOSING A CONTAINER, A COMBINATION OF A CAP AND A NECK**

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(57) **ABSTRACT**

A combination comprises a cap for a container and a neck of a container. The neck is delimited by an outer surface from which a circular enlargement projects, the outer surface extending up to a rim of the neck. The cap comprises a side wall extending about an axis. A separation line is provided on the side wall for defining a retaining ring intended to engage with the circular enlargement to remain anchored to the neck of the container and a closure element removably engageable with the neck so as to be movable between a closed position and an open position. The separation line extends about the axis and is circumferentially interrupted so as to leave a joining portion between the retaining ring and the closure element. The cap further has an incision line which extends transversally to the axis between the separation line and a free edge of the retaining ring, so that two connecting bands are defined between the separation line and the incision line, the connecting bands joining the retaining ring to the joining portion. The connecting bands are deformable for allowing the joining portion to rotate when the closure element is moved from the closed position to the open position, so that an edge of the joining portion which, in the closed position, faces the retaining ring, is facing towards the rim of the neck in the open position.

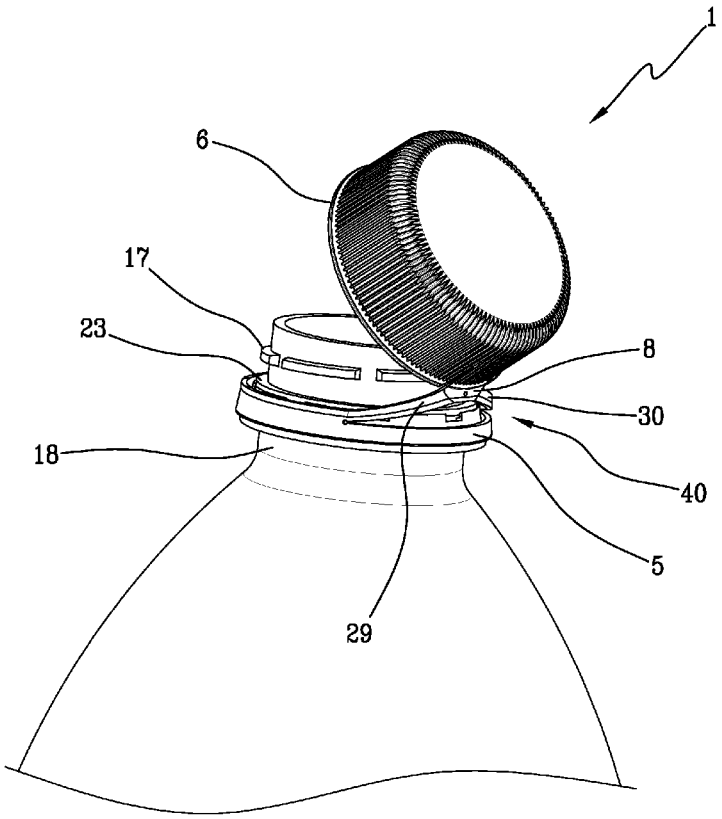
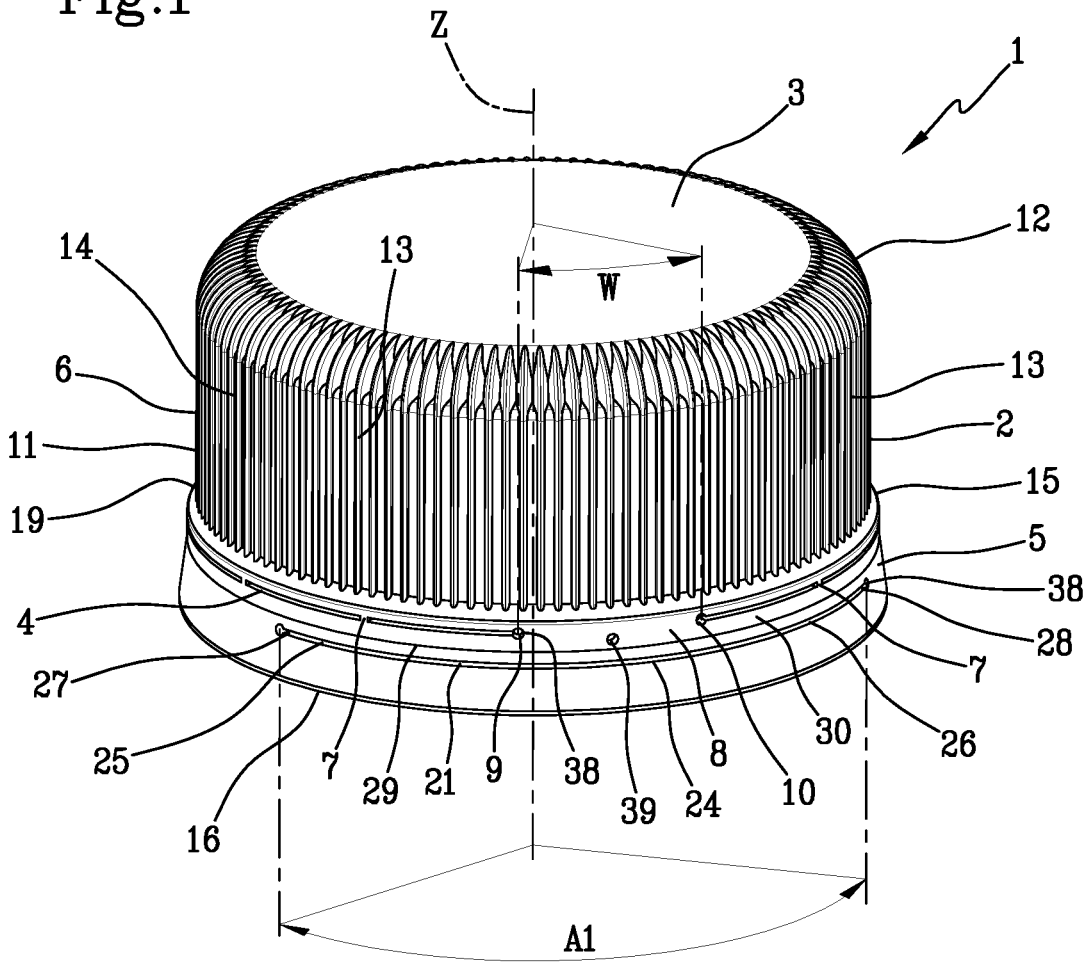


Fig.1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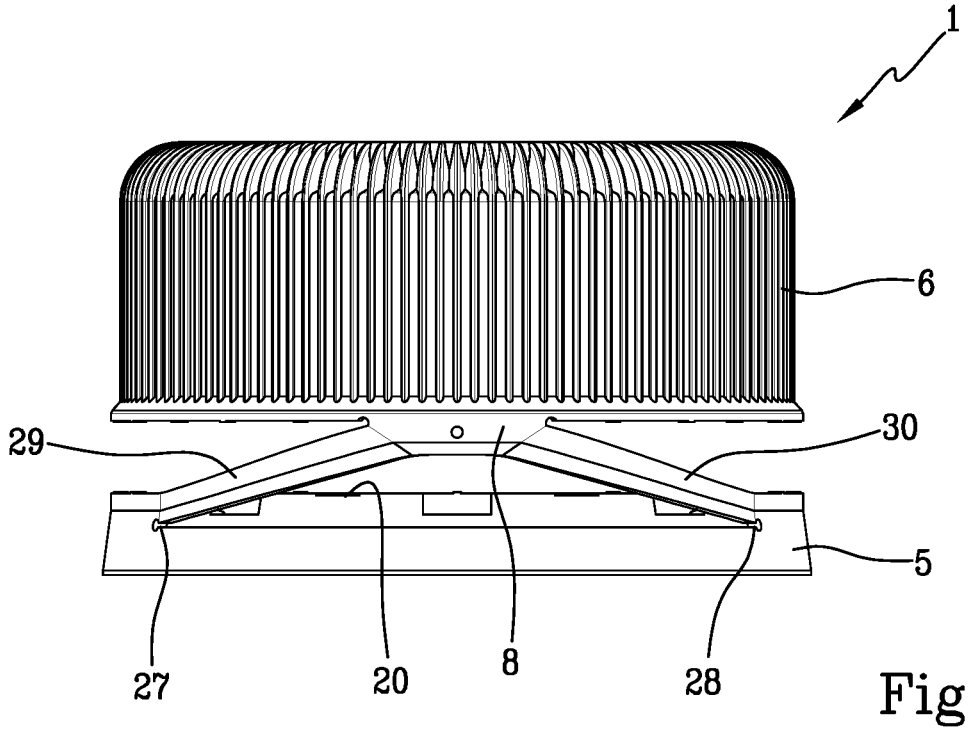
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Fig.2

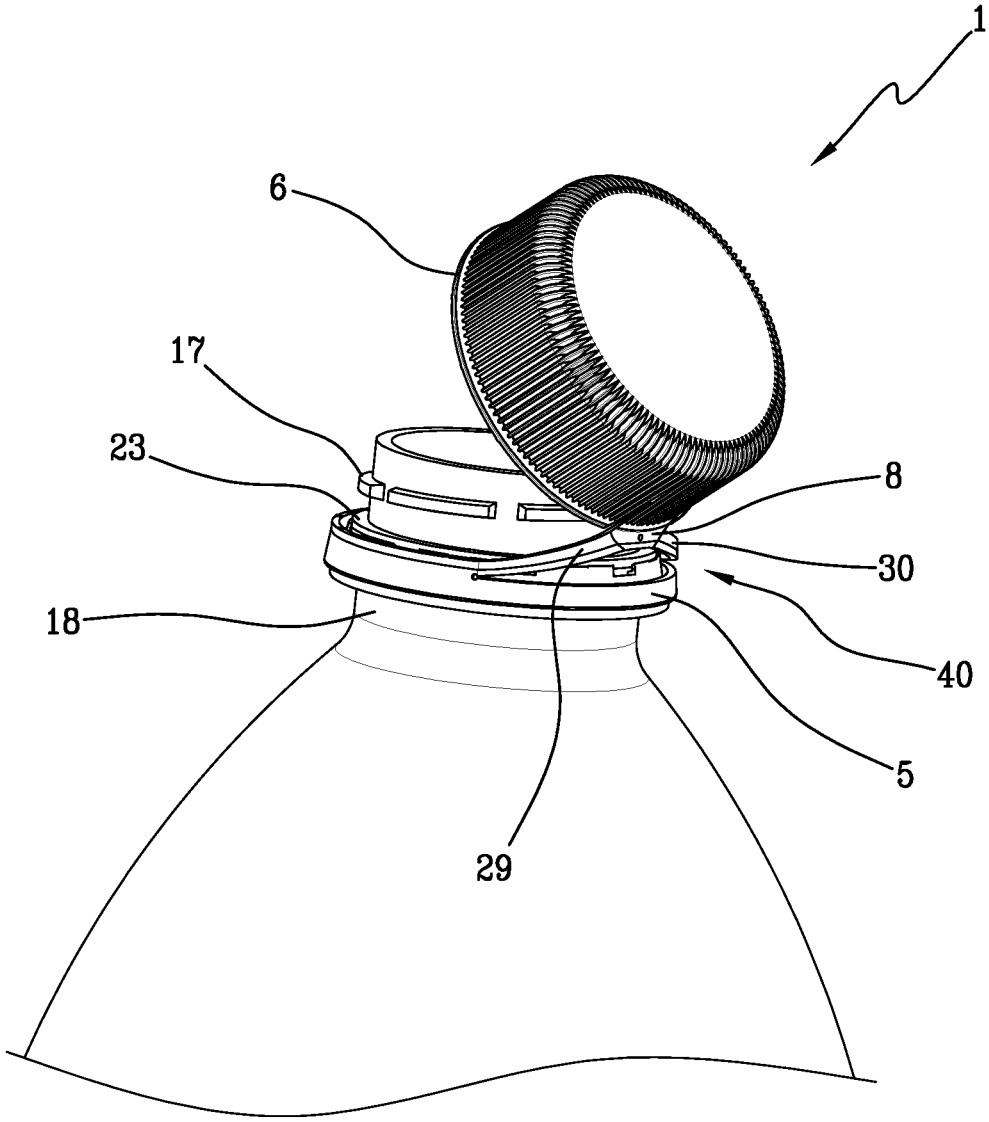
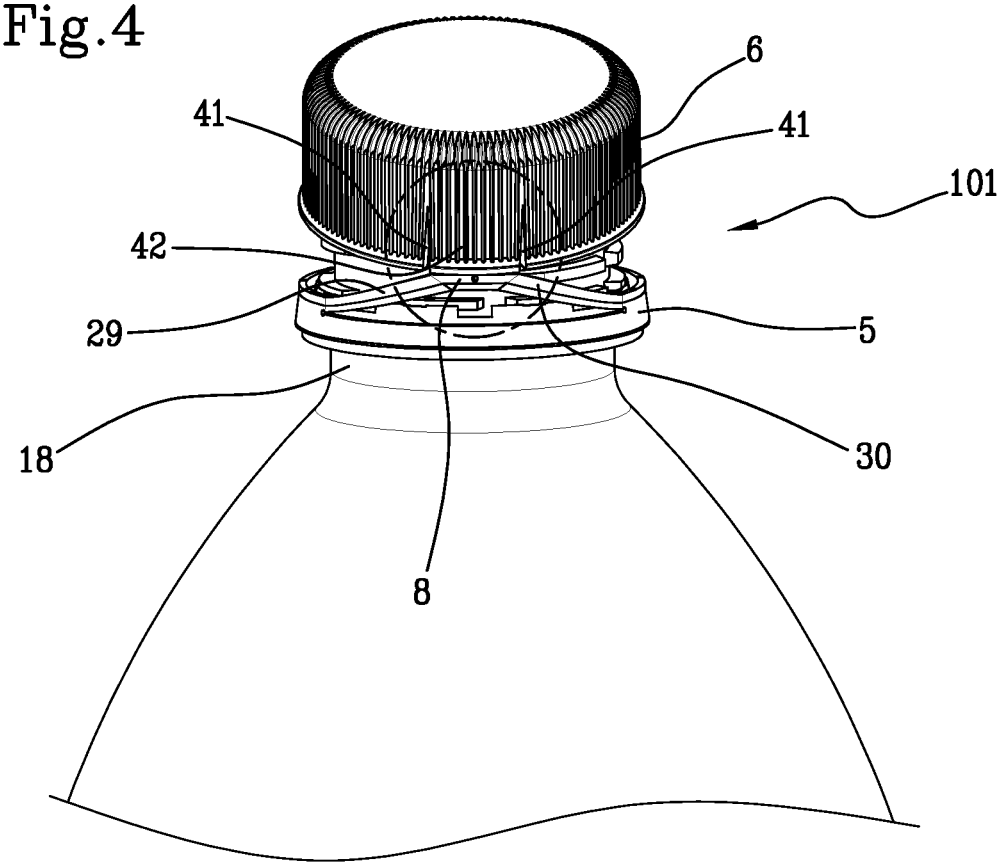


Fig.3

Fig.4



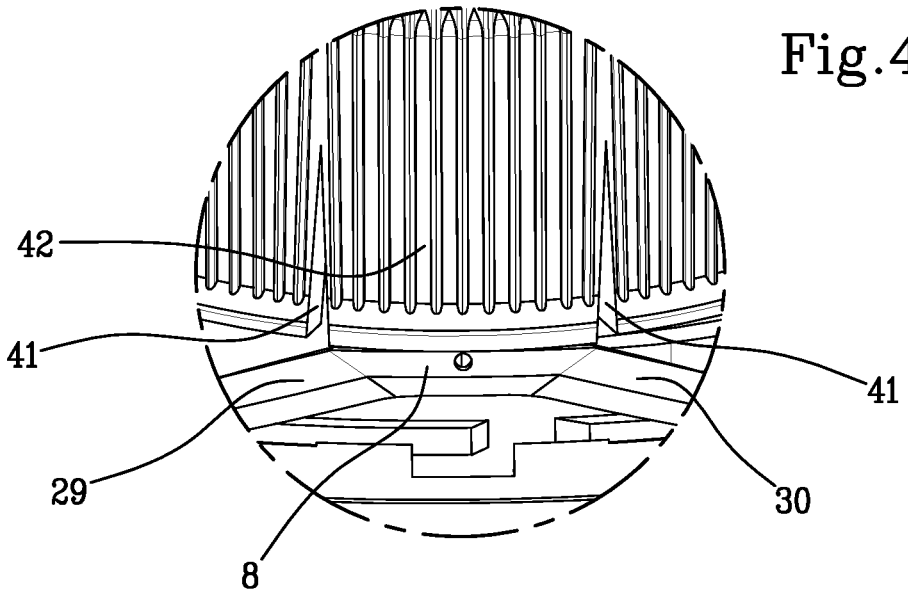
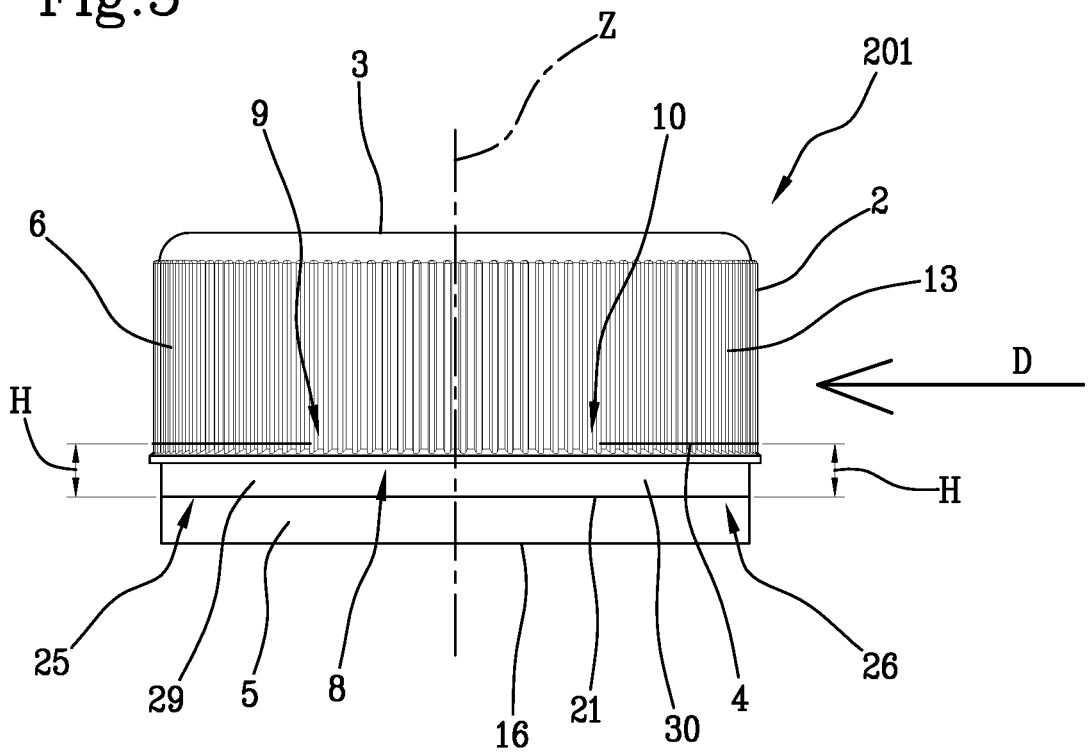


Fig.4a

Fig.5



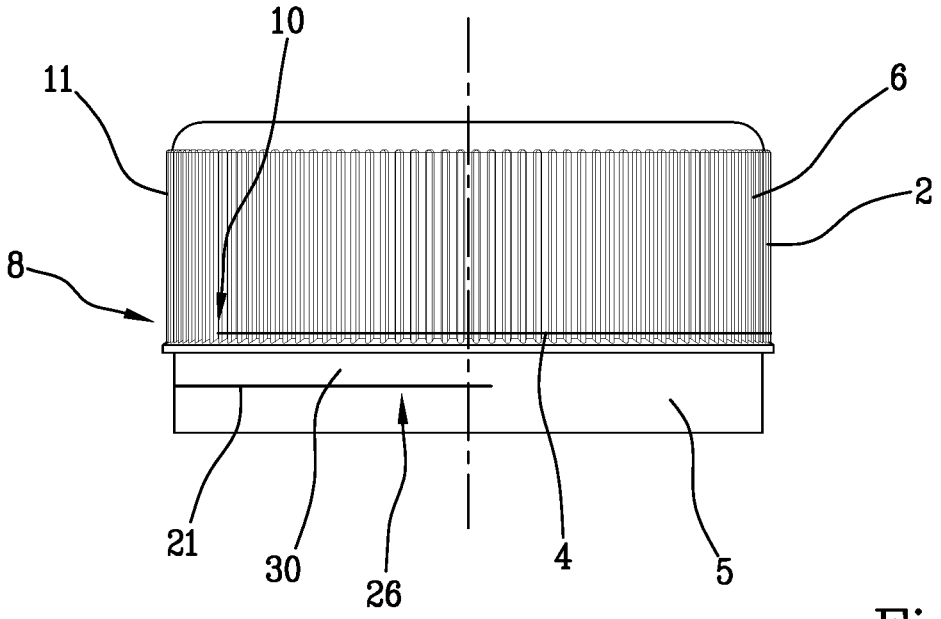


Fig.6

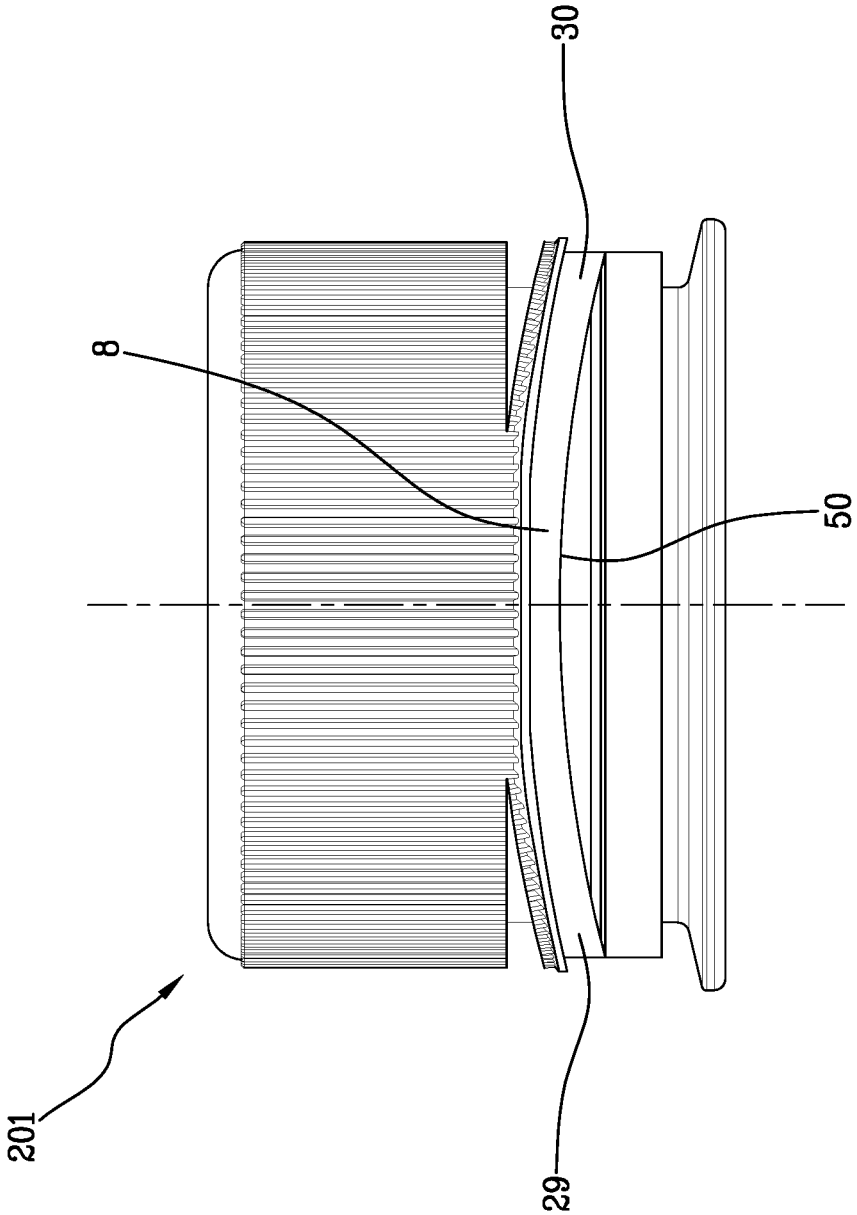


Fig.7

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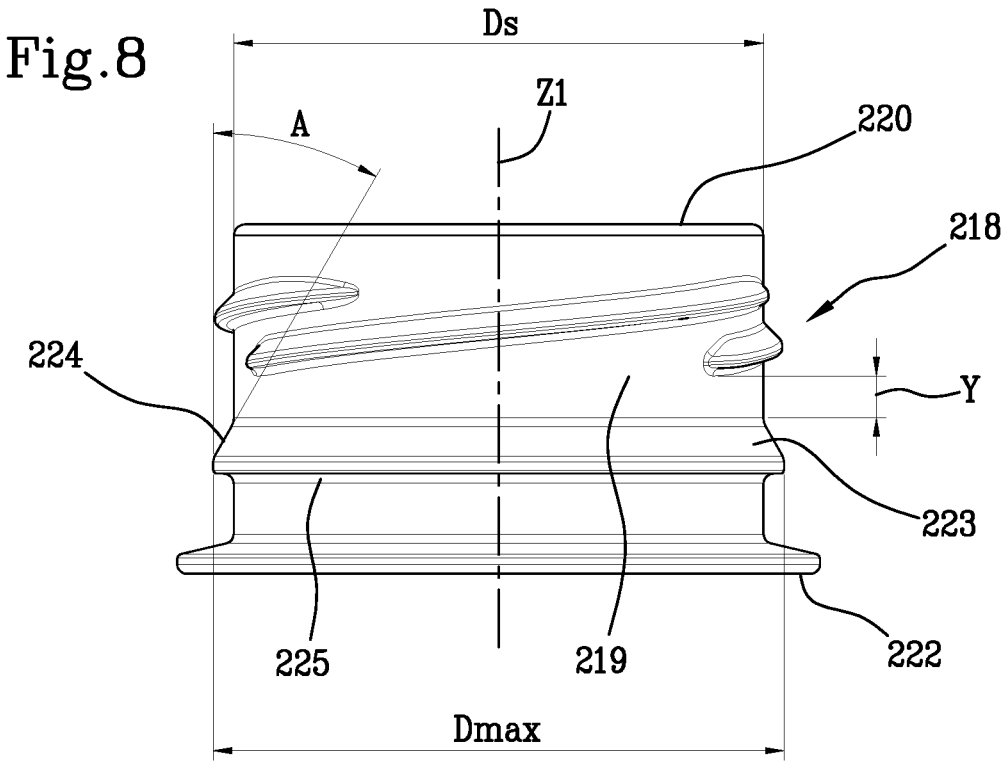
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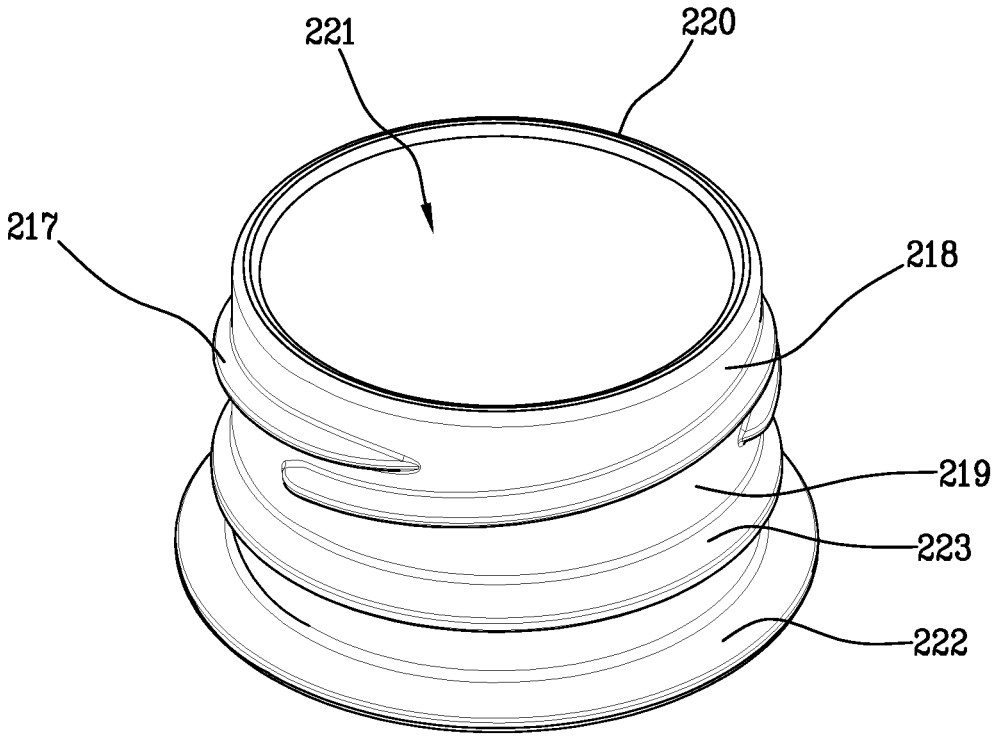
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Fig.9

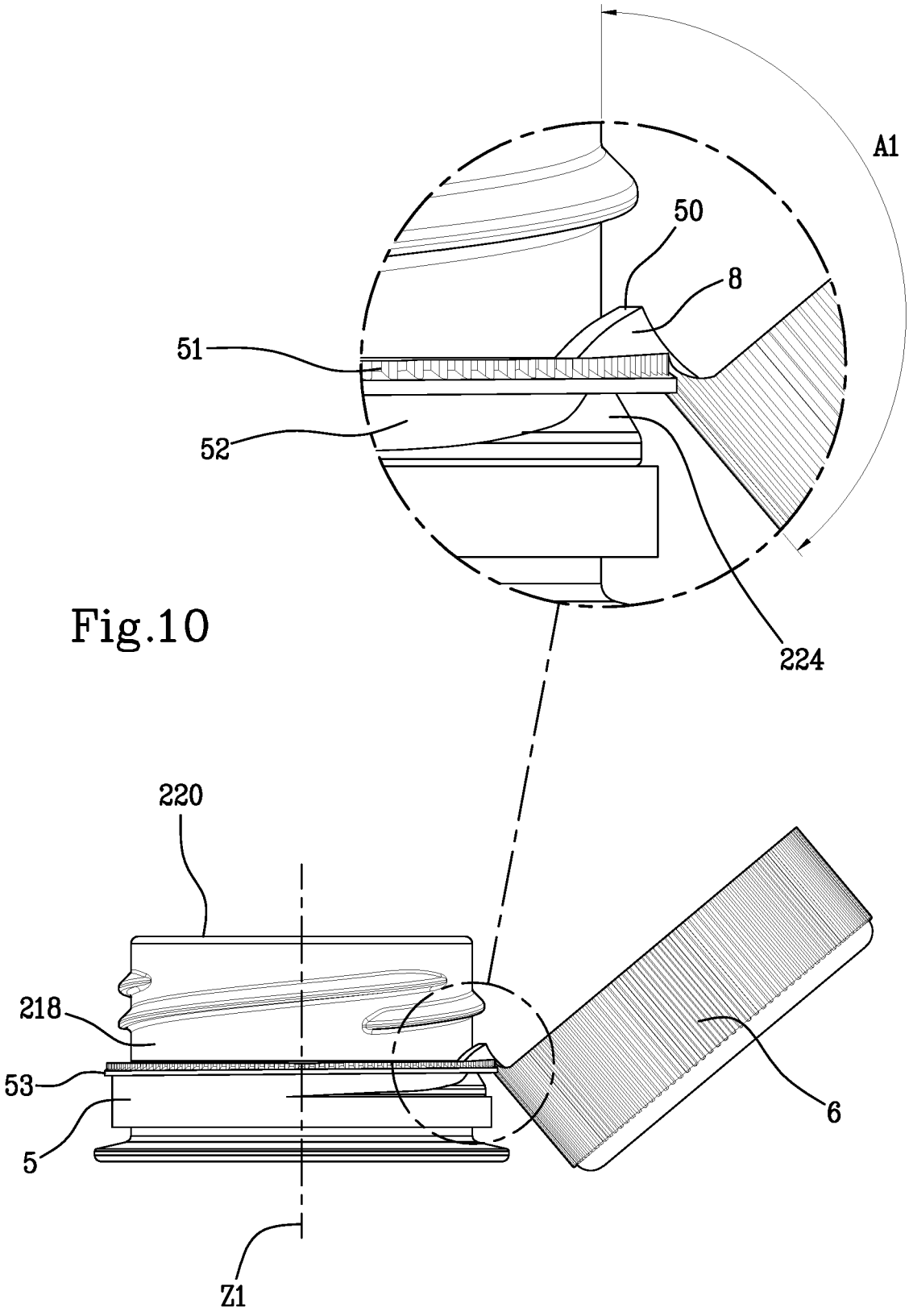

Fig.10

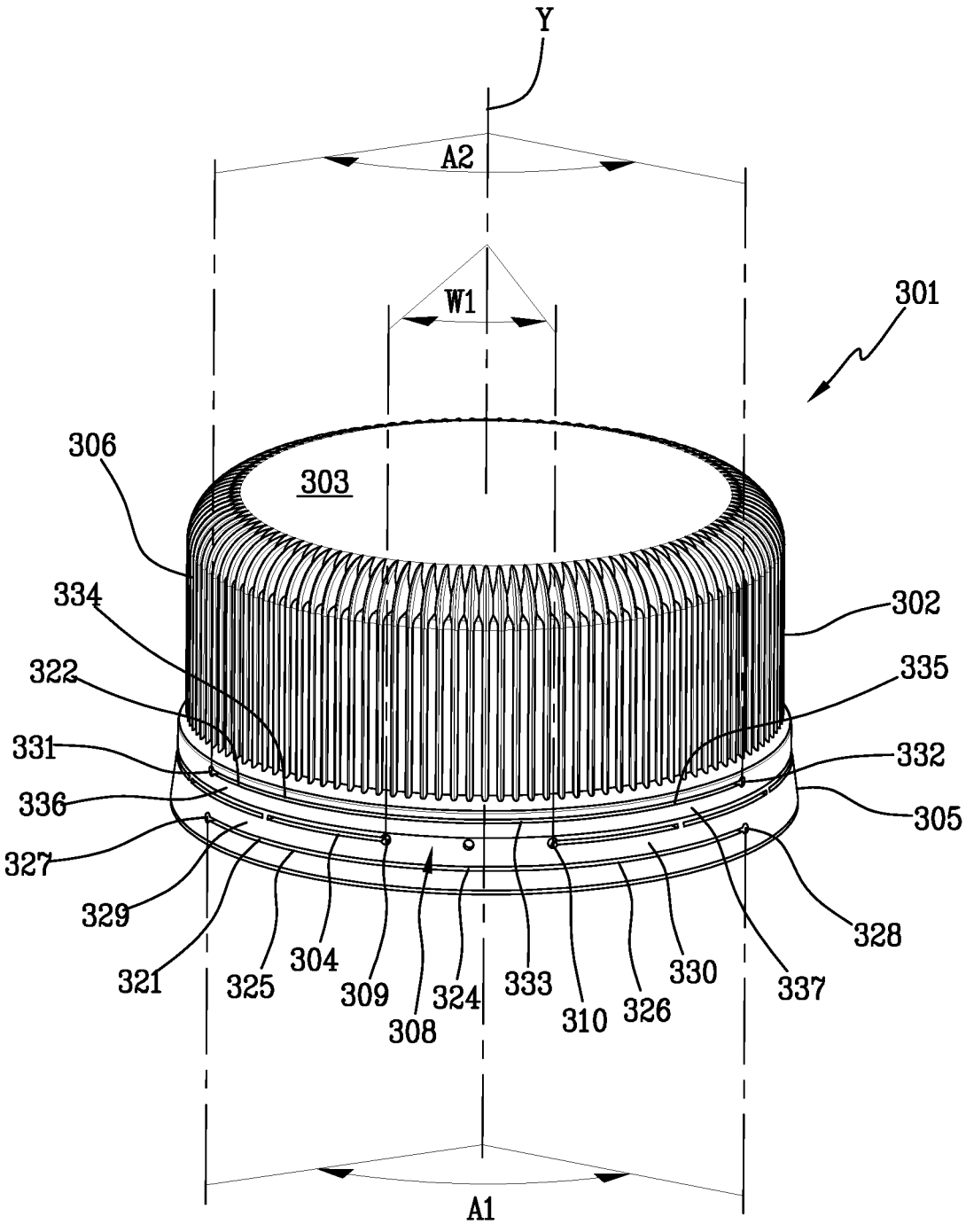
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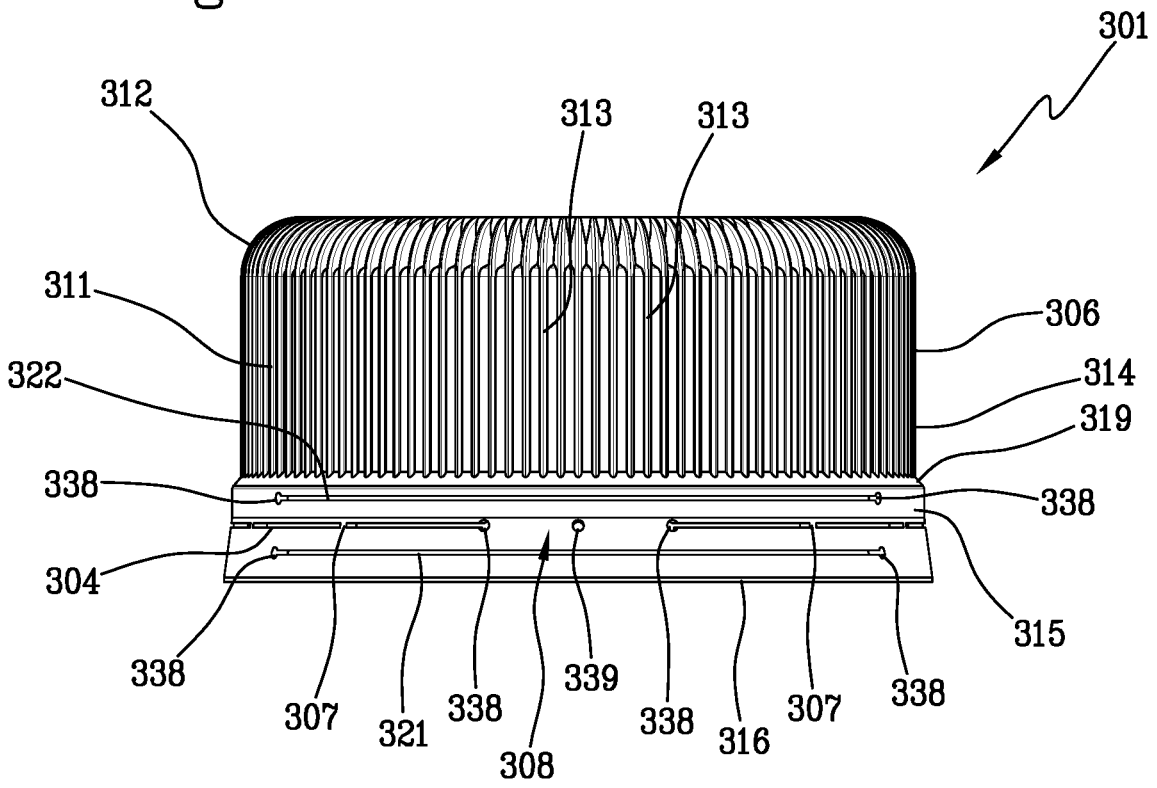
Fig.11

Fig.12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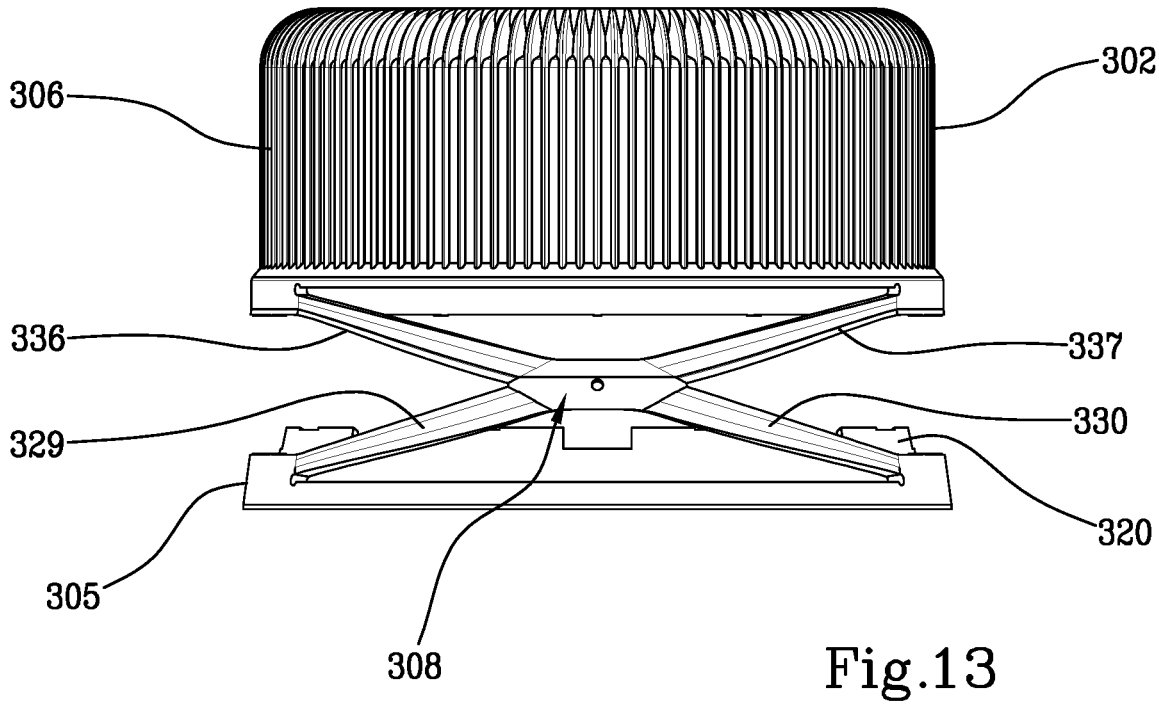
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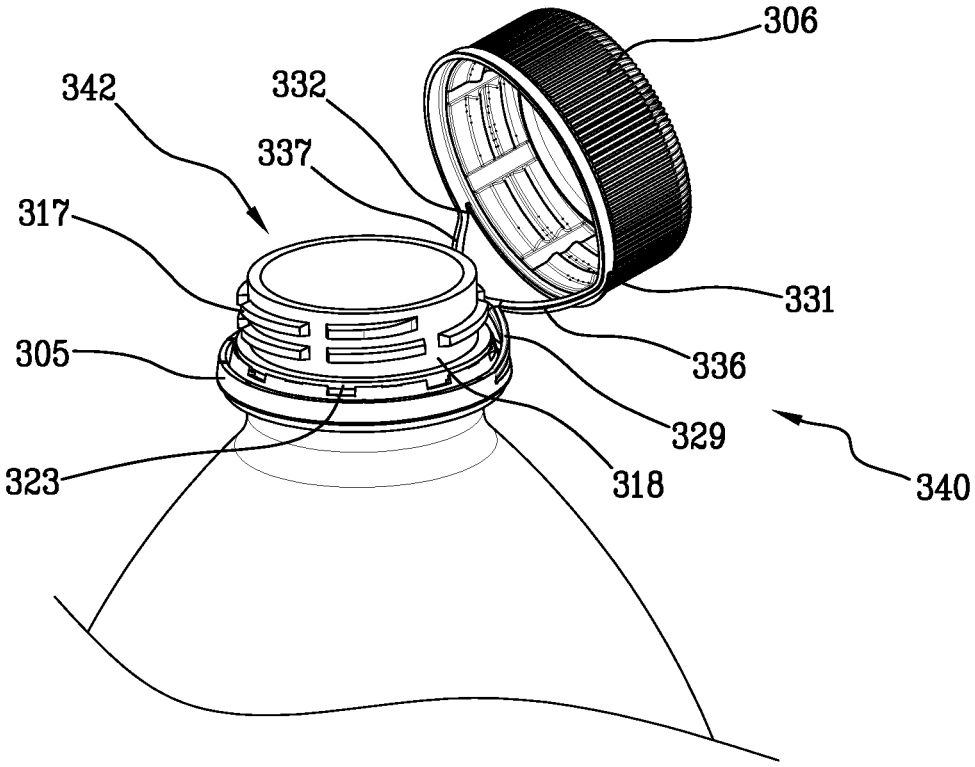
Fig.13

Fig.14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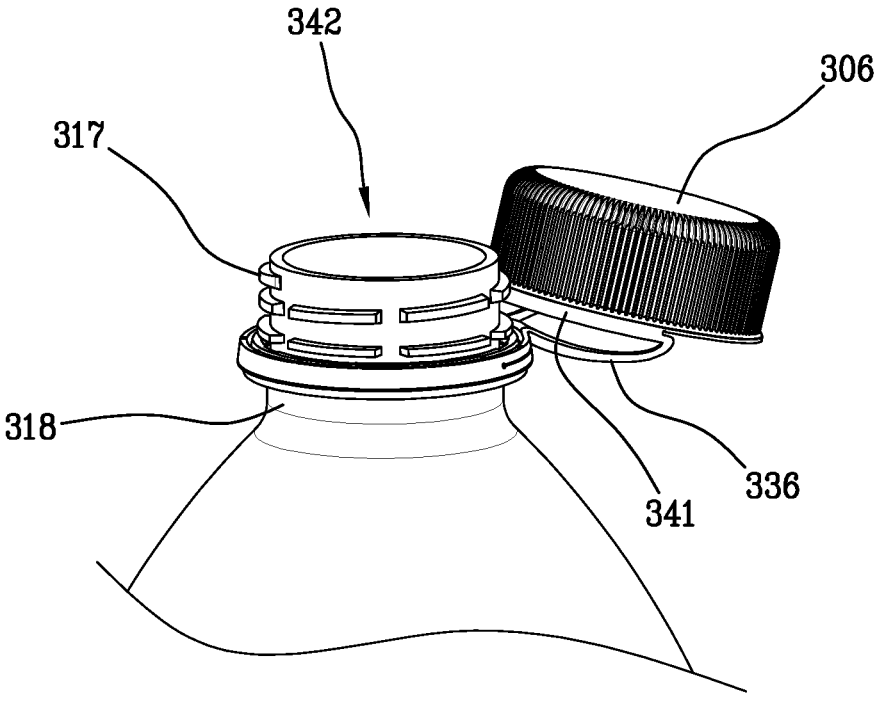
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Fig.15

A CAP FOR CLOSING A CONTAINER, A COMBINATION OF A CAP AND A NECK

[0001] This invention relates to a cap for a container, in particular a cap having a retaining ring, which can be associated with a neck of the container, the cap further having a closure element which, after opening, remains connected to the retaining ring. The cap according to the invention is particularly, but not exclusively, suitable for being applied to bottles intended to contain liquid substances.

[0002] The invention further relates to a combination of a cap and of a neck of a container.

[0003] In addition, the invention relates to a method for the production of a cap for a container.

[0004] Caps for bottles are known, which comprise a cup-shaped body provided with an inner thread suitable for engaging with an outer thread of a neck of the bottle. The known caps are further provided with a tamper-evident ring connected to the cup-shaped body by a plurality of breakable elements. When the cap is opened for the first time, the cup-shaped body separates from the tamper-evident ring due to breakage of the breakable elements. The tamper-evident ring remains associated with the neck of the bottle, whilst the cup-shaped body can be unscrewed by the user, which in this way separates the cup-shaped body from the bottle to access the contents of the bottle. Subsequently, the cup-shaped body can be screwed again on the neck to reclose the bottle.

[0005] Sometimes, after the bottle has been emptied, the user throws the cup-shaped body on the ground, either intentionally or accidentally, whilst the bottle, together with tamper-evident ring associated thereto, is correctly disposed of in a waste bin.

[0006] To overcome this drawback, caps have been proposed which are provided with a retaining ring, which can be associated with a neck of a bottle, and a closure element, connected to the retaining ring by a hinge. The closure element can be rotated about the hinge between an open position, in which a user can access the contents of the bottle, and a closed position, in which the closure element prevents access to the bottle. The hinge keeps the closure element associated with the retaining ring and, therefore, with the bottle, thereby preventing the closure element from being thrown on the ground independently of the bottle.

[0007] The known caps provided with a hinge have however the drawback of being rather complicated to be manufactured. In effect, the hinge is usually produced in the same mould in which the cap is obtained, particularly by injection moulding or compression moulding.

[0008] In order to produce the caps with a hinge of known type it is therefore necessary to provide special moulds, different from those which are normally adopted for producing the caps free of the hinge. These moulds are more complicated than the ordinary ones, in particular because the caps with hinge of known type may have undercut parts, which thus require special means in order to be extracted from the mould.

[0009] Moreover, the caps with a hinge of known type may have zones with a very reduced thickness, which are difficult to obtain because the molten polymeric material flows with difficulty in the portions of the mould intended to form these zones.

[0010] This increases the costs for the production of the caps with hinge and/or the cycle time necessary to obtain them.

[0011] In caps with a hinge of the known type, sometimes the closure element, after having been moved to the open position, prematurely recloses by rotating about the hinge. It may also happen that the closure element partly rotates about the hinge, thereby moving into a vertical, or almost vertical configuration. In these cases, the closure element may in an unwelcome way strike the face of a user, who is drinking from the bottle to which the cap with hinge is applied, or be interposed in the desired way between the bottle and a container, for example a glass, into which a liquid contained in the bottle is poured.

[0012] Moreover, in caps with a hinge of the known type, when the closure element has been moved to the open position, the retaining ring, which remained associated with the neck, is free to rotate about the neck itself. Therefore, it may happen that, whilst a user is drinking a liquid contained in the bottle to which the cap with a hinge is applied, or is pouring the liquid contained in the bottle into a glass, the retaining ring rotates about the neck due to the force of gravity, together with the closure element. If that occurs, the closure element may strike the face of the user who is drinking, or be interposed between the neck of the bottle and the glass, which obstructs the dispensing of the liquid into the glass.

[0013] An object of the invention is to improve the caps of known type, particularly the caps comprising a retaining ring intended to remain associated with a neck of the container and a closure element which may removably engage with the neck to allow a user to open or alternatively close the container.

[0014] Another object is to provide a cap for a container, of the type mentioned above, which can be produced simply.

[0015] A further object is to provide a cap for a container, provided with a closure element that remains connected to the retaining ring which does not require very complicated moulds for its production.

[0016] A further object is to provide a cap for a container, comprising a closure element that remains connected to the retaining ring, wherein the closure element is kept stably in an open position.

[0017] Another object is to provide a cap for a container wherein, in the open position, there is reduced risk of the closure element accidentally striking the face of the user or obstructing the dispensing of a substance contained in the container into a glass or the like.

[0018] In a first aspect of the invention, there is provided a combination of a cap for a container and of a neck of a container,

[0019] wherein the neck is delimited by an outer surface from which a circular enlargement projects, the outer surface extending up to a rim of the neck,

[0020] and wherein the cap comprises a side wall extending about an axis, a separation line being provided on the side wall for defining:

[0021] a retaining ring intended to engage with the circular enlargement to remain anchored to the neck,

[0022] and a closure element which can removably engage the neck so as to be movable between a closed position and an open position,

[0023] wherein the separation line extends about the axis and is circumferentially interrupted so as to leave a joining portion between the retaining ring and the closure element,

[0024] wherein the cap further has an incision line which extends transversally to the axis between the separation line and a free edge of the retaining ring, so that two connecting bands are defined between the separation line and the incision line, the two connecting bands joining the retaining ring to the joining portion,

[0025] and wherein the connecting bands are deformable to allow the joining portion to rotate when the closure element is moved from the closed position to the open position, so that an edge of the joining portion which, in the closed position, faces the retaining ring, is facing towards the rim of the neck in the open position.

[0026] Owing to this aspect of the invention, it is possible to obtain a cap capable of stably remaining in the open position. In effect, when the joining portion rotates whilst the closure element passes from the closed position to the open position, interference occurs between the joining portion and the neck of the container. This interference persists even in the open position. In order to bring the closure element back to the closed position, a predetermined force has to be applied to the closure element, so as to overcome the interference between the neck and the joining portion. This makes it difficult, if not impossible, for the closure element to return to the closed position on its own.

[0027] In more detail, in the open position, the joining portion rests on the neck of container and the connecting bands, which have been deformed, apply on the joining portion a force which tends to keep the joining portion in contact with the neck of the container. That causes the interference between the joining portion and the neck of the container, which stably keeps the closure element in the open position.

[0028] Owing to the interference between the joining portion and the neck, rotation of the cap, in particular of the retaining ring, about the neck, is also obstructed.

[0029] In an embodiment, the connecting bands are deformable by a twisting movement when the closure element is moved from the closed position to the open position.

[0030] This twisting movement may affect at least one part of the height of each connecting band, the height being defined as the dimension of the connecting band in a direction parallel to the axis, in the closed position of the closure element.

[0031] This makes is possible to rotate the joining portion as previously described, without providing fracture or weakening lines placed between the joining portion and the connecting bands. Consequently production of the cap is facilitated.

[0032] Whilst the joining portion rotates and its edge slides in contact with the neck until it reaches the open position in which the edge of the joining portion is facing towards the rim of the neck, an interference is generated between the joining portion and the neck, which reaches a maximum value when the joining portion is substantially perpendicular to the neck, and which is reduced (but without reaching a null value) after the joining portion has overturned and is resting on the neck with the edge facing upwards.

[0033] The user who moves the closure element towards the open position notices that the position in which the interference is at its maximum has been passed, since his/her hand perceives a sort of vibration which makes he/she understand that the closure element has been stably moved to the open position. That is welcomed by the user, who has the certainty of having correctly opened the container.

[0034] In an embodiment, the distance between the separation line and the incision line is equal to, or greater than, 1.5 times half the difference between the external diameter of the circular enlargement and the diameter of the outer surface of the neck, immediately above the circular enlargement.

[0035] The above-mentioned distance is measured parallel to the axis of the side wall, when the closure element is in the closed position. This distance therefore corresponds to the height of the connecting bands.

[0036] Experimentation has shown that the values of the distance between the separation line and the incision line mentioned above guarantee that the connecting bands deform correctly when the closure element passes from the closed position to the open position. In particular, if the distance between the separation line and the incision line satisfies the condition indicated above, a condition of interference between the joining portion and the neck occurs which is very favourable for keeping the closure element in the open position.

[0037] It is preferable for said distance between the separation line and the incision line to be equal to, or greater than, 2 times half the difference between the external diameter of the circular enlargement and the diameter of the outer surface of the neck, immediately above the circular enlargement.

[0038] It is even more preferable for said distance between the separation line and the incision line to be equal to, or greater than, 2.5 times half the difference between the external diameter of the circular enlargement and the diameter of the outer surface of the neck, immediately above the circular enlargement.

[0039] In an embodiment, the joining portion has an angular dimension about the axis of the side wall, greater than, or equal to, 20°, preferably greater than, or equal to, 25°.

[0040] In an embodiment, the joining portion has an angular dimension about the axis of the side wall which is less than, or equal to, 120°, preferably less than, or equal to, 90°.

[0041] In this way, the joining portion is not too wide about the axis of the side wall, which would make it difficult for the joining portion to overturn, that is to say for its edge to pass from a configuration facing the retaining ring, to a configuration facing towards the rim of the neck.

[0042] At the same time, the joining portion is not too narrow about the axis of the side wall, which could generate an interference, between the joining portion and the neck, which is not sufficient to keep the closure element stably in the open position.

[0043] In an embodiment, the neck is provided with at least one fixing element suitable for engaging with the closure element to allow the closure element to be removably fixed to the neck.

[0044] The at least one fixing element may comprise a thread having one or more starts.

[0045] Preferably but not necessarily, the distance between the circular enlargement and the at least one fixing element is greater than, or equal to, half of the distance between the separation line and the incision line.

[0046] In this way, between the circular enlargement and the at least one fixing element there is a space sufficient for receiving the joining portion, without the edge of the latter interfering with the at least one fixing element.

[0047] In an embodiment, the circular enlargement is delimited, towards the rim of the neck, by a truncated cone shaped surface.

[0048] In an embodiment, a generatrix of the truncated cone shaped surface forms an angle less than, or equal to, 35° with a straight line parallel to a longitudinal axis of the neck.

[0049] Preferably, the above-mentioned angle is 30°.

[0050] In this way, the closure element can easily be positioned in an open position in which it forms a sufficiently large angle of opening with the neck.

[0051] In an embodiment, the separation line extends in a portion of the side wall in which a plurality of knurling lines is provided.

[0052] That is to say, the separation line intersects the knurling lines provided on the side wall of the cap.

[0053] That allows maximisation of the height of the connecting bands, without compromising the capacity to grip the cap by a user or a capping machine. Alternatively, the separation line may extend in a portion of the side wall externally delimited by a smooth surface, that is to say, a surface free of knurling lines.

[0054] In a second aspect of the invention, there is provided a cap for a container, comprising a side wall extending about an axis and a transversal wall arranged at an end of the side wall, a separation line being provided on the side wall for defining:

[0055] a retaining ring intended to remain anchored to a neck of the container, and

[0056] a closure element which can removably engage the neck, so as to open or close the container;

[0057] wherein the separation line extends about the axis and is circumferentially interrupted so as to leave a joining portion between the retaining ring and the closure element, the joining portion defining a hinge band which extends between two opposite end zones of the joining portion,

[0058] the cap further having an incision line which extends transversally to the axis between the separation line and a free edge of the retaining ring, so that two connecting bands are defined between the separation line and the incision line, the two connecting bands joining the retaining ring to the opposite end zones of the joining portion.

[0059] The joining portion makes it possible to keep the closure element stably associated with the retaining ring and therefore with the neck of the container. This prevents the closure element from being thrown on the ground separately from the container. This thus increases the probability that the closure element, together with the container, is correctly disposed of together with waste of the same type, in particular together with plastic material waste.

[0060] The cap provided by the second aspect of the invention may be produced in a relatively simple manner, without the need to use special moulds. In effect, the cap provided by the second aspect of the invention can be produced in a traditional mould, if the incision line is made by a cutting operation. It is possible by the cutting operation to obtain an incision line passing through the entire thickness of the side wall, or an incision line which does not pass through, at which the thickness of the side wall is cut only partially.

[0061] It is also possible to produce the incision line by moulding, inside the mould in which the cap is produced, but without, however, causing excessive complications of the mould, owing to the particularly simple shape of the incision line. In this case, the incision line may even be shaped as a weakening line.

[0062] Since the incision line lies between the separation line and the free edge of the retaining ring, the incision line does not weaken the joining portion. In the cap provided in the second aspect of the invention, the joining portion is therefore relatively sturdy, which makes it more difficult to accidentally separate the retaining ring from the closure element.

[0063] The connecting bands, together with the joining portion, define a hinge arrangement which has a capacity for movement, in an axial direction, noticeably greater than the capacity for movement which would be allowed by the joining portion alone.

[0064] In effect, that hinge arrangement makes it possible to move the closure element away from the retaining ring along a significant axial distance, determined by the combination of the length of the connecting bands and of the joining portion. In this way the closure element can be easily disengaged from the neck of the container.

[0065] In an embodiment, the joining portion has an angular dimension about the axis of the side wall, greater than, or equal to, 20°, preferably greater than, or equal to, 25°.

[0066] In an embodiment, the joining portion has an angular dimension about the axis of the side wall which is less than, or equal to, 120°, preferably less than, or equal to, 90°.

[0067] That allows the joining portion to rotate when the closure element is moved from a closed position to an open position, so that an edge of the joining portion which, in the closed position, faces the retaining ring, is facing towards a rim of the neck in the open position. In this way it is possible to obtain the advantages previously described with reference to the first aspect of the invention, in particular relative to the closure element which is stably kept in the open position.

[0068] In an embodiment, the connecting bands may be arranged symmetrically to each other relative to a plane containing the axis of the side wall and a centre line of the joining portion.

[0069] This symmetrical shape allows a reduction in the involuntary movements of the closure element when the cap is in an open position, in particular limiting its lateral movements.

[0070] In an embodiment, the joining portion has a thickness substantially constant on a plane containing the separation line.

[0071] That makes the cap of the second aspect of the invention even simpler to make, since special moulds are not necessary for producing triangular hinges or very thin joining lines.

[0072] In a third aspect of the invention, a method is provided comprising the steps of:

[0073] producing a cap for a container, the cap comprising a side wall extending about an axis and a transversal wall arranged at an end of the side wall,

[0074] providing a separation line on the side wall for defining a retaining ring intended to remain anchored to a neck of the container, and a closure element which can removably engage the neck, so as to open or close

the container, wherein the separation line extends about the axis and is circumferentially interrupted so as to leave a joining portion between the retaining ring and the closure element,

[0075] making an incision line which extends transversally to the axis, so that two connecting bands are defined between the separation line and the incision line, the two connecting bands joining the retaining ring to the joining portion.

[0076] The method according to the third aspect of the invention makes it possible to obtain, in a particularly simple manner, a cap wherein the closure element remains associated with the retaining ring.

[0077] In a fourth aspect of the invention, there is provided a cap for a container, comprising a side wall extending about an axis and a transversal wall arranged at an end of the side wall, a separation line being provided on the side wall for defining:

[0078] a retaining ring intended to remain anchored to a neck of the container, and

[0079] a closure element which can removably engage the neck, so as to open or close the container;

[0080] wherein the separation line extends about the axis and is circumferentially interrupted for defining a joining portion having an angular dimension about the axis,

[0081] the cap further having a first incision line and a second incision line, which extend transversely to the axis for delimiting the joining portion on opposite sides, the first incision line and the second incision line having respective angular extensions about the axis greater than the angular dimension of the joining portion.

[0082] The joining portion makes it possible to keep the closure element stably associated with the retaining ring and therefore with the neck of the container. This prevents the closure element from being thrown on the ground separately from the container. This thus increases the probability that the closure element, together with the container, is correctly disposed of together with waste of the same type, in particular together with plastic material waste.

[0083] The cap according to the fourth aspect of the invention may be produced in a relatively simple manner, without need to use special moulds. In effect, the cap according to the fourth aspect of the invention can be produced in a traditional mould, if the first incision line and the second incision line are made by a cutting operation. It is possible by the cutting operation to obtain incision lines passing through the entire thickness of the side wall, or incision lines which do not pass through, at which the thickness of the side wall is cut only partially.

[0084] It is also possible to consider the production of the first incision line and the second incision line by moulding, inside the mould in which the cap is produced, but without, however, causing excessive complications of the mould, owing to the particularly simple shape of the first incision line and the second incision line. In this case, the first incision line and the second incision line may be shaped as weakening lines.

[0085] Since the first incision line and the second incision line lie on opposite sides of the joining portion, the first incision line and the second incision line do not weaken the joining portion. In the cap according to the fourth aspect of the invention, the joining portion is therefore relatively sturdy, which makes it more difficult to accidentally separate the retaining ring from the closure element.

[0086] In an embodiment, the first incision line delimits at least partially a connecting band and a further connecting band which connect the retaining ring to the joining portion.

[0087] The connecting band may be defined between a peripheral part of the first incision line and an end portion of the separation line.

[0088] The further connecting band may be defined between a further peripheral part of the first incision line and a further end portion of the separation line.

[0089] The joining portion is interposed between the end portion and the further end portion of the separation line.

[0090] In an embodiment, the second incision line delimits at least partially a connecting strip and a further connecting strip which connect the closure element to the joining portion.

[0091] The connecting strip may be defined between a peripheral portion of the second incision line and an end portion of the separation line.

[0092] The further connecting strip can be defined between a further peripheral portion of the second incision line and a further end portion of the separation line.

[0093] The retaining ring is thus connected to the joining portion by the connecting band and the further connecting band, which converge in the joining portion from two regions of the retaining ring spaced apart from each other.

[0094] The closure element is in turn connected to the joining portion by the connecting strip and the further connecting strip, which converge in the joining portion from two regions of the closure element spaced apart from each other.

[0095] The connecting band, the further connecting band, the connecting strip and the further connecting strip define a hinge arrangement which is particularly robust and effective.

[0096] In effect, the hinge arrangement makes it possible to move the closure element away from the retaining ring along a significant axial distance, determined by the combination of the length of the connecting band and the connecting strip (or by the combination of the length of the further connecting band and the further connecting strip). In this way the closure element can be easily disengaged from the neck of the container.

[0097] The joining portion guarantees that the hinge arrangement has a good resistance, which for the same length is certainly greater than a hinge defined by only two bands parallel to each other, which are not connected to each other.

[0098] This reduces the risk that the closure element can be accidentally detached from the retaining ring, as well reducing the possibility of lateral misalignments of the closure element when the cap is moved to an open position.

[0099] In an embodiment, the connecting band and the connecting strip may be arranged symmetrically to the further connecting band and, respectively, to the further connecting strip relative to a plane containing the axis of the side wall and a centre line of the joining portion.

[0100] This symmetrical shape reduces the involuntary movements of the closure element when the cap is in an open position, in particular limiting the lateral movements of the closure element.

[0101] In an embodiment, in an open position, the closure element is rotatable about an ideal line passing through an end of the second incision line and through a further end of the second incision line, so that an edge zone of the closure

element diametrically opposite the joining portion can be moved close to the joining portion for engaging with the neck.

[0102] This makes it possible to keep the closure element stably spaced from the neck in the open position, thereby preventing the closure element from tending to reclose accidentally.

[0103] The invention can be better understood and implemented with reference to the accompanying drawings which illustrate some non-limiting example embodiments of it and in which:

[0104] FIG. **1** is a perspective view of a cap for a container, in a closed position;

[0105] FIG. **2** is a side view of the cap of FIG. **1**, in a configuration wherein a closure element of the cap is separated from a retaining ring;

[0106] FIG. **3** is a perspective and interrupted view of the cap of FIG. **1**, applied on a neck of a container, in a configuration wherein a closure element of the cap is moved to a lateral position relative to the neck;

[0107] FIG. **4** is a perspective view of a cap according to an alternative embodiment, in a configuration wherein a closure element of the cap begins to be separated from the retaining ring;

[0108] FIG. **4***a* shows an enlarged detail of FIG. **4**;

[0109] FIG. **5** is a side view showing a cap for a container, according to an alternative embodiment;

[0110] FIG. **6** is a view like that of FIG. **5**, from the direction D indicated in FIG. **5**;

[0111] FIG. **7** is a side view like that of FIG. **5**, in a configuration wherein a closure element of the cap is separated from a retaining ring;

[0112] FIG. **8** is a side view of a neck on which the cap of FIG. **5** may be screwed;

[0113] FIG. **9** is a perspective view of the neck of FIG. **8**;

[0114] FIG. **10** is side view, showing the cap of FIG. **5**, applied on the neck of FIG. **8**, the closure element of the cap being arranged in an open position;

[0115] FIG. **11** is a perspective view of a cap for a container, in a closed position;

[0116] FIG. **12** is a side view of the cap of FIG. **11**, in the closed position;

[0117] FIG. **13** is a side view of the cap of FIG. **11**, in a configuration in which a closure element of the cap is separated from a retaining ring;

[0118] FIG. **14** is a perspective view of the cap of FIG. **11**, applied to a neck of a container, in an open position;

[0119] FIG. **15** is a view like that of FIG. **14**, wherein the closure element of the cap interferes with the neck to remain stably open.

[0120] FIG. **1** shows a cap **1** for closing a container, particularly a bottle intended to contain a liquid substance such as a drink. The cap **1** is made of polymeric material. Any polymeric material suitable for moulding may be used to obtain the cap **1**.

[0121] The cap **1** is shown in FIG. **1** in a closed position in which the cap **1** is when it leaves a cap production line, ready to be applied on the container. In this condition, the cap **1** comprises a side wall **2** which extends about an axis Z, and a transversal wall **3** arranged at an end of the side wall **2**, so as to close that end. The transversal wall **3** extends transversally, in particular perpendicularly, to the axis Z. The transversal wall **3** may be flat, even though other shapes are theoretically possible. In the example illustrated, the transversal wall **3** has a substantially circular shape in plan view.

[0122] The cap **1** has a separation line **4**, positioned on the side wall **2** and extending about the axis Z. The separation line **4** extends on a plane arranged transversally, in particular perpendicularly, to the axis Z. The separation line **4** defines on the cap **1** a retaining ring **5** and a closure element **6**. The latter are positioned on opposite sides of the separation line **4**. As described in more detail below, when the cap **1** is brought to an open position, the closure element **6** separates from the retaining ring **5** along the separation line **4**.

[0123] Along the separation line **4** a plurality of breakable bridges **7** may be provided, which connect the retaining ring **5** to the closure element **6**. The breakable bridges **7** are intended to be broken the first time the cap **1** is moved to the open position, to signal that the container is no longer intact. The separation line **4** may be parallel to a free edge **16** of the cap **1**. More specifically, the free edge **16** delimits the retaining ring **5** on the opposite side to the transversal wall **3**.

[0124] The separation line **4** does not extend for an entire angle of 360° about the axis Z. The separation line **4** is interrupted in the circumferential direction, so as to define on the side wall **2** a joining portion **8**, at which the closure element **6** remains joined to the retaining ring **5**.

[0125] In other words, the separation line **4** has a first end **9** and a second end **10**. The joining portion **8** is interposed between the first end **9** and the second end **10**. At the joining portion **8**, the retaining ring **5** is joined to the closure element **6**.

[0126] As shown in FIG. **1**, the joining portion **8** has an angular dimension W about the axis Z.

[0127] The joining portion **8** defines a hinge band about which the closure element **6** can rotate after disengaging from a neck **18**, shown in FIG. **3**, of the container on which the cap **1** is applied.

[0128] This hinge band extends between two opposite end zones of the joining portion **8**, that is to say, it extends from a zone of the joining portion **8** immediately adjacent to the first end **9** to a zone of the joining portion **8** immediately adjacent to the second end **10**.

[0129] The hinge band defined by the joining portion **8** therefore affects the entire angular dimension W of the joining portion **8**, without interposition of arrow shaped hinges or of reduced thickness zones.

[0130] In the example illustrated, the closure element **6** has a cup-shaped body and comprises a skirt **11** which extends about the axis Z. The skirt **11** is connected to the transversal wall **3**, arranged at the end of the skirt **11** opposite the separation line **4**. In particular, the skirt **11** is connected to the transversal wall **3** by a connecting zone **12**, which may be shaped, in cross section, like a beveled edge or a circular connection zone.

[0131] The skirt **11** has, on an inner surface thereof, a removably fixing arrangement, not shown, by which the closure element **6** can removably engage with the neck **18** of the container. The removably fixing arrangement may comprise, for example, an inner thread intended to engage with an outer thread **17**, shown in FIG. **3**, formed on the neck **18**.

[0132] The skirt **11** can be provided, on an outer surface thereof, with a plurality of knurling lines **13**, extending parallel to the axis Z and suitable for facilitating gripping of the cap **1** by the user or by the capping machine which applies the cap **1** on the container to be closed.

[0133] The knurling lines **13** may continue also in the connecting zone **12** and/or in the retaining ring **5**.

[0134] In the example shown, the skirt **11** comprises a cylindrical portion **14** on which the knurling lines **13** are made. The skirt **11** further comprises a wide portion **15** having a diameter larger than the cylindrical portion **14**. The wide portion **15** may be delimited by a smooth outside surface, that is to say, it can be free of knurling lines. This condition is not, however, necessary and the knurling lines could also extend on the wide portion **15**. Between the cylindrical portion **14** and the wide portion **15** a step **19** may be provided.

[0135] The retaining ring **5** extends between the free edge **16** and the separation line **4**. The retaining ring **5** may be delimited by a cylindrical or truncated cone shaped outer surface. In the closed position of the cap **1** shown in FIG. **1**, the retaining ring **5** is coaxial with the closure element **6**.

[0136] The retaining ring **5** is provided internally with an engagement element **20**, shown in FIG. **2**, suitable for engaging with a circular enlargement **23**, shown in FIG. **3**, which projects from an outer surface of the neck **18**. The engagement element **20** is configured to abut against the circular enlargement **23** in order to prevent axial movements of the retaining ring **5**, away from the neck **18**, when the closure element **6** is removed from the neck **18**.

[0137] The engagement element **20** may be shaped like an annular element which is bent around the free edge **16** towards the inside of the retaining ring **5**. In an alternative embodiment not illustrated, there may be a plurality of engagement elements, shaped like tabs which project from the free edge **16** and are bent towards the inside of the retaining ring **5**. Alternatively, the engagement element **20** may be shaped like an enlargement, continuous or interrupted, which from an inner surface of the retaining ring **5** projects towards the axis Z to engage with the circular enlargement **23**.

[0138] As shown in FIG. **1**, the cap **1** has an incision line **21** which extends on the side wall **2** transversally, in particular perpendicularly, to the axis Z. In more detail, the incision line **21** is interposed between the separation line **4** and the free edge **16**.

[0139] If the cap **1** is positioned in the same orientation which it will have after having been applied to the container, that is to say, with the transversal wall **3** facing upwards, the incision line **21** is arranged below the separation line **4**. The incision line **21** is therefore located on the side of the retaining ring **5**, relative to the separation line **4**.

[0140] The joining portion **8** is located on the opposite side of the incision line **21** relative to the retaining ring **5**. The incision line **21** therefore delimits the joining portion **8** towards the retaining ring **5**.

[0141] The incision line **21** has an angular extension A**1**, measured about the axis Z, greater than the angular distance (also measured about the axis Z) between the first end **9** and the second end **10** of the separation line **4**, that is to say, the angular dimension W of the joining portion **8**. For example, the angular extension A**1** of the incision line **21** may be between 60° and 200°, preferably between 75° and 180°. The angular dimension W of the joining portion **8** about the axis Z, that is to say, the angular distance between the first end **9** and the second end **10** of the separation line **4**, may be between 5° and 40°, preferably between 10° and 30°.

[0142] In the example illustrated, the joining portion **8** is centred relative to the separation line **21**. In other words, the midpoint of the separation line **21** and the centre line of the joining portion **8** are aligned with each other in a direction parallel to the axis Z, that is to say, they lie in a common plane which contains the axis Z. This condition is not however necessary, since even a not perfectly centred positioning of the incision line **21** relative to the joining portion **8** is permitted.

[0143] In the example illustrated, the incision line **21** has a flat arched shape. However, other shapes are possible.

[0144] The incision line **21** and the separation line **4** may be parallel to each other, even though this condition is not necessary. For example, the incision line **21** and the separation line **4** could be slightly inclined relative to each other. Alternatively, the incision line **21** could comprise a plurality of stretches having different inclinations, not necessarily parallel to each other.

[0145] As shown in FIG. **1**, the incision line **21** has an end **27** and a further end **28**. The end **27** extends outside the joining portion **8**, beyond the first end **9** of the separation line **4**. The further end **28** also extends outside the joining portion **8**, but goes beyond the second end **10** of the separation line **4**.

[0146] The incision line **21** comprises a central part **24** interposed between a peripheral part **25** and a further peripheral part **26**. The central part **24** faces the joining portion **8**. The peripheral part **25** faces the separation line **4**, in particular an end portion of the separation line **4**. More precisely, the peripheral part **25** faces the separation line **4** in a zone between the first end **9** of the separation line **4** and the end **27** of the incision line **21**. The further peripheral part **26** faces the separation line **4**, in particular a further end portion of the separation line **4**. More precisely, the further peripheral part **26** faces the separation line **4** in a zone between the second end **10** of the separation line **4** and the further end **28** of the incision line **21**.

[0147] Between the peripheral part **25** of the incision line **21** and a portion of the separation line **4** which starts from the first end **9**, a connecting band **29** is defined for connecting the joining portion **8** to the retaining ring **5**. Similarly, between the further peripheral part **26** of the incision line **21** and a further portion of the separation line **4** which starts from the second end **10**, a further connecting band **30** is defined for connecting the joining portion **8** to the retaining ring **5**.

[0148] In the example illustrated, the connecting band **29** and the further connecting band **30** are arranged symmetrically to each other relative to a plane containing the axis Z and a centre line of the joining portion **8**.

[0149] The incision line **21** may be shaped as a through cut which passes through the entire thickness of the side wall **2**. Even though this feature is not shown in the drawings, along the incision line **21** there may be one or more breakable elements intended to break the first time the cap **1** is opened.

[0150] Alternatively, the incision line **21** may be shaped as a weakening line that does not pass through the entire thickness of the side wall **2**, but at which the thickness of the side wall **2** is reduced with respect to the surrounding zones.

[0151] At the first end **9** and at the second end **10** of the separation line **4**, and/or at the end **27** and at the further end **28** of the incision line **21**, there may be incision zones **38**, shown in FIG. **1**. The incision zones **38** may have a circular geometry and in general have a transversal dimension greater than a width of the corresponding incision line or separation line. This makes it possible to prevent the propa-

gation of fracture cracks starting from the incision or separation lines. In an alternative embodiment, the incision zones **38** may be absent.

[0152] In a central part of the joining portion **8** there may be a stress reduction cut **39**, having dimensions very limited relative to the dimensions of the joining portion **8**, so as to not adversely affect the resistance of the joining portion **8**. The stress reduction cut **39** makes it possible to increase the deformability of the central part of the joining portion **8**, reducing the tensions in the surrounding zones. The presence of the weight reduction cut **39** is optional.

[0153] The cap **1** is applied on the neck **18** of the container in the closed position shown in FIG. **1**. The cap **1** is positioned in such a way that the engagement element **20** provided inside the retaining ring **5** is below the circular enlargement **23** present on the neck **18**.

[0154] When the user wishes to open the container for the first time, the user grips the skirt **11** of the closure element **6** and rotates the closure element **6** about the axis Z, in order to unscrew the closure element **6** from the neck **18**. Initially, the closure element **6** and the retaining ring **5** are rotated together about the axis Z, and they simultaneously move together in a direction parallel to the axis Z, away from the neck **18**. This occurs until the engagement element **20** of the retaining ring **5** abuts against the circular enlargement **23** provided on the neck **18**. At this point, the circular enlargement **23** prevents the retaining ring **5** from rising further along the axis Z, acting as a stop for the movement of the retaining ring **5** away from the neck **18**.

[0155] The closure element **6**, which is unscrewed by the user, continues to move along the axis Z away from the neck **18**. The breakable bridges **7** are thereby tensioned, until causing their failure. The closure element **6** consequently separates from the retaining ring **5** along the separation line **4**, but remains joined to the retaining ring **5** at the joining portion **8**.

[0156] If the user continues to unscrew the closure element **6**, so as to move the closure element **6** along the axis Z to remove it from the neck **18**, the first connecting band **29** and the second connecting band **30** deform. In particular, by moving the closure element **6** upwards, the first connecting band **29** and the second connecting band **30** are also pulled upwards. Consequently, the first connecting band **29** and the second connecting band **30** are spaced apart from both the closure element **6** and the retaining ring **5** and remain joined to each other in the joining portion **8**.

[0157] The first connecting band **29** and the second connecting band **30** thus adopt a kind of trapezium shape as shown in FIG. **2**, in which the neck **18** of the container is not shown. In this configuration, the first connecting band **29** remains joined to the retaining ring **5** at the end **27** of the incision line **21**. Similarly, the second connecting band **30** remains joined to the retaining ring **5** at the further end **28** of the incision line **21**.

[0158] The first connecting band **29** and the second connecting band **30** are joined to each other in the joining portion **8**.

[0159] In other words, the first connecting band **29** and the second connecting band **30** are arranged in an inclined configuration relative to the retaining ring **5** and converge in the joining portion **8**.

[0160] Continuing to unscrew the closure element **6**, the latter is disengaged from the outer thread **17** made on the neck **18**, so that the container can be opened. The retaining ring **5** remains, however, anchored to the neck **18**. The first connecting band **29**, the second connecting band **30** and the joining portion **8** define a hinge arrangement **40**, shown in FIG. **3**, about which the closure element **6** can rotate to allow the user to access the contents of the container.

[0161] In particular, by moving the closure element **6** about the hinge arrangement **40** after the closure element **6** has been disengaged from the neck **18**, it is possible to move the closure element **6** to a lateral position relative to the neck **18**, so that the closure element **6** is no longer coaxial with the retaining ring **5**, as shown in FIG. **3**. The closure element **6** may be rotated further backwards relative to the position shown in FIG. **3**, in order to move it further away from the neck **18** and to allow the user to more easily access the contents of the container.

[0162] After use, the user can return the cap **1** to the closed position shown in FIG. **1** by a sequence of operations in reverse order compared with that previously described.

[0163] The first connecting band **29** and the second connecting band **30** allow a hinge arrangement **40** to be obtained which is longer than that which would be available if only the hinge band defined by the joining portion **8** were present. This makes it easier to disengage the closure element **6** from the neck **18**, and reapply the closure element **6** on the neck **18**, by rotating the closure element **6** about the hinge arrangement **40**.

[0164] The capacity for rotating the closure element **6** about the hinge arrangement **40** may be further increased by using a cap **101** according to the alternative embodiment shown in FIG. **4**.

[0165] The cap **101** shown in FIG. **4** has many similarities to the cap **1** shown in FIGS. **1** to **3**. In particular, the incision line **21**, the separation line **4**, the joining portion **8**, the first connecting band **29** and the second connecting band **30** are present and are structurally and functionally the same as those described with reference to FIGS. **1** to **3**.

[0166] The cap **101** differs from the cap **1** because the side wall **2** has a pair of break lines **41** which, from the joining portion **8**, extend towards the transversal wall **3**.

[0167] In particular, a first break line of the above-mentioned pair of break lines **41** extends from the first end **9** of the separation line **4** towards the transversal wall **3**, whilst a second break line extends from the second end **10** of the separation line **4** towards the transversal wall **3**.

[0168] Between the break lines **41** a flexible strap **42** which connects the closure element **6** to the joining portion **8**.

[0169] In the example illustrated, the break lines **41** are parallel to each other, even though this condition is not necessary.

[0170] In the example illustrated, the break lines **41** extend parallel to the axis Z. However, this condition too is not necessary and the break lines **41** could be slightly inclined relative to the axis Z.

[0171] The break lines **41** may have the same length.

[0172] The break lines **41** may be shaped as cuts which pass through the entire thickness of the closure element **6**. In this case, along the break lines **41** there may be one or more joining points intended to be broken the first time the cap **101** is moved to the open position.

[0173] In an alternative embodiment, the break lines **41** may be shaped as weakening lines at which the closure element **6** has a thickness which is reduced with respect to the surrounding zones. Along those weakening lines, the

material of which the closure element **6** consists is intended to break, the first time the cap **101** is opened.

[0174] In order to move the cap **101** to the open position, the procedure is as previously described with reference to FIGS. **1** to **3**. In particular, the closure element **6** of the cap **101** is unscrewed from the neck **18**, until the position shown in FIG. **4** is reached, wherein the inner thread formed in the closure element **6** is completely disengaged from the outer thread **17** formed on the neck **18**. At this point, the closure element **6** of the cap **101** may be rotated backwards by an angle greater than for the closure element **6** of the cap **1**, owing to the break lines **41**, which increase the flexibility and the deformability of the corresponding hinge arrangement.

[0175] FIGS. **5** to **7** and **10** show a cap **201** according to another embodiment.

[0176] The parts of the cap **201** common to the cap **1** described with reference to FIGS. **1** to **3** will be indicated with the reference numbers already used in FIGS. **1** to **3** and, for brevity, will not be described again in detail. What was previously described with reference to the cap **1** shall be understood to also be applicable to the cap **201**, unless differences are explicitly provided. As shown in FIGS. **5** to **7** and **10**, the cap **201** comprises the side wall **2** which extends about the axis Z, and the transversal wall **3** located at an end of the side wall **2**, so as to close that end.

[0177] The cap **201** is further provided with the separation line **4**, positioned on the side wall **2**, which defines on the cap **201** the retaining ring **5** and the closure element **6**. The retaining ring **5** is intended to remain anchored to the neck of the container on which the cap **201** is applied, owing to at least one engagement element provided inside it. In contrast, the closure element **6** is suitable for removably engaging with the neck, owing to the removably fixing arrangement provided inside the skirt **11**. In this way, the closure element **6** is movable between a closed position, shown in FIGS. **5** and **6**, and an open position, shown in FIG. **10**.

[0178] The separation line of **4** extends about the axis Z and is circumferentially interrupted so as to define on the side wall **2** the joining portion **8** by which the closure element **6** is joined to the retaining ring **5**.

[0179] The incision line **21** is further provided on the side wall **2**. In the example illustrated, the incision line **21** is axially interposed between the free edge **16** of the retaining ring **5** and the separation line **4**.

[0180] Two connecting bands, that is to say, a connecting band **29** and a further connecting band **30**, are defined between the separation line **4** and the incision line **21**, the two connecting bands joining the retaining ring **5** to the joining portion **8**.

[0181] In particular, the connecting band **29** extends between the peripheral part **25** of the incision line **21** and a portion of the separation line **4** which starts from the first end **9** of the later. Similarly, the further connecting band **30** extends between the further peripheral part **26** of the incision line **21** and a further portion of the separation line **4** which starts from the second end **10**. The connecting band **29** and the further connecting band **30** may be arranged symmetrically to each other relative to a plane containing the axis Z and a centre line of the joining portion **8**.

[0182] FIGS. **8** and **9** show a neck **218** on which the cap **201** may be applied. The neck **218** extends about a longitudinal axis Z1. When the cap **201** is applied on the neck **218** and the closure element **6** is in the closed position, the axis Z of the side wall **2** coincides with the longitudinal axis Z1.

[0183] The neck **218** is delimited by an outer surface **219**, which in the example illustrated is cylindrical and coaxial with the longitudinal axis Z1.

[0184] The outer surface **219** extends as far as a rim **220** of the neck **218**. The rim **220** surrounds an opening **221** through which it is possible to access the container, when the closure element **6** is in the open position. Vice versa, the closure element **6** closes the opening **221** when it is arranged in the closed position.

[0185] The neck **218** comprises a collar **222**, suitable for preventing the retaining ring **5** from descending along the neck **218** below a predetermined level.

[0186] Moreover, the collar **222** may be used for conveying the container during the production, filling and capping process.

[0187] The outer surface **219** extends from the collar **222** to the rim **220**.

[0188] A circular enlargement **223** projects from the outer surface **219**, the circular enlargement **223** being suitable for engaging with the engagement element provided inside the retaining ring **5** so as to prevent the retaining ring **5** from being detached from the neck **218**.

[0189] The circular enlargement **223** may comprise a truncated cone shaped portion **224**, whose diameter increases in a direction going from the rim **220** towards the collar **222**.

[0190] The circular enlargement **223** is delimited, on the opposite side to the rim **220**, by an abutment surface **225** against which the at least one engagement element of the retaining ring **5** abuts.

[0191] A cylindrical portion of the circular enlargement **223** may be interposed between the truncated cone shaped portion **224** and the abutment surface **225**.

[0192] However, other geometries of the circular enlargement **223** are possible.

[0193] The neck **218** comprises at least one removable fixing element with which the removably fixing arrangement formed inside the closure element **6** can engage to allow the closure element **6** to be alternatively applied on, or removed from, the neck **218**.

[0194] The at least one removable fixing element may comprise an outer thread **217** formed on the outer surface **219**, in particular projecting from the outer surface **219**.

[0195] The cap **201** is intended to be applied on the neck **218** when the closure element **6** is in the closed position. In particular, the cap **201** is applied on the neck **218** in such a way that the at least one engagement element provided inside the retaining ring **5** is below the circular enlargement **223**, in particular in a position interposed between the collar **222** and the circular enlargement **223**.

[0196] When the user acts on the cap **201** to move the closure element **6** to the open position for the first time, the closure element **6** is unscrewed, that is to say, it is rotated about the longitudinal axis Z1 and simultaneously moved away from the collar **222**. The retaining ring **5**, joined to the closure element **6** by the breakable bridges **7**, initially moves together with the closure element **6**. When the at least one engagement element provided inside the retaining ring **5** abuts against the abutment surface **225**, the retaining ring **5** cannot rise any further along the neck **218**. On the other hand, the closure element **6** moves further away from the body of the container and simultaneously rotates about the

longitudinal axis Z1, gradually as the user continues to unscrew the closure element **6**. In this way, the breakable bridges **7** arranged along the separation line **4** are subjected to a stress that causes them to break. The connecting bands **29**, **30** also deform while the closure element **6** is unscrewed. In particular, gradually as the closure element **6**, during unscrewing, is moved away from the retaining ring **5**, the connecting bands **29**, **30** are positioned in an inclined position relative to the retaining ring **5**, detaching from the retaining ring **5** along the incision line **21**. The closure element **6** also detaches from the connecting bands **29**, **30**. Any breakable elements positioned along the incision line **21** break.

[0197] In this way, the position shown in FIG. **7** is reached, wherein the neck has not been shown. The position shown in FIG. **7** may be defined as a disengaged position, because in the position shown in FIG. **7** the removably fixing arrangement formed inside the closure element **6** has disengaged from the thread **217** of the neck **218**.

[0198] At this point, the closure element **6** may be rotated relative to the retaining ring **5** for displacing it into the open position shown in FIG. **10**, in which the closure element **6** is arranged on one side of the neck **218** and the axis Z of the closure element **6** no longer coincides with the longitudinal axis Z1 of the neck **218**.

[0199] The connecting bands **29**, **30** are deformable, in such a way that not just the closure element **6**, but also the joining portion **8** is rotated relative to the neck **218**.

[0200] As is shown more clearly in FIG. **7**, the joining portion **8** is delimited by an edge **50** which, in the closed position of the closure element **6** (and in general before the closure element **6** is rotated relative to the retaining ring **5** to be moved to the open position) faces the retaining ring **5**. More specifically, the edge **50** is defined on the side wall **2**, towards the closure element **6**, by the incision line **21**.

[0201] When the closure element **6** passes from the disengaged position to the open position, the joining portion **8** is overturned relative to the neck **218**. Consequently, the edge **50**, which in the disengaged position (and also in the closed position) was facing the retaining ring **5**, is positioned in such a way that it is facing towards the rim **220** of the neck **218**, that is to say, upwards in FIG. **10**.

[0202] In order to make that possible, the joining portion **8**, and in particular its edge **50**, slides along the truncated cone shaped portion **224** of the circular enlargement **223** and simultaneously rotates relative to the connecting bands **29**, **30**. The edge **50** reaches a height which is higher than the circular enlargement **223**, assuming that the neck **218** is positioned in such a way that the opening **221** is facing upwards. The joining portion **8** is thus positioned at least partly above the circular enlargement **223**, resting on the neck **218**. In particular, the joining portion **8** rests on the outer surface **219** above the circular enlargement **223**.

[0203] In this way, an interference is generated between the neck **218** and the joining portion **8**, in particular along the edge **50** and near the latter. There may also be interference between the connecting bands **29**, **30** and the neck **218**. This allows the closure element **6** to be stably kept in the open position. In effect, in order to bring the closure element **6** back to the closed position, it is necessary to overcome the interference between the joining portion **8** and the neck **218**. Normally, that does not occur accidentally, instead only occurring if the user deliberately applies sufficient force to the closure element **6**, that is to say, if the user wishes to move the closure element **6** to the closed position.

[0204] Moreover, the interference which occurs between the joining portion **8** and the neck **218** makes it difficult for the cap **201** to be able to rotate about the neck **218**, due to the rotation of the retaining ring **5** about the neck **218**. In effect, the retaining ring **5** is connected to the joining portion **8** by the connecting bands **29**, **30**. Consequently, the retaining ring **5** is not free to rotate about the neck **218**, instead it can only rotate if the interference between the joining portion **8** and the neck **218** is overcome.

[0205] In order to make it possible for the joining portion **8** to rotate when the closure element **6** passes from the disengaged position to the open position, the connecting bands **29**, **30** are subjected to twisting, which affects at least part of the height H of each connecting band **29**, **30**. The term "height H" of the connecting bands **29**, **30** refers to the dimension of the connecting bands **29**, **30** in a direction parallel to the axis Z of the side wall **2**, when the closure element **6** is in the closed position, as shown in FIG. **5**.

[0206] In the example illustrated, wherein the separation line **4** and the incision line **21** lie in respective planes parallel to each other, the height H of the connecting bands **29**, **30** is constant along the entire length of the connecting bands **29**, **30** and is equal for the two connecting bands **29**, **30**. As shown in FIGS. **5** to **7** and **10**, the knurling lines **13** are provided on the closure element **6**. The knurling lines **13** may extend parallel to the axis Z.

[0207] In the example illustrated, the separation line **4** intersects the knurling lines **13**. In other words, the knurling lines **13** extend on both sides of, that is to say, both above and below, the separation line **4**.

[0208] That occurs because the separation line **4** is provided in a position as close as possible to the removably fixing arrangement arranged inside the closure element **6**, that is to say, to the inner thread. In this way, it is possible to increase the height H of the connecting bands **29**, **30**.

[0209] Consequently, as shown in FIG. **10**, the connecting bands **29**, **30** comprise a first portion **51** provided with knurling lines **13** and a second portion **52** which is smooth. A widened part **53** may be provided between the first portion **51** and the second portion **52**.

[0210] In the example illustrated, when the joining portion **8** rotates so that the edge **50** is facing towards the rim **220**, the second portion **52** of the connecting bands **29**, **30** twists and passes under the first portion **51**. The first portion **51**, like the widened part **53**, if present, in contrast expands radially, but does not undergo substantial twisting.

[0211] Owing to deformation of the connecting bands **29**, **30**, the joining portion **8** can rest on the neck **218** with the edge **50** facing towards the rim **220**, without it being necessary to provide weakening lines or fracture lines in the joining portion **8** and/or in the connecting bands **29**, **30**. In this way, production of the cap **201** is not complicated.

[0212] In the closed position, when the edge **50** faces the retaining ring **5**, there is an albeit small amount of play between the joining portion **8** and the neck **218**. When the closure element **6** is moved to be brought to the open position, the joining portion **8** begins to rotate and starts to interfere with the neck **218**. The interference between the joining portion **8** and the neck **218** reaches a maximum value when the joining portion **8** is approximately arranged in a plane perpendicular, or almost perpendicular, to the neck **218**, or rather to its longitudinal axis Z1. The interference

between the joining portion **8** and the neck **218** is reduced when the joining portion **8** is overturned, that is to say, when the edge **50** moves above the connecting bands **29**, **30**. In the open position, the interference between the joining portion **8** and the neck **218** remains, although it is less than the maximum value.

[0213] When the position in which the interference reaches a maximum value is passed, the user who is manually rotating the closure element **6** in order to move it to the open position can feel a sort of vibration. That vibration is perceived by the hand of the user, who is moving the closure element **6**, as a discontinuity in the movement of the closure element **6**. In other words, the closure element **6** snaps into place beyond the position in which the interference between the joining portion **8** and the neck **218** reaches the maximum value, and the user perceives this snap motion.

[0214] In this way the user is certain that the closure element **6** has been correctly moved to the open position.

[0215] It is also possible, but not necessary, for the vibration to be accompanied by a sound such as a "click", which can be heard by the user.

[0216] The cap **201** described above guarantees not just that the closure element **6** stably remains in the open position, but also that, in the open position, the closure element **6** is rotated backwards, relative to the neck, by a relatively wide angle of opening A**1**, as shown in FIG. **10**.

[0217] In particular, the angle A**1** may be greater than, or equal to, 140°. This makes it very difficult for the closure element **6** to be able in an unwelcome way to strike the face of the user who is drinking directly from the bottle on which the cap **201** is applied, or for the closure element **6** to be able to obstruct the dispensing of a liquid contained in the bottle into a container, such as a glass.

[0218] Experimentation has shown that several geometric parameters of the cap **201** and/or of the neck **218** favour the behaviour previously described with reference to FIG. **10**.

[0219] In particular, on the neck **218** it is possible to define an external or maximum diameter Dmax of the circular enlargement **223**, as shown in FIG. **8**. It is also possible to define a diameter Ds of the outer surface **219** of the neck **218**, immediately above the circular enlargement **223**, that is to say, in a position interposed between the circular enlargement **223** and the outer thread **217**. In the example illustrated, the diameter Ds immediately above the circular enlargement **223** coincides with the diameter of the outer surface **219** in a region interposed between the outer thread **217** and the rim **220**, but this condition is not necessary.

[0220] Delta indicates the difference between the external diameter Dmax of the circular enlargement **223** and the diameter Ds of the outer surface **219** immediately above the circular enlargement **223**.

[0221] In the example illustrated, the external diameter Dmax of the circular enlargement **223** is 30.2 mm.

[0222] The diameter Ds of the outer surface **219** immediately above the circular enlargement **223** is 28 mm.

[0223] The difference Delta between Dmax and Ds is 30.2−28=2.2 mm.

[0224] Half of the difference Delta expresses how far the circular enlargement **223** projects relative to the outer surface **219**.

[0225] As already said, H indicates the height of the connecting bands **29**, **30**, that is to say, the distance between the separation line **4** and the incision line **21**, measured parallel to the axis Z, when the closure element **6** is in the closed position.

[0226] In the example illustrated, the height H is 2.8 mm.

[0227] The ratio R1 between the height H and half of the difference Delta is therefore 2.8/1.1, that is to say, 2.55.

[0228] It is advisable for the ratio R1 between the height H and half of the difference Delta, as they are defined above, to be greater than, or equal to 1.5. It is preferable for the above-mentioned ratio R1 to be greater than, or equal to, 2. It is even more preferable for R1 to be greater than, or equal to, 2.5.

[0229] That ensures that the height H of the connecting bands **29**, **30** is correctly proportionate to how far the circular enlargement **223** projects from the outer surface **219**.

[0230] More specifically, if the ratio R1 is less than 1.5, it may happen that between the joining portion **8** and the neck **218** the interference created is not sufficient to stably lock the closure element **6** in an open position in which the angle of opening A**1** is greater than, or equal to, 120°, preferably greater than, or equal to, 140°.

[0231] In the example illustrated, half of the difference Delta between the external diameter Dmax of the circular enlargement **223** and the diameter Ds of the outer surface **219** of the neck **218**, immediately above the circular enlargement **223**, is Delta/2=1.1 mm.

[0232] It is possible to obtain a cap **201** which works correctly even with values of the difference Delta other than those mentioned above. In general, experimentation has shown that relatively low values of the difference Delta (and therefore of Delta/2) are helpful for obtaining a behaviour of the type shown in FIG. **10**.

[0233] The joining portion **8** has an angular dimension W about the axis Z of the side wall, which has been explicitly indicated in FIG. **1** and which is definable in the same way with reference to the cap **201**.

[0234] In the example illustrated, the angular dimension W of the joining portion **8** is 54°.

[0235] In general, the angular dimension W may be greater than, or equal to, 20°, preferably greater than, or equal to, 25°.

[0236] Moreover, the angular dimension W may be less than, or equal to, 120°, preferably less than, or equal to, 90°.

[0237] Experimentation has shown that, if the angular dimension W is greater than 120°, the connecting bands **29**, **30** may break, when the closure element **6** is rotated in order to move it to the open position.

[0238] In contrast, if W is less than 20°, it may happen that the joining portion **8** does not succeed in stably keeping the closure element **6** in an open position in which the opening angle A**1** is greater than, or equal to, 120°, preferably greater than, or equal to, 140°.

[0239] It is also possible to define a distance Y, shown in FIG. **8**, between the circular enlargement **223** and the at least one removable fixing element provided on the neck **219**. In other words, the distance Y is measured between the upper limit of the circular enlargement **223** and the starting point of the outer thread **217**.

[0240] The distance Y may be greater than, or equal to, half of the distance between the separation line **4** and the incision line **21**, that is to say, half the height H. However, this condition is not necessary.

[0241] It is possible to define an angle A, indicated in FIG. **8**, formed between a generatrix of the truncated cone shaped portion **224** and a straight line parallel to the longitudinal axis Z**1**.

[0242] In the example illustrated, the angle A is 30°.

[0243] More generally, the angle A is preferably less than, or equal to, 35°.

[0244] That reduces the risk of the joining portion **8** not sliding correctly on the circular enlargement **223**, in particular near the external diameter Dmax, for then stably stopping in contact with the neck **218**.

[0245] When the user wishes to reclose the container, the closure element **6** can be returned to the closed position with a sequence of operations in reverse order compared with that previously described. In particular, the user rotates the closure element **6** relative to the neck **218** in order to return it to the closed position. Consequently, the joining portion **8** is also rotated, so as to return the edge **50** below the connecting bands **29**, **30**, in a position facing the retaining ring **5**. When the edge **50** disengages from the neck **218**, the user perceives a vibration or snap-motion feedback, which may (but not necessarily) be accompanied by a "click" sound. In this way, the user realises that the closure element **6** is ready to be screwed onto the neck **218** again. In effect, the disengagement position has been reached, starting from which the closure element **6** can be screwed onto the neck **218** again for moving it to the closed position.

[0246] In the example described so far, the separation line **4** is located in a portion of the side wall **2** wherein the knurling lines **13** are present.

[0247] However, this condition is not necessary. In an alternative embodiment not illustrated, the separation line **4** may be made in a portion of the side wall **2** wherein the latter is externally delimited by a substantially smooth outer surface. That is to say, the separation line **4** may be positioned in a portion of the side wall **2** free of knurling lines **13**, for example interposed between the knurling lines **13** and the free edge **16**. Consequently, in the alternative embodiment just described, the connecting bands **29**, **30** are externally delimited by a smooth surface, that is to say, a surface free of knurling lines.

[0248] The cap **201** is also particularly easy to make.

[0249] In effect, the cap **201** may be obtained starting from a concave body comprising the side wall **2** and the transversal wall **3**. The concave body is produced by moulding a polymeric material, for example compression moulding or injection moulding.

[0250] After the concave body has been formed, the separation line **4** and the incision line **21** are made on the side wall **2**.

[0251] The separation line **4** and the incision line **21** may be made by cutting operations, for example performed in a cutting unit located downstream of a mould in which the concave body has been formed. Such cutting operations may be performed by respective blades, for example circular or linear, which interact with the side wall **2** from the outside of the latter, or from the inside. In particular, the concave body may be rotated about the axis Z of the side wall **2**, while the blades are held in their position, so as to bring consecutive zones of the side wall **2** to interact, one after another, with the blades. It is also possible to hold the concave body in its position and to rotate the blades, for making the cut.

[0252] The blades which allow the separation line **4** and the incision line **21** to be obtained may be configured to interact with the side wall **2** in respective parallel planes, for example perpendicular to the axis Z, if, as in the desired examples, the separation line **4** and the incision line **21** are to lie in respective parallel planes.

[0253] The blades may have an interrupted cutting edge, if, along the separation line **4** the breakable bridges **7** are to remain defined and/or if, along the incision line **21**, respective breakable elements are to remain defined.

[0254] It is also possible that the blades do not cut through the entire thickness of the side wall **2**, instead only partially cutting through thickness of the side wall **2**, so as to leave, along the incision line **21** and/or along the separation line **4**, a thin membrane intended to be broken the first time the cap is opened.

[0255] The separation line **4** and the incision line **21** may be made simultaneously, or during two separate steps.

[0256] The cap **201** is therefore particularly easy to produce, since the concave body can be formed in an ordinary mould. There is no need for undercut parts or thin parts other than those normally provided for a cap of the known type.

[0257] An additional operation, that is to say, making the incision line **21**, may be performed very simply while the separation line **4** is obtained.

[0258] FIGS. **11** and **12** show a cap **301** for closing a container, particularly a bottle intended to contain a liquid substance such as a drink. The cap **301** is made of polymeric material. Any polymeric suitable for being moulded can be used to obtain the cap **301**.

[0259] The cap **301** is shown in FIGS. **11** and **12** in a closed position in which the cap **301** is when it leaves a cap production line, ready to be applied on the container. In this condition, the cap **301** comprises a side wall **302** which extends about an axis Y, and a transversal wall **303** located at an end of the side wall **302**, so as to close the end. The transversal wall **303** extends transversally, in particular perpendicularly, to the axis Y. The transversal wall **303** may be flat, even though other shapes are theoretically possible. In the example illustrated, the transversal wall **303** has a substantially circular shape in plan view.

[0260] The cap **301** has a separation line **304**, arranged on the side wall **302** and extending about the axis Y. The separation line **304** extends on a plane arranged transversally, in particular perpendicularly, to the axis Y. The separation line **304** forms on the cap **301** a retaining ring **305** and a closure element **306**. The latter are arranged on opposite sides of the separation line **304**. As described in more detail below, when the cap **301** is moved to an open position, the closure element **306** separates from the retaining ring **305** along the separation line **304**.

[0261] Along the separation line **304** there may be a plurality of breakable bridges **307** which connect the retaining ring **305** to the closure element **306**. The breakable bridges **307** are intended to be broken the first time the cap **301** is moved to the open position, to signal that the container is no longer intact. The separation line **304** may be parallel to a free edge **316** of the cap **301**. More specifically, the free edge **316** delimits the retaining ring **305** on the opposite side to the transversal wall **303**.

[0262] The separation line **304** does not extend for an entire angle of 360° about the axis Y. The separation line **304** is interrupted in the circumferential direction, so as to define

on the side wall **302** a joining portion **308**, at which the closure element **306** remains joined to the retaining ring **305**.

[0263] In other words, the separation line **304** has a first end **309** and a second end **310**. The joining portion **308** is interposed between the first end **309** and the second end **310**. At the joining portion **308**, the retaining ring **305** is joined to the closure element **306**.

[0264] As shown in FIG. **11**, the joining portion **308** has an angular dimension W**1** about the axis Y.

[0265] In the example shown, the closure element **306** has a cup-shaped body and comprises a skirt **311** which extends about the axis Y. The skirt **311** is connected to the transversal wall **303**, arranged at the end of the skirt **311** opposite the separation line **304**. More specifically, the skirt **311** is connected to the transversal wall **303** by a connecting zone **312**, which may be shaped, in cross section, like a beveled edge or a circular connection portion.

[0266] The skirt **311** has, on an inner surface thereof, a removably fixing arrangement, not shown, by which the closure element **306** can removably engage with a neck **318** of the container, shown in FIGS. **14** and **15**. The removably fixing arrangement can comprise, for example, an inner thread intended to engage with an outer thread **317**, shown in FIGS. **14** and **15**, formed on the neck **318**.

[0267] The skirt **311** can have, on an outer surface thereof, a plurality of knurling lines **313**, extending parallel to the axis Y and intended to facilitate gripping of the cap **301** by the user or by the capping machine which applies the cap **301** on the container to be closed.

[0268] The knurling lines **313** may continue also in the connecting zone **312** and/or in the retaining ring **305**.

[0269] In the example shown, the skirt **311** comprises a cylindrical portion **314** on which the knurling lines **313** are made. The skirt **311** also comprises a wide portion **315** having a diameter larger than the cylindrical portion **314**. The wide portion **315** may be delimited by a smooth outside surface, that is to say it can be free of knurling lines. This condition is not, however, necessary and the knurling lines could also extend on the wide portion **315**. Between the cylindrical portion **314** and the wide portion **315** there may be a step **319**.

[0270] The retaining ring **305** extends between the free edge **316** and the separation line **304**. The retaining ring **305** may be delimited by a cylindrical or truncated cone shape outer surface. In the closed position of the cap **301** shown in FIG. **11**, the retaining ring **305** is coaxial with the closure element **306**.

[0271] The retaining ring **305** is provided internally with an engagement element **320**, shown in FIG. **13**, suitable for engaging with a circular enlargement **323**, shown in FIG. **14**, which projects from an outer surface of the neck **318**. The engagement element **320** is configured to abut against the circular enlargement **323** so as to prevent axial movements of the retaining ring **305**, away from the neck **318**, when the closure element **306** is removed from the neck **318**.

[0272] The engagement element **320** may be shaped like an annular element which is bent around the free edge **316** towards the inside of the retaining ring **305**. In an alternative embodiment not illustrated, there may be a plurality of engagement elements, shaped like tabs which project from the free edge **316** and are bent towards the inside of the retaining ring **305**. Alternatively, the engagement element **320** may be shaped like an enlargement, continuous or interrupted, which from an inner surface of the retaining ring **305** projects towards the axis Y to engage with the circular enlargement **323**.

[0273] As shown in FIGS. **11** and **12**, the cap **301** has a first incision line **321** and a second incision line **322** provided on the side wall **302** and lying on two levels different to each other. More specifically, if the cap **301** is positioned in the same orientation which it will have after having been applied to the container, that is to say, with the transversal wall **303** facing upwards, the first incision line **321** is arranged below the separation line **304**. On the other hand, the second cut **322** is arranged above the separation line **304**. In other words, the first incision line **321** and the second incision line **322** are arranged on opposite sides of the separation line **304**.

[0274] The first incision line **321** is arranged in a position closer to the free edge **316** than the second incision line **322**. In effect, the first incision line **321** is arranged on the side of retaining ring **305**, relative to the separation line **304**.

[0275] The second incision line **322** is arranged in a position closer to the transversal wall **303** than the first incision line **321**. In effect, the second incision line **322** is arranged on the side of the closure element **306**, relative to the separation line **304**.

[0276] The joining portion **308** is interposed between the first incision line **321** and the second incision line **322**. The first incision line **321** and the second incision line **232** extend transversely to the axis Y, delimiting the joining portion **308** on opposite sides of the separation line **304**.

[0277] In other words, the first incision line **321** and the second incision line **322** face each other, that is to say, are not offset, so that the joining portion **308** is interposed between them.

[0278] The first incision line **321** and the second incision line **322** have respective angular extensions A**1** and A**2**, measured about the axis Y, greater than the angular distance (also measured about the axis Y) between the first end **309** and the second end **310** of the separation line **304**, that is to say, of the angular dimension W**1** of the joining portion **308**. For example, the angular extension A**1** of the first incision line **321** and the angular extension A**2** of the second incision line **322** may be between 60° and 200°, for example between 75° and 180°. The angular dimension W**1** of the joining portion **308** about the axis Y, that is to say, the angular distance between the first end **309** and the second end **310** of the separation line **304**, may be between 5° and 75°, for example between 10° and 40°.

[0279] The first incision line **321** and the second incision line **322** may have the same angular extension about the axis Y, or angular extensions about the axis Y which are different from each other. In other words, the angular extensions A**1** and A**2** can be identical or different from each other.

[0280] In the example shown, the joining portion **308** is centred relative to the first separation line **321** and to the second separation line **322**. In other words, the midpoint of the separation line **321**, the midpoint of the separation line **322** and the centre line of the joining portion **308** are aligned with each other in a direction parallel to the axis Y, that is to say, they lie in a common plane which contains the axis Y. This condition is not however necessary, since a slight misalignment between the first incision line **321** and the second incision line **322** is permitted and/or a not perfectly centred positioning of the first incision line **321** and the second incision line **322** relative to the joining portion **308**.

[0281] In the example shown, the first incision line **321** and the second incision line **322** each have a flat arched shape. However, other shapes are possible.

[0282] The first incision line **321** and the second incision line **322** may be parallel to each other, even though this condition is not necessary. For example, the first incision line **321** and the second incision line **322** might be slightly inclined relative to each other, or each might comprise a plurality of stretches having different inclinations, not necessarily parallel to each other. In the example shown, the first incision line **321** and the second incision line extend perpendicularly to the axis Y, that is to say, they extend on respective planes positioned transversally, in particular perpendicularly, to the axis Y. However, this condition is also unnecessary.

[0283] As shown in FIG. **1**, the first incision line **321** has an end **327** and a further end **328**. The end **327** extends outside the joining portion **308**, beyond the first end **309** of the separation line **304**. The further end **328** also extends outside the joining portion **308**, but goes beyond the second end **310** of the separation line **304**.

[0284] The first incision line **321** comprises a central part **324** interposed between a peripheral part **325** and a further peripheral part **326**. The central part **324** faces the joining portion **308**. The peripheral part **325** faces the separation line **304**, in particular an end portion of the separation line **304**. More precisely, the peripheral part **325** faces the separation line **304** in a zone between the first end **309** of the separation line **304** and the end **327** of the first incision line **321**. The further peripheral part **326** faces the separation line **304**, in particular a further end portion of the separation line **304**. More specifically, the further peripheral part **326** faces the separation line **304** in a zone between the second end **310** of the separation line **304** and the further end **328** of the first incision line **321**.

[0285] Between the peripheral part **325** of the first incision line **321** and a portion of the separation line **304** which starts from the first end **309**, a connecting band **329** is defined for connecting the joining portion **308** to the retaining ring **305**. Similarly, between the further peripheral part **326** of the first incision line **321** and a further portion of the separation line **304** which starts from the second end **310**, a further connecting band **330** is defined for connecting the joining portion **308** to the retaining ring **305**.

[0286] The second incision line **322** has an end **331** and a further end **332**. The end **331** extends outside the joining portion **308**, beyond the first end **309** of the separation line **304**. The further end **332** also extends outside the joining portion **308**, but goes beyond the second end **310** of the separation line **304**. The second incision line **322** comprises a central portion **333** interposed between a peripheral portion **334** and a further peripheral portion **335**. The central portion **333** faces the joining portion **308**. The peripheral portion **334** faces the separation line **304**, in a zone between the first end **309** of the separation line **304** and the end **331** of the second incision line **322**. The further peripheral portion **335** faces the separation line **304**, in a zone between the second end **310** of the separation line **304** and the further end **332** of the second incision line **322**.

[0287] Between the peripheral portion **334** of the second incision line **322** and a portion of the separation line **304** which starts from the first end **309**, a connecting strip **336** is defined for connecting the joining portion **308** to the closure element **306**. Similarly, between the further peripheral portion **335** of the second incision line **322** and a further portion of the separation line **304** which starts from the second end **310**, a further connecting strip **337** is defined for connecting the joining portion **308** to the closure element **306**.

[0288] In the example shown, the connecting band **329** and the connecting strip **336** are arranged symmetrically to the further connecting band **330** and respectively to the further connecting strip **337** relative to a plane containing the axis Y and a centre line of the joining portion **308**.

[0289] The first incision line **321** is not connected in any way to the second incision line **322**, that is to say, it is isolated from the second incision line **322**. More specifically, on the cap **301** there are no incision lines which pass through the joining portion **308** for joining the first incision line **321** to the second incision line **322**. This prevents adversely affecting the resistance of the joining portion **308**.

[0290] The first incision line **321** and the second incision line **322** may be shaped as through cuts which pass through the entire thickness of the side wall **302**. Even though this feature is not shown in the drawings, along the first incision line **321** and along the second incision line **322** there may be one or more breakable elements intended to break the first time the cap **301** is opened. Alternatively, the first incision line **321** and the second incision line **322** may be shaped as weakening lines that do not pass through the entire thickness of the side wall **302**, but at which the thickness of the side wall **302** is reduced with respect to the surrounding zones.

[0291] At the first end **309** and at the second end **310** of the separation line **304**, and/or at the end **327** and at the further end **328** of the first incision line **321**, and/or at the end **331** and at the further end **332** of the second incision line **322**, there can be incision zones **338**, shown in FIG. **12**. The incision zones **338** may have a circular geometry and in general have a transversal dimension greater than a width of the corresponding incision line or separation line. This makes it possible to prevent the propagation of fracture cracks starting from the incision or separation lines. In an alternative embodiment, the incision zones **338** may be absent.

[0292] In a central portion of the joining portion **308** there may be a stress reduction incision **339**, having dimensions very limited relative to the dimensions of the joining portion **308**, so as to not adversely affect the resistance of the joining portion **308**. The stress reduction incision **339** makes it possible to increase the deformability of the central part of the joining portion **308**, reducing the tensions in the surrounding zones. The presence of the stress reduction incision **339** is optional.

[0293] The cap **301** is applied to the neck **318** of the container in the closed position shown in FIGS. **11** and **12**. The cap **301** is positioned in such a way that the engagement element **320** provided in the retaining ring **305** is below the circular enlargement **323** present on the neck **318**.

[0294] When the user wishes to open the container for the first time, the user grips the skirt **311** of the closure element **306** and rotates the closure element **306** about the axis Y, in order to unscrew the closure element **306** from the neck **318**. Initially, the closure element **306** and the retaining ring **305** are rotated together about the axis Y, and they simultaneously move together in a direction parallel to the axis Y, away from the neck **318**. This occurs until the engagement element **320** of the retaining ring **305** abuts against the circular enlargement **323** provided on the neck **318**. At this point, the circular enlargement **323** prevents the retaining

ring **305** from rising further along the axis Y, acting as a stop for the movement of the retaining ring **305** away from the neck **318**.

[0295] The closure element **306**, which is unscrewed by the user, continues to move along the axis Y away from the neck **318**. The breakable bridges **307** are thereby tensioned, until causing the failure. The closure element **306** consequently separates from the retaining ring **305** along the separation line **304**, but remains joined to the retaining ring **305** at the joining portion **308**. If the user continues to unscrew the closure element **306**, so as to move the closure element **306** along the axis Y to remove it from the neck **318**, the connecting bands **329**, **330** and the connecting strips **336**, **337** deform. More specifically, by moving the closure element **306** upwards, the connecting strips **336**, **337** are also pulled upwards. Consequently, the connecting strips **336**, **337** are spaced from the closure element **306** and remain joined to each other in the joining portion **308**. The connecting bands **329**, **330** are also pulled upwards and consequently move away from the retaining ring **305**. The connecting bands **329**, **330** remain joined to each other in the joining portion **308**.

[0296] The connecting bands **329**, **330** and the connecting strips **336**, **337** thus adopt a "X" shape as shown in FIG. **13**, in which the neck **318** of the container is not shown. In this configuration, the first connecting band **329** remains joined to the retaining ring **305** at the end **327** of the first incision line **321**. Similarly, the second connecting band **330** remains joined to the retaining ring **305** at the further end **328** of the first incision line **321**. The connecting strip **336** remains joined to the closure element **306** at the end **331** of the second incision line **322**. The further connecting strip **337** remains joined to the closure element **306** at the further end **332** of the second incision line **322**.

[0297] The connecting bands **329**, **330** and the connecting strips **336**, **337** are joined together in the joining portion **308**.

[0298] The connecting bands **329**, **330** are arranged in an inclined configuration relative to the retaining ring **305** and converge in the joining portion **308**.

[0299] Similarly, the connecting strips **336**, **337** are arranged in a configuration which is inclined relative to the closure element **306** and converge in the joining portion **308**, on the opposite side relative to the connecting bands **329**, **330**.

[0300] Continuing to unscrew the closure element **306**, the latter is disengaged from the outer thread **317** made on the neck **318**, so that the container can be opened. The retaining ring **305** remains, however, anchored to the neck **318**. The connecting bands **329**, **330**, the connecting strips **336**, **337** and the joining portion **308** form a hinge arrangement **340**, shown in FIG. **14**, around which the closure element **306** can rotate to allow the user to access the contents of the container.

[0301] More specifically, by moving the closure element **306** about the hinge structure **340** after the closure element **306** has been disengaged from the neck **318**, it is possible to move the closure element **306** to a lateral position relative to the neck **318**, so that the closure element **306** is no longer coaxial with the retaining ring **305**. Moreover, it is possible to vary the orientation of the concavity defined inside the closure element **306**. The concavity does not therefore remain always facing downwards as occurs when the closure element **306** is applied to the container in the closed position.

[0302] The "X" configuration as shown in FIG. **13** is reached when the user is terminating the unscrewing of the closure element **306** from the neck **318** and the closure element **306** is about to be disengaged from the neck **318**. Subsequently, when the closure element **306** is arranged in a lateral position relative to the neck **318**, the connecting bands **329**, **330** may move close again to the retaining ring **305**, as shown in FIG. **14**. It is now possible, as shown in FIG. **14**, to rotate the closure element about an ideal line passing through the end **331** and the further end **332** of the second incision line **322**, so that the concavity defined inside the closure element **306** faces mainly downwards.

[0303] At this point, as shown in FIG. **15**, an edge zone **341** of the closure element **306**, close to the separation line **311**, can move towards the neck **318** until engaging with a projection that projects from the neck **318** towards the outside, for example with a portion of the external thread **317**. The edge zone **341** may be diametrically opposite the joining portion **308**.

[0304] In this way, the closure element **306** remains stably locked in a lateral position relative to the neck **318**, far from a dispensing opening **342** formed inside the neck **318**, by which it is possible to access the contents of the container. This prevents the closure element **306** from obstructing the access to the container and/or the escape from the container of the substance contained therein, returning to a position in which the dispensing opening **342** is at least partly obstructed. More specifically, if the container is a bottle containing a liquid which the user drinks resting his/her lips directly on the neck **318**, it possible to avoid that the closure element **306** recloses prematurely, striking the user's face.

[0305] To summarize, in a first embodiment there is provided a cap for a container, comprising a side wall (**302**) extending about an axis (Y) and a transversal wall (**303**) arranged at an end of the side wall (**302**), a separation line (**304**) being provided on the side wall (**302**) for defining:

- **[0306]** a retaining ring (**305**) intended to remain anchored to a neck (**318**) of the container, and
- **[0307]** a closure element (**306**) which can removably engage the neck (**318**), so as to open or close the container;

[0308] wherein the separation line (**304**) extends about the axis (Y) and is circumferentially interrupted to define a joining portion (**308**) having an angular dimension (W**1**) about the axis (Y),

[0309] the cap (**301**) further having a first incision line (**321**) and a second incision line (**322**), which extend transversely to the axis (Y) for delimiting the joining portion (**8**) on opposite sides, the first incision line (**321**) and the second incision line (**322**) having respective angular extensions (A**1**, A**2**) about the axis (Y) greater than the angular dimension (W**1**) of the joining portion (**308**). In a second embodiment, there is provided a cap according to the first embodiment, wherein the first incision line (**321**) delimits at least partially a connecting band (**329**) and a further connecting band (**330**) which connect the retaining ring (**305**) to the joining portion (**308**), and wherein the second incision line **3**(**22**) delimits at least partially a connecting strip (**336**) and a further connecting strip (**337**) which connect the closure element (**306**) to the joining portion (**308**).

[0310] In a third embodiment, there is provided a cap according to the second embodiment, wherein the connecting band (**329**) is defined between a peripheral part (**325**) of the first incision line (**321**) and an end portion of the

separation line (**304**), the further connecting band (**330**) being defined between a further peripheral part (**326**) of the first incision line (**321**) and a further end portion of the separation line (**304**).

[0311] In a fourth embodiment, there is provided a cap according to the third embodiment, wherein the connecting strip (**336**) is defined between a peripheral portion (**334**) of the second incision line (**322**) and the end portion of the separation line (**304**), the further connecting strip (**337**) being defined between a further peripheral portion (**335**) of the second incision line (**322**) and the further end portion of the separation line (**304**).

[0312] In a fifth embodiment, there is provided a cap according to any one of embodiments from the second to the fourth, wherein the connecting band (**329**) and the connecting strip (**336**) are positioned symmetrically to the further connecting band (**330**) and respectively to the further connecting strip (**337**) relative to a plane containing the axis (Y) and a centre line of the joining portion (**308**).

[0313] In a sixth embodiment, there is provided a cap according to any one of embodiments from the first to the fifth, wherein, in an open position, the closure element (**306**) is rotatable about an ideal line passing through an end (**331**) of the second incision line (**322**) and through a further end (**332**) of the second incision line (**322**), so that an edge zone (**341**) of the closure element (**306**) diametrically opposite the joining portion (**308**) can be moved towards the joining portion (**308**) for engaging with the neck (**318**).

[0314] In a seventh embodiment, there is provided a cap according to any one of embodiments from the first to the sixth, wherein the first incision line (**321**) is isolated from the second incision line (**322**).

[0315] In an eighth embodiment, there is provided a cap according to any one of embodiments from the first to the seventh, wherein the first incision line (**321**) and the second incision line (**322**) extend on two levels different from each other.

[0316] In a ninth embodiment, there is provided a cap according to any one of embodiments from the first to the eighth, wherein the second incision line (**322**) is parallel to the first incision line (**321**).

[0317] In a tenth embodiment, there is provided a cap according to any one of embodiments from the first to the ninth, wherein the first incision line (**321**) and the second incision line (**322**) extend on respective planes parallel to a further plane on which the separation line (**304**) extends, the further plane being interposed between said respective planes.

[0318] In an eleventh embodiment, there is provided a cap according to any one of embodiments from the first to the tenth, wherein the angular extensions (**A1**, **A2**) of the first incision line (**321**) and the second incision line (**322**) are equal to each other.

[0319] In a twelfth embodiment, there is provided a cap according to any one of embodiments from the first to the eleventh, wherein the angular extensions (**A1**, **A2**) of the first incision line (**321**) and the second incision line (**322**) are each between 60° and 200°, for example between 75° and 180°.

[0320] In a thirteenth embodiment, there is provided a cap according to any one of embodiments from the first to the twelfth, wherein the angular dimension (**W1**) of the joining portion (**308**) is between 5° and 75°, for example between 10° and 40°.

[0321] In a fourteenth embodiment, there is provided a cap according to any one of embodiments from the first to the thirteenth, wherein the closure element (**306**) is provided with an internal thread intended to engage with an external thread (**317**) of the neck (**318**).

1-30. (canceled)

31. Combination of a cap for a container and of a neck of a container, wherein the neck is delimited by an outer surface from which a circular enlargement projects, the outer surface extending up to a rim of the neck, and wherein the cap comprises a side wall extending about an axis, a separation line being provided on the side wall for defining:

a retaining ring intended to engage with the circular enlargement for remaining anchored to the neck,

and a closure element which can removably engage the neck so as to be movable between a closed position and an open position,

wherein the separation line extends about the axis and is circumferentially interrupted for leaving a joining portion between the retaining ring and the closure element, the cap further having an incision line which extends transversally to the axis between the separation line and a free edge of the retaining ring, so that two connecting bands are defined between the separation line and the incision line, the connecting bands joining the retaining ring to the joining portion, the connecting bands being deformable to allow the joining portion to rotate when the closure element is brought from the closed position to the open position, so that an edge of the joining portion which, in the closed position, faces the retaining ring, is facing towards the rim of the neck in the open position.

32. Combination according to claim **31**, wherein the connecting bands are deformable by a twisting movement which affects at least a part of the height of each connecting band when the closure element is brought from the closed position to the open position.

33. Combination according to claim **31**, wherein a distance between the separation line and the incision line is equal to, or greater than, 1.5 times half the difference between an external diameter of the circular enlargement and a diameter of the outer surface of the neck immediately above the circular enlargement.

34. Combination according to claim **31**, wherein the joining portion has an angular dimension about said axis, which is greater than, or equal to, 20° and less than, or equal to, 120°.

35. Combination according to claim **31**, wherein the joining portion has an angular dimension about said axis, which is greater than, or equal to, 25° and which is less than, or equal to, 90°.

36. Combination according to claim **31**, wherein the neck is provided with at least one fixing element suitable for engaging with the closure element to allow the closure element to be removably fixed to the neck, a distance between the circular enlargement and the at least one fixing element being greater than, or equal to, half of a distance between the separation line and the incision line.

37. Combination according to claim **31**, wherein the circular enlargement is delimited, towards the rim of the neck, by a truncated cone shaped surface, a generatrix of the truncated cone shaped surface forming an angle which is less than, or equal to, 35° with a straight line parallel to a longitudinal axis of the neck.

38. Combination according to claim **31**, wherein the side wall is externally provided with a plurality of knurling lines, the separation line intersecting the knurling lines.

39. Cap for a container, comprising a side wall extending about an axis and a transversal wall arranged at an end of the side wall, a separation line being provided on the side wall for defining:

a retaining ring intended to remain anchored to a neck of the container, and

a closure element which can removably engage the neck so as to open or close the container;

wherein the separation line extends about the axis and is circumferentially interrupted for leaving a joining portion between the retaining ring and the closure element, the cap further having an incision line which extends transversally to the axis between the separation line and a free edge of the retaining ring, so that two connecting bands are defined between the separation line and the incision line, the connecting bands joining the retaining ring to the joining portion, the joining portion having an angular dimension about said axis, which is greater than, or equal to, 20° and less than, or equal to, 120°.

40. Cap according to claim **39**, wherein said angular dimension is greater than, or equal to, 25°, and less than, or equal to, 90°.

41. Cap according to claim **39**, wherein the incision line lies in a plane arranged perpendicularly to said axis, when the closure element is in a closed position.

42. Cap according to claim **39**, wherein the side wall is externally provided with a plurality of knurling lines, the separation line intersecting the knurling lines.

43. Cap according to claim **39**, wherein the incision line and the separation line are cut lines extending on respective parallel planes.

44. Cap according to claim **39**, wherein the incision line has an angular extension about the axis of between 60° and 200°.

45. Cap according to claim **39**, wherein two fracture lines are provided on the side wall, the fracture lines extending towards the transversal wall, respectively from a first end and from a second end of the separation line.

46. Cap according to claim **45**, wherein the fracture lines are parallel to each other and to the axis, the fracture lines having equal length.

47. Cap according to claim **39**, wherein the closure element is provided with an inner thread suitable for engaging with an outer thread of the neck.

48. Cap according to claim **39**, wherein the separation line has a first end and a second end, the joining portion, which joins the retaining ring to the closure element, extending from the first end to the second end.

49. Cap according to claim **39**, wherein the separation line and/or the incision line have respective ends at which incision zones having a circular geometry are provided, for preventing propagation of fracture cracks starting from the separation line and/or from the incision line.

50. Cap according to claim **39**, wherein the joining portion has a thickness substantially constant on a plane containing the separation line.

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