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(54) CAP FOR CONTAINER

(57) The closing cap for a container comprises a lateral wall extending around an axis and a transversal wall positioned at one end of the lateral wall. A separating line is provided on the lateral wall to define a retaining ring, which comprises a retaining portion which extends as far as a free edge of the retaining ring and is configured to internally engage with a locking ring of a neck of the container in such a way as to remain anchored to the neck, and a closing element which can removably engage with the neck, so as to open or close the container. The cap additionally comprises an incision line also provided on the lateral wall to define, together with the separating line, at least one connecting band for connecting the closing element and the retaining portion to each other. The cap comprises: a coupling structure positioned inside the lateral wall for removably coupling the closing element to the neck of the container, the lateral wall having a first portion, without the coupling structure and on which the separating line and the incision line are made, which has a first height measured along an axis parallel to the axis starting from the free edge, and a second portion provided with the coupling structure, which has a second height measured along an axis parallel to the axis starting from the transversal wall. The ratio between the second height and the first height is less than or equal to 2.00 so that the connecting band can be made in the first portion with suitable dimensions.

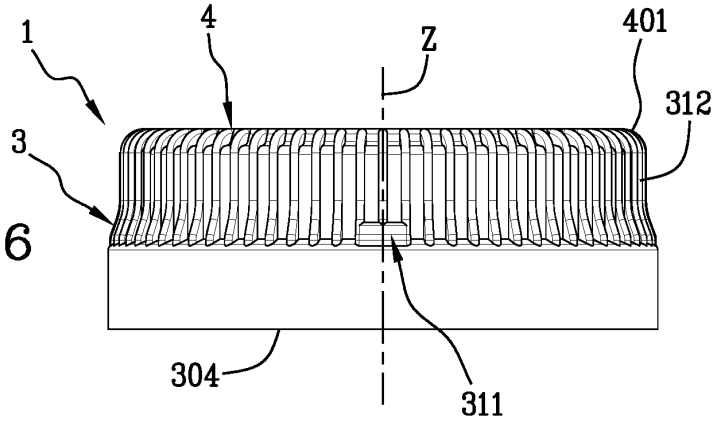


Fig.6

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Description

[0001] The present invention relates to a cap for a container.

[0002] In particular, the invention relates to a cap provided with a retaining ring, joinable to a container neck, the cap also being provided with a closing element which, after opening, remains connected to the retaining ring. The cap is particularly, but not exclusively, suitable for bottles intended to contain liquid substances.

[0003] There are prior art bottle caps comprising a cup-shaped body having a lateral wall extending around an axis, the cup-shaped body being provided with an inner thread suitable for engaging with an outer thread of a neck of the bottle. The prior art caps are also provided with a security ring connected to the cup-shaped body by means of a tear line provided with a plurality of breakable elements, for example breakable bridges. When the cap is opened for the first time, the cup-shaped body separates from the security ring along the tear line following breaking of the breakable bridges. The security ring remains joined to the neck of the bottle, whilst the cup-shaped body can be unscrewed by the user, who 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 onto the neck again to reclose the bottle.

[0004] Sometimes, after the bottle has been emptied, the user throws the cup-shaped body on the ground, intentionally or accidentally, whilst the bottle, together with the security ring joined to it, is correctly thrown in a waste bin. Obviously, this is unwanted behaviour.

[0005] In order to overcome this disadvantage, caps have been proposed which are provided with a separating line made in a lateral wall of the cap to define a retaining ring, configured to remain anchored to a neck of the container, and a closing element, which can removably engage with the neck, so as to open or close the container. The retaining ring is provided with a retaining portion, which extends as far as a free edge of the retaining ring and is configured to internally engage with a locking ring of the neck. These caps additionally comprise an incision line also provided on the lateral wall to define, together with the separating line, at least one connecting band positioned for connecting the closing element and the retaining portion to each other.

[0006] Along the separating line, or along the incision line, the breakable bridges may be present, which are intended to be broken the first time the cap is opened.

[0007] The closing element can be rotated between an open condition, in which a user can access the contents of the bottle, and a closed condition, in which the closing element prevents access to the bottle.

[0008] The connecting band keeps the closing element joined to the retaining ring and therefore to the bottle, preventing the possibility of the closing element being thrown on the ground independently from the bottle.

[0009] Moreover, the connecting band allows the closing element to be moved away from the retaining portion of the retaining ring, which remains anchored to a locking ring of the neck of the container during opening of the container. Indeed, it is possible to make use of the movement capacity of the connecting band itself, in passing from the closed condition to the open condition, and vice versa.

[0010] The cap may be obtained from a concave body which comprises the lateral wall and a transversal wall placed at one end of the lateral wall, and it may be made for example by moulding a polymeric material, for example compression moulding or injection moulding.

[0011] After the concave body has been formed, the separating line and the incision line are made on the lateral wall using cutting tools, which may for example be blades positioned perpendicularly to the axis Z, if the separating line and the incision line lie, for example in respective parallel planes, which are for example perpendicular to the axis Z.

[0012] If we now consider the lateral wall, it comprises a first portion starting from the free edge which is without thread and a second portion, starting from the transversal wall which is provided with the thread.

[0013] Since they are made by means of cutting operations, the separating line and the incision line may be positioned in the lateral wall only in the first portion which is without thread but not in the second portion in which the thread is present.

[0014] Since the connecting band is made by the separating line, together with the incision line, the axial height of the connecting band is defined by the positioning of the separating line and of the incision line relative to each other in the first portion of the lateral wall.

[0015] To ensure that the connecting band is sturdy and that it does not break along with the breakable bridges when the cap is opened for the first time, the connecting band must have a minimum axial height. However, this is not always possible if the caps have a small height.

[0016] Indeed, for relatively short caps, the thread may leave free a portion of cap, which extends as far as the free edge, which is so small as to mean that the connecting band, which is made in it, has a height unsuitable for guaranteeing sturdiness and deformability of the self-same connecting band.

[0017] The sturdiness of the connecting band guarantees that the latter does not break, whilst the deformability of the connecting band guarantees correct locking of the closing element, when the cap is in the open condition.

[0018] Indeed, in prior art caps, the retaining ring, in the open condition, when a user inclines the bottle to pour its contents, can easily rotate and also cause the closing element connected to it fall downwards due to gravity. If that happens, the closing element may be positioned facing and below the dispensing opening. Therefore, the user is obliged to manually lock the cap before inclining the bottle, in order to avoid undesired splashes or deviations of the content to be poured and have the guarantee that the closing element does not disturb the dispensing.

[0019] If the connecting band is deformable, it can be subjected to bending and can operate in conjunction with the neck to keep the cap stably locked in the same position in the open condition.

[0020] Figures 1 to 4 show caps, which have a small height, in which the possibility of making a separating line 105 and an incision line 107 intended to define at least one connecting band is considered.

[0021] Specifically, the caps 100 below which are illustrated in Figures 1 to 4 show two connecting bands 116 and 117 but it should be noticed that the considerations provided below may also apply to various variants of caps, even provided with only one connecting band.

[0022] In the caps with small height, shown in Figures 1 to 4, the incision line 107 is positioned between the separating line 105 and a free edge of the cap and the separating line 105, which defines the closing element and the retaining ring, is circumferentially interrupted in order to keep the closing element and the retaining ring joined together by means of a joining portion.

[0023] Figure 1 shows a cross-section of a cap 100, widespread on the market, disclosing a first axial portion of the lateral wall without thread which has a first height T1 and a second axial portion provided with thread which has a second height T2, in which it can be seen how the first height T1 is much smaller than a height H2 of the cap;

[0024] Figure 2 shows a side view of an embodiment of the cap 100 of Figure 1, in which it is assumed that the separating line 105 and the incision line 107 are made in the first portion to define a closing element, a retaining ring and two connecting bands, 116 and 117 made between the separating line 105 and the incision line 107;

[0025] Figure 3 shows a side view of another embodiment of the cap 100 of Figure 1, in which it is assumed that the separating line 105 and the incision line 107 are made in the first portion to define a closing element, a retaining ring and two connecting bands 116 and 117 made between the separating line 105 and the incision line 107, and in which it is assumed that a tab 108 is made, interposed between the two connecting bands 116 and 117, an end edge of the tab 108 being aligned with the incision line 107;

[0026] Figure 4 shows a side view of another different embodiment of the cap 100 of Figure 1, in which it is assumed that the separating line 105 and an incision line 107' are made in the first portion to define a closing element, a retaining ring and two connecting bands 116 and 117 made between the separating line 105 and the incision line 107', and in which it is assumed that a tab 108' is made, interposed between the two connecting bands 116 and 117, which differs from the tab 108 of Figure 3 because a central stretch of the incision line 107', intended to form the end edge of the tab 108', projects relative to the connecting bands 116, 117 towards the free edge.

[0027] The separating line 105 is positioned at a distance D1 from the free edge of the retaining ring. The height of the retaining ring along an axis parallel to the axis Z is therefore equal to D1.

[0028] H1 indicates a height of the connecting bands and D2 indicates a height of a retaining portion, along an axis parallel to the axis Z when the closing element is in the closed condition. The incision line 107, 107' is therefore positioned at a distance D2 from the free edge of the retaining ring.

[0029] H2 indicates a height of the cap 1, measured between the transversal wall and the free edge.

[0030] In Figure 4, in which the projecting tab is present, D3 indicates the distance between the central stretch of the incision line and the free edge.

[0031] Therefore, it should be noticed that there is a transition from the first portion to the second portion positioned at a distance equal to T1 from the free edge 304, and that the separating line 105 can be positioned in the lateral wall of the cap in the first portion.

[0032] If the height D1 of the retaining ring is small due to the thread in the second portion, the height H1 of the connecting bands may be small, as shown in Figures 2 and 3.

[0033] If, in addition, the tab 108' which projects relative to the connecting bands is present, as illustrated in Figure 4, although keeping the distance D3 relative to the free edge to a minimum, the height H1 of the connecting bands is even smaller, since the tab 108' itself must also be made within the height D1 of the retaining ring.

[0034] Consequently, considering a cap 100 with small height which is currently widespread on the market and assuming that at least one connecting band is made in it so as to keep the closing element connected to the retaining ring in the cap open condition, that connecting band may have a height insufficient to guarantee that, during opening of the container, or during its subsequent use, the connecting band will not break.

[0035] Moreover, the thickness being inadequate, the deformability of the connecting band, or of the two connecting bands previously shown, could be insufficient to guarantee that the closing element will remain stably locked in the same position in the closed condition.

[0036] Document US2020/115115 shows a closing cap which includes a first and a second closing portion. The first closing portion includes an upper wall portion and a first and a second breakable connection, wherein the first breakable connection extends around the closing circumference and the second breakable connection is at a distance from the first breakable connection, at least one portion of the second breakable connection being located further from the upper wall portion than a portion of the first breakable connection. The second breakable connection defines an area suitable for forming a tab.

[0037] An aim of the invention is to improve the prior art caps, in particular the caps comprising a retaining ring intended to remain joined to a neck of the container and a closing element which can removably engage with the neck to allow a user to open or alternatively close the container.

[0038] A further aim is to provide a cap for a container,

provided with a closing element which remains connected to the retaining ring, which additionally may remain stably locked in a position after opening, even when the height of the cap is small.

[0039] A different aim of the invention is to provide a cap, provided with at least one connecting band, positioned between a closing element of the cap and a retaining portion of the retaining ring and intended to remain anchored to a locking ring of the neck, which is sturdy and deformable in the cap open condition, even when the height of the cap is small.

[0040] According to one aspect of the invention, a cap for a container is provided according to claim 1 and the claims dependent on it.

[0041] The invention can be better understood and implemented with reference to the accompanying drawings, which illustrate several example, non-limiting embodiments of it, in which:

Figure 5 is a cross-section of a closing cap for a container, in accordance with the invention, along a plane passing through an axis of the cap;

Figure 6 is a side view of the cap of Figure 5, showing an optically recognisable mark amongst knurling lines of a lateral wall of the cap;

Figure 7 is a cross-section of the cap of Figure 5 along the cross-section plane VII - VII;

Figure 8 is a side view of an embodiment of the cap of Figure 5, which comprises a separating line and an incision line to define a closing element, a retaining ring and two connecting bands, which are defined between the incision line and the separating line;

Figure 9 shows a side view of a different embodiment of the cap of Figure 5, in which the separating line, the incision line and the two connecting bands are present, and in which a tab is present interposed between the two connecting bands, a central stretch of the incision line, intended to form the end edge of the tab, being aligned with the incision line.

Figure 10 shows a side view of another embodiment of the cap of Figure 5, in which the separating line, the incision line and the two connecting bands are present, and in which a tab is present interposed between the two connecting bands, a central stretch of the incision line, intended to form the end edge of the tab, projecting towards a free edge of the retaining ring;

Figure 11 is a cross-section of a variant of the closing cap of Figure 5, along a plane passing through an axis of the cap;

Figure 12 is an enlarged side view of a portion of a lateral wall of the cap of

Figure 11, seen from the angle D of Figure 13, for highlighting an embodiment of the optically recognisable mark of Figure 6;

Figure 13 is a cross-section of the cap of Figure 11 along the cross-section plane XIII - XIII;

Figure 14 is a cross-section of another variant of the closing cap of Figure 5, along a plane passing through an axis of the cap;

Figure 15 is an enlarged side view of a portion of a lateral wall of the cap of

Figure 14, for highlighting another embodiment of the optically recognisable mark of Figure 6;

Figure 16 is a cross-section of the cap of Figure 14 along the cross-section plane XVI - XVI;

Figure 17 is a cross-section of a further variant of the closing cap of Figure 5, along a plane passing through an axis of the cap;

Figure 18 is a cross-section of the cap of Figure 17 along the cross-section plane XVIII - XVIII;

Figure 19 is a side view of another different embodiment of the cap of Figure 8, which comprises the separating line and the incision line to define the closing element, the retaining ring and two connecting bands, defined between the incision line and the separating line, in which the cap additionally comprises a projection positioned between the separating line and the incision line which projects from an outer surface of the cap transversally to the axis Z;

Figure 20 is another side view of the cap of Figure 19.

[0042] With reference to the appended Figures 5 to 20, the numeral 1 denotes a closing cap for a container, not illustrated, in particular a bottle intended to contain a liquid substance such as a beverage.

[0043] It should be noticed that, in this description, the same reference numbers will be assigned to identical components.

[0044] The cap 1 is made of polymeric material. Any polymeric material suitable for moulding may be used to obtain the cap 1.

[0045] The cap 1 is shown in Figures 5 to 20 in a condition in which the cap 1 is found when it leaves a cap production line and can be applied to a neck, not illustrated, of the container, in combination with it.

[0046] The cap 1 comprises a lateral wall 3 which extends around an axis Z, and a transversal wall 4 positioned at one end of the lateral wall 3, so as to close that end. The transversal wall 4 extends transversally, in particular perpendicularly, to the axis Z.

[0047] The axis Z is a central axis, of symmetry for the cap 1.

[0048] The transversal wall 4 may be flat, even though other shapes are theoretically possible. In the example illustrated, the transversal wall 4 has a substantially circular shape in plan view.

[0049] The lateral wall 3 and the transversal wall 4 define a cup-shaped body, suitable for receiving an end portion of the neck of the container, so that the cap 1 can close the self-same container.

[0050] In particular, the lateral wall 3 is connected to the transversal wall 4 by a connecting zone 401, which may be shaped, in cross section, like a bevelled edge or a circular connector.

[0051] The cap 1 comprises a separating line 5, shown

at least in Figures 8 to 10, which is provided on the lateral wall 3 to define a retaining ring 301, which is configured to remain anchored to the neck of the container.

[0052] The separating line 5, on the lateral wall 3, defines not just the retaining ring 301, but also a closing element 302 removably engageable with the neck, so as to open or close the container. The closing element 302 is engageable for closing a dispensing opening, not illustrated, of the container.

[0053] The retaining ring 301 comprises a retaining portion 303 which is configured to internally engage with a locking ring of the neck, not illustrated, in such a way as to remain anchored to the self-same neck.

[0054] The locking ring is an annular protuberance, which projects from an outer surface of the neck in a plane placed transversally to the axis Z.

[0055] The retaining portion 303 extends as far as a free edge 304 of the retaining ring 301, which delimits the retaining ring 301 on the opposite side to the transversal wall 4.

[0056] In other words, the retaining portion 303 is a lower portion of the retaining ring 301, and therefore of the cap 1, when the cap is joined to the container and is configured to keep the retaining ring 301 anchored to the neck of the container.

[0057] The lateral wall 3 may be provided, on an outer surface thereof, with a plurality of knurling lines 312, 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.

[0058] The knurling lines 312 may be positioned in the closing element 302, but may also continue in the connecting zone 401 and/or in the retaining ring 301.

[0059] In the example shown in Figure 6, it should be noticed that the lateral wall 3 comprises a cylindrical portion which extends as far as the connecting zone 401, on which the knurling lines 312 are made, a widened portion with diameter greater than the cylindrical portion, which extends as far as the free edge 304 of the retaining ring 301 and a connecting zone positioned between the cylindrical portion and the widened portion. The knurling lines 312 are provided on the connecting zone but not in the widened portion, which is externally delimited by a smooth outer surface, that is to say, it can be free of knurling lines 312. However, that is not necessary, since the knurling lines 312 could also extend on the widened portion.

[0060] Figure 6 shows that in the connecting zone the knurling lines 312 are interrupted and there is a mark 311 present, which is optically recognisable, having a rectangular shape and a smooth outer surface, so that optical inspection systems for the cap 1, which are present in cap 1 production lines, can optically tell the difference between it and the knurling lines 312. An incision line 7, shown in Figures 8 to 10, 19 and 20, is provided on the lateral wall 3 and defines, together with the separating line 5, at least one connecting band for connecting the closing element 302 and the retaining portion 303 to each other.

[0061] The separating line 5 and the incision line 7 can be made as cutting lines by means of a cutting operation on a concave body obtained by moulding. The cutting lines may pass through the entire thickness of the lateral wall, or not pass through if the thickness of the lateral wall is to be only partially cut.

[0062] Preferably, the separating line 5 and the incision line 7 are made by means of through cuts passing through an entire thickness of the lateral wall.

[0063] Optionally, along the separating line 5 there may be a plurality of breakable bridges 503, whilst along the incision line 7, there may be a plurality of breakable elements 704, which are shown in Figures 8 to 10, 19 and 20, those breakable bridges 503 and breakable elements 704 being intended to break the first time the cap 1 is opened. The breakable elements 704 may be positioned in angularly offset positions around the axis Z relative to the breakable bridges 503.

[0064] Preferably, the breakable bridges 503 are provided along the separating line 5 but not on the incision line 7.

[0065] As indicated in more detail below, concerning the position of the incision line 7 relative to the separating line 5 different variants of the cap 1 may be identified as regards, for example, the position of the connecting band or the number of connecting bands present.

[0066] As already indicated, the separating line 5 is positioned at a distance D1 from the free edge 304 of the retaining ring 301. The height of the retaining ring 301 along an axis parallel to the axis Z is therefore equal to D1.

[0067] H1 indicates a height of the connecting band and D2 indicates a height of the retaining portion 303, along an axis parallel to the axis Z when the closing element 302 is in the closed condition.

[0068] H2 indicates a height of the cap 1, measured between the transversal wall 4 and the free edge 304.

[0069] As shown at least in Figures 5, 11, 14 and 17, the cap 1 additionally comprises a coupling structure 2, or thread, positioned inside the lateral wall 3 for removably coupling the closing element 302 to the neck of the container.

[0070] Figure 7 shows how the thread 2 has three starts, that is to say, it comprises three distinct helical curved threads 201, each of which extends continuously for an angle α which is equal to 120° and begins every 120°.

[0071] Figure 7 also shows how there are three distinct optically recognisable marks 311 present, which are angularly spaced by an angle β which is also equal to 120° and they are in turn spaced relative to a starting position of each thread 201.

[0072] Alternatively, the angular spacing of each mark 311 relative to each thread 201 may be equal to 0°, or equal to any other value necessary in the cap 1 production lines in order to allow a check of quality or assembly of the cap on the container.

[0073] This applies not just for the cap 1 of Figure 7, but also for the caps which will be described below and which also have respective optically recognisable marks.

[0074] The lateral wall 3 has a first portion 309 without the thread 2 which has a first height T1 measured along an axis parallel to the axis Z starting from the free edge 304.

[0075] The separating line 5 and the incision line 7 are positioned on the first portion 309 since it is necessary that the cutting operations, which may be necessary in order to make them, are carried out in the portion without the thread 2.

[0076] The lateral wall 3 also has a second portion 310 provided with the thread 2 which has a second height T2 measured along an axis parallel to the axis Z starting from the transversal wall 4.

[0077] The sum of the first height T1 and of the second height T2 is equal to the height H2 of the cap 1 and consequently, at a distance from the free edge 304 equal to the first height T1, a transition from the first portion 309 to the second portion 310 is present, that is to say, the thread 2 begins.

[0078] At the first portion 309, on the inside of the lateral wall 3 there is a cylindrically shaped inner surface, whilst at the second portion 310 the inner surface is in the shape of the thread 2.

[0079] A connecting surface 314 may be present in the first portion 309 to connect the inner surface in the shape of the thread of the second portion 310 and the cylindrical inner surface of the first portion 309. As shown in Figures 5 and 14, the connecting surface 314 may have a conical shape or alternatively, as shown in Figures 11 and 17, it may have a planar shape. According to this invention, the ratio between the second height T2 and the first height T1 is less than or equal to 2.00 so that the connecting band can be made with suitable dimensions. The term "suitable" dimensions means that the dimensions of the connecting band are such that they keep the closing element 302 stably connected to the retaining ring 301 when the closing element 302 is in an open condition.

[0080] In other words, if we consider the second height T2 as the dividend and the first height T1 as the divisor, the ratio between them, which is less than or equal to 2.00, guarantees that the connecting band can have the characteristics necessary for keeping the closing element 302 and the retaining ring 301 connected during the passage from the closed condition to the open condition and when the cap 1 is in the open condition. Thanks to the connecting band, which stably connects the closing element 302 to the retaining portion 303 when the cap is in the open condition, the possibility of the closing element 302 being thrown on the ground separately from the container is prevented. This increases the probability that the closing element 302, together with the container, is correctly disposed of together with waste of the same type as it, in particular with waste made of plastic material.

[0081] Thanks to the fact that the ratio between the second portion 310, provided with the thread 2 and the first portion 309, without the thread 2 is less than or equal to 2.00, it is guaranteed that part of the height H2 of the cap 1, established proportionally relative to the height H2, always remains without the thread 2 so that it is possible to make in said part the separating line 5 and the incision line 7, which together define the height H1 of the connecting band.

[0082] Even if the cap 1 has a small overall height H2, it is guaranteed that the height H1 of the connecting band, defined by the separating line 5 and by the incision line 7 which are present in the first portion 309, may be kept to a size sufficient to ensure that the connecting band is sturdy and can deform, in the cap open condition, when it is subjected to stress by a user. This allows the closing element 302 to be stably locked on the neck of the container when the cap is in the open condition and prevents any rotating movement of the closing element, either towards the dispensing opening or around the neck of the bottle. Therefore, the closing element cannot fall due to gravity, as illustrated below.

[0083] Even when the user wants to close the container again, the presence of a sturdy connecting band allows the passage from the open condition to the closed condition without the connecting band breaking.

[0084] According to one variant of the invention, the ratio between the second height T2 and the first height T1 is less than or equal to 1.70, preferably it is less than or equal to 1.40.

[0085] Even more preferably, the ratio between the second height T2 and the first height T1 is greater than or equal to 1.0.

[0086] As a result, the ratio between the second height T2 and the first height T1 may be greater than or equal to 1.0 and less than or equal to 2.0; preferably greater than or equal to 1.0 and less than or equal to 1.70; even more preferably greater than or equal to 1.0 and less than or equal to 1.40.

[0087] The Applicant has noticed that said size ratios are particularly advantageous for caps 1 which have a height H2 greater than or equal to 10.0 mm and less than or equal to 16.0 mm, preferably for caps 1 which have a height greater than or equal to 10.0 mm and less than or equal to 12.5 mm, even more preferably for caps 1 which have a height greater than or equal to 10.0 mm and less than or equal to 11.0 mm.

[0088] For example, the cap 1 of Figures 5 to 10, has height H2 equal to 11.71 mm. According to this invention, the first height T1 is equal to 5.41, the second height T2 is equal to 6.30 and the ratio between the second height T2 and the first height T1 is equal to 1.16.

[0089] Therefore, it should be noticed that, although the height H2 of the cap is small, it is particularly advantageous to have the first portion 309 with increased height, so as to guarantee that a significant portion of the cap 1 is available for being able to make the separating line 5 and the incision line 7.

[0090] However, it should be noticed that the ratio between the second portion 310 and the first portion 309,

according to the invention, may be applied to any type of cap. Indeed, even in caps with height H2 greater than 16 mm it could still be advantageous to have a first portion 309 with increased height if one wants the closing element 302 to be locked on the neck resting on a coupling structure of the neck, beyond the locking ring, in order to render even more stable the combination of the cap and the neck on which the cap is applied.

[0091] If the first portion 309 has increased height in accordance with this invention, irrespective of the height H2 of the cap 1, it therefore follows that the second portion 310, in which the thread 2 is present, is small. As a result of this, when the cap 1 engages with the neck of the container, the thread 2 engages with the corresponding thread of the neck of the container later than in a cap 1 which has the same height H2 but is not made according to this invention.

[0092] The cap 1 also comprises a sealing element 8 which extends from an inner surface of the transversal wall 4 internally relative to the lateral wall 3 and, in use, is configured to be positioned inside the dispensing opening of the neck in order to form a seal with an inner wall of the neck.

[0093] That sealing element 8 is made as a cylindrical wall which protrudes from the transversal wall 4 as far as a sealing end 801, which has increased thickness and protrudes radially outward towards the lateral wall 3 so as to create the seal with the inner wall of the neck, when the sealing element 8 is inserted in the dispensing opening of the neck.

[0094] The sealing element 8 is coaxial relative to the lateral wall 3 and has a height H3 measured along an axis parallel to the axis Z starting from the transversal wall 4.

[0095] The height H3 of the sealing element 8 is less than or equal to the first height T1.

[0096] In other words, even the height H3 of the sealing element 8 is small so as to ensure that the sealing element 8 engages with the neck of the container only after the thread 2 of the cap 1 has engaged with the corresponding thread of the neck, during closing of the cap 1.

[0097] The small dimensions of the sealing element 8 guarantee that the cap 1 can be screwed onto the neck of the container in the usual way, despite the thread 2 according to this invention engaging with the neck later than the thread of a cap which is not made according to this invention.

[0098] It should be noticed that reference is made to "small" dimensions compared with corresponding dimensions of a cap 1 of the same height, already known but not made according to this invention.

[0099] If we now consider the transition at the height T1 (from the free edge 304) between the first portion 309 and the second portion 310, it can be seen how the separating line 5, or the incision line 7, may advantageously be positioned at a distance (not illustrated) less than or equal to 1.00 mm from said transition and therefore at a height less than or equal to 1.00 mm from the height T1.

[0100] Preferably, the separating line 5, or the incision line 7, may be positioned at a distance preferably less than or equal to 0.50 mm from said transition, preferably equal to 0.40, from said transition.

[0101] Thanks to this distance from the transition, the separating line 5, or the incision line 7, may be made in a zone of the lateral wall 3 which is, radially, the stiffest of the cap 1. Consequently, the cutting operation necessary to make the separating line 5, or the incision line 7, is extremely efficient, since the cutting tools are capable of making optimum contact with the lateral wall 3, therefore maximising a penetration in the lateral wall 3, which allows the achievement of high cutting precision and minimum wear on the cutting tools themselves.

[0102] As already indicated, the retaining ring 301 is configured to internally engage with the locking ring in such a way as to remain anchored to the neck.

[0103] For that purpose, as shown in Figure 5, the retaining ring 301 is internally provided with an engaging element 313, suitable for engaging with the locking ring. The engaging element 313 is configured to abut against the locking ring in order to prevent axial movements of the retaining ring 301, away from the neck, when the closing element is moved away from the neck.

[0104] In detail, it is the retaining portion 303 of the retaining ring 301 which is provided with the engaging element 313, in such a way that it is kept anchored to the locking ring even when the closing element 302 is in the open condition and is locked at a distance from the neck and from the dispensing opening.

[0105] The engaging element 313 is shaped like an annular element which is bent around the free edge 304 inwards towards the inside of the retaining portion 303. In detail, the annular element may be continuous or interrupted. Indeed, there may be a plurality of bent elements, shown in Figure 5, shaped like tabs, which project from the free edge 304 and are bent inwards towards the inside of the retaining portion 303 to form the engaging element. Alternatively, according to an embodiment not illustrated, the engaging element 313 may be shaped like a continuous or interrupted protuberance, which from an inner surface of the retaining portion 303 projects towards the axis Z to engage with the locking ring.

[0106] If we now consider the cap 1 of Figures 5 to 7 and position the separating line 5 and the incision line 7 in it, as shown in Figures 8 to 10, 19 and 20, we can see how there may be a plurality of connecting bands present, for example two, that is to say, a first connecting band 306 and a second connecting band 307 for connecting the closing element 302 and the retaining portion 303 to each other, the connecting bands being defined by the separating line 5 together with the incision line 7.

[0107] In detail, the first connecting band 306 and the second connecting band 307 are defined between the separating line 5 and the incision line 7.

[0108] Advantageously, since the separating line 5, or the incision line 7 are near the height T1, it is possible to obtain the first connecting band 306 and the second con-

necting band 307 with height sufficient for them to be sturdy and not break.

[0109] The incision line 7 comprises a first lateral stretch 702 and a second lateral stretch 703, which at least partly define the first connecting band 306 and the second connecting band 307. The first connecting band 306 is defined between the first lateral stretch 702 and a first part of the separating line 5, which extends from a first end 501 of the separating line 5.

[0110] The second connecting band 307 is defined between the second lateral stretch 703 and a second part of the separating line 5, which extends from a second end 502 of the latter.

[0111] The separating line 5 extends around the axis Z and is circumferentially interrupted so as to leave the retaining ring 301 and the closing element 302 joined by a joining portion 305. In detail, the separating line 5 extends between the first end 501 and the second end 502.

[0112] The incision line 7 extends between the separating line 5 and the free edge 304 of the retaining ring 301.

[0113] Therefore, the retaining ring 301 extends between the separating line 5 and the free edge 304 and may be delimited by a cylindrical or frustoconical outer surface.

[0114] Preferably, the separating line 5 is parallel to the free edge 304.

[0115] The first connecting band 306 and the second connecting band 307 are therefore positioned in the retaining ring 301 and extend from the joining portion 305 to the retaining portion 303.

[0116] The first connecting band 306 and the second connecting band 307 are positioned circumferentially on opposite sides of the joining portion 305.

[0117] It should be noticed that the incision line 7 has an angular extent, measured around the axis Z, which is greater than the angular distance (also measured around the axis Z) between the first end 501 and the second end 502 of the separating line 5, that is to say, the angular extent of the joining portion 305.

[0118] In addition, the joining portion 305 extends circumferentially in the angular extent of the incision line 7.

[0119] The first lateral stretch 702 and the second lateral stretch 703 of the incision line 7 are both perpendicular to the axis Z and are aligned. However, in an embodiment not illustrated, the two lateral stretches 702 and 703 could be slightly angled relative to each other and have different inclinations, not necessarily parallel to each other.

[0120] The first lateral stretch 702 and the second lateral stretch 703 preferably extend, in a first plane (not illustrated) parallel to a separating plane (not illustrated) containing the separating line 5, the first plane being transversal to the axis Z, in particular perpendicular to the axis Z.

[0121] When the cap 1 is in the open condition, the first lateral stretch 702 and the second lateral stretch 703 respectively define a first free lower edge, not illustrated, and a second free lower edge, not illustrated, of the connecting bands 306, 307.

[0122] In addition, the first lateral stretch 702 and the second lateral stretch 703 also define a first free upper edge, not illustrated, and a second free upper edge, not illustrated, of the retaining portion 303.

[0123] The first lateral stretch 702 and the second lateral stretch 703 are positioned at the distance D2 from the free edge 304 of the retaining ring 301, along an axis parallel to the axis Z, which corresponds to the height of the retaining portion 303.

[0124] The incision line comprises a central stretch 701 which is interposed between the first lateral stretch 702 and the second lateral stretch 703 of the incision line 7 and defines an end edge which in the closed condition is facing the retaining portion 303 and is configured to be directed, when the cap is in the open condition, towards the neck, or towards the dispensing opening, of the container.

[0125] It should be noticed that, as shown in Figures 8 to 10, and 19, the central stretch 701 as well as the two lateral stretches 702 and 703 are positioned in a single plane which is positioned transversally, in particular perpendicularly to the axis Z.

[0126] When the closing element 302 passes from the closed condition to the open condition, the joining portion 305 deforms and is overturned relative to the neck, so that the end edge can rest on the neck itself.

[0127] A centre line of the joining portion 305 and a centre line of the incision line 7 may be positioned angularly near each other.

[0128] Preferably, the centre line of the separating line 5 and the centre line of the incision line 7 coincide with each other, as shown in Figures 8 to 10, and 19, so that the first connecting band 306 and the second connecting band 307 are positioned symmetrically relative to a plane containing the axis Z and a centre line of the joining portion 305, and the first connecting band 306 and the second connecting band 307 are of equal length.

[0129] According to one embodiment not illustrated, the centre line of the incision line 7 may not coincide with the centre line of the joining portion 305, provided that it is angularly near it as previously said, and in that case the first connecting band 306 may have a different length to the second connecting band 307, since the first lateral stretch 702 and the second lateral stretch 703 may have a different angular extent.

[0130] As illustrated in Figure 9, the retaining ring 301 comprises a tab 308 so that when the closing element 302 is in an open condition and the connecting bands 306, 307 keep the closing element 302 connected to the retaining ring 301, the tab 308 can rest on the neck.

[0131] The central stretch 701 defines the end edge of the tab 308, when the cap 1 is in the open condition.

[0132] Two cutting lines 6 are provided on the lateral wall 3 to define the respective lateral edges of the tab 308 and they are formed by cutting lines which pass through an entire thickness of the lateral wall 3.

[0133] The central stretch 701 of the incision line 7 is positioned between the cutting lines 6 and is also interposed between the first lateral stretch 702 and the second lateral stretch 703 of the incision line.

[0134] If, as illustrated in Figure 9, the central stretch 701 as well as the two lateral stretches 702 and 703 are aligned with each other and in the single plane positioned transversally, in particular perpendicularly, to the axis Z, the end edge of the tab 308 is aligned with the first free lower edge, and with the second free lower edge, of the connecting bands 306, 307.

[0135] If we consider a height of the tab 308, this is determined by the height of the cutting lines 6.

[0136] Otherwise, as illustrated in Figure 10, the cap 1 may comprise a tab 308', which differs from the tab 308 illustrated in Figure 9 due to the fact that it has an incision line 7' which comprises a central stretch 701' which extends in a second plane, parallel to the separating plane and interposed between the first plane and the free edge 304 of the retaining ring 301, to define an end edge of the tab 308' which projects relative to the connecting bands 306, 307.

[0137] Indeed, whilst the first lateral stretch 702 and the second lateral stretch 703 are similar to those of Figure 9, the incision line 7' has the central stretch 701' which is nearer to the free edge 704 in order to define the tab 308' projecting relative to the connecting bands 306, 307.

[0138] D3 indicates the distance between the central stretch 701' and the free edge 304.

[0139] In this case too, the height of the tab 308' is determined by the height of the cutting lines 6, which extend from the central stretch 701' until they intercept the lateral stretches 702, 703.

[0140] In one embodiment not illustrated, the cutting lines 6 may continue in the joining portion 305 and optionally also in the closing element 302 to give the tab 308 greater flexibility relative to a virtual hinge line, placed on the opposite side to the end edge between the opposite ends of the cutting lines 6.

[0141] Whilst the tab 308 of Figure 9 is made in the height H1 of the connecting bands 306, 307, the tab 308' of Figure 4 is made exclusively as an external part, projecting relative to the first connecting band 306 and the second connecting band 307.

[0142] Figure 19 shows a cap which differs from the cap of Figure 8 due to the fact that the joining portion 305 is externally provided with a projection 315, which projects from the joining portion 308 and is positioned between the separating line 305 and the incision line 7, so that, when the closing element 302 is in the open position and the connecting bands 306, 307 keep the closing element 302 connected to the retaining ring 301, the end edge defined by the central stretch 701 of the incision line is directed, in the open position, towards the dispensing opening of the container and the projection 315 is resting on the neck.

[0143] The projection 315 operates in conjunction with the overturning of the joining portion 305 and can stabilise and lock the closing element 302 on the neck, preventing the connecting bands 306 and 307 from rotating in the opposite direction.

[0144] Now considering the shape of the cap 1 and the positioning of the separating line 5, it should be noticed that the closing element 302 is defined by the cylindrical portion whilst the retaining ring 301 is defined by the widened portion since the separating line 5 is provided on the widened portion, near to the first height T1 at which the first portion 309 without the thread 2 begins.

[0145] However, other cap 1 configurations could be possible, with respect to the position of the separating line 5, the extent of the knurling lines 312 and the outer shape of the cap 1. For example, the separating line 5 may be positioned on the cylindrical portion, if the transition from the first portion 309 to the second portion 310 occurs at the self-same cylindrical portion. According to one variant not illustrated, the separating line 5 and the incision line 7 have angular extent greater than 180° and the centre line of the separating line 5 and the centre line of the incision line 7 are positioned angularly opposite each other. Preferably, the separating line 5 and the incision line 7 have equal angular extent.

[0146] According to this variant, the separating line 5 and the incision line 7 only overlap each other between the first part of the separating line 5 and the first lateral stretch 702 of the incision line 7 and between the second part of the separating line 5 and the second lateral stretch 703 to define respectively the first connecting band 306 and the second connecting band 307.

[0147] According to a further variant not illustrated, the separating line 5 is positioned between an incision line and the free edge 304. In this case, the retaining ring 301 coincides with the retaining portion 303 and the connecting bands 306, 307 are made in the closing element 302.

[0148] The joining portion 305, defined between the first end 501 and the second end 502 of the separating line 5, is joined to the retaining portion 303.

[0149] The first connecting band 306 and the second connecting band 307, when the cap passes from the closed condition to the open condition, thereby adopt a trapezium-shaped configuration, not illustrated, but the smaller base of the trapezium is directed towards the free edge 304, whilst the larger base of the trapezium, defined by the incision line, is directed towards the transversal wall 4.

[0150] In other words, the central stretch of the incision line is facing the closing element 302, and in detail, is facing an end edge of the closing element 302. Therefore, it should be noticed that, advantageously, in all of the embodiments of the cap 1 according to this invention, illustrated in the accompanying figures or only described, the presence of a ratio between the second height T2 of the second portion 310 and the first height T1 of the first portion 309, allows the first portion 309 to have a height sufficient to make in it the separating line 5, or the incision line 7, which are positioned in such a way as to guarantee at least one sturdy and deformable connecting band.

[0151] According to Figures 11 to 13 what is proposed is a variant 1a of a cap 1 according to this invention which differs from the cap 1 shown in Figures 5 to 10 since it has a coupling structure 2a which is a variant of the coupling structure 2, having a single thread 201a, which is angularly interrupted in order to leave equally spaced vents 202 at which the thread 2a is absent. The cap 1a of Figures 11 to 13 has the height H2 equal to 15.27 mm. According to this invention, the first height T1 is equal to 7.03 mm, the second height T2 is equal to 8.24 mm and the ratio between the second height T2 and the first height T1 is equal to 1.17.

[0152] The thread 201a extends from a start 201a' to an end 201a", as shown in Figure 13, which are separated by an angular distance equal to 45°.

[0153] The cap 1a of Figures 11 to 13 has a single start and is particularly suitable for use with carbonated beverages.

[0154] Moreover, as illustrated in Figure 12, it can be seen how an optically recognisable mark 311a is present which differs from the mark 311 of Figure 6 since it is also shaped like a knurling line 312 but it has a different height to all of the others which are present in the lateral wall 3.

[0155] As shown in Figure 13, there is a single mark 311a and it is positioned angularly spaced relative to the start 201a' and to the end 201a" of the thread 201a.

[0156] According to Figures 14 to 16 what is proposed is a further embodiment 1b of a cap 1 according to this invention which differs from the cap 1 shown in Figures 5 to 10 since it comprises an optically recognisable mark 311b which differs from the mark 311 of Figure 6 and also from the mark 311a of Figure 12.

[0157] The cap 1b of Figures 14 to 16 has the height H2 equal to 11.29 mm. According to this invention, the first height T1 is equal to 5.56 mm, the second height T2 is equal to 5.73 mm and the ratio between the second height T2 and the first height T1 is equal to 1.03.

[0158] The mark 311b is also shaped like a knurling line 312 but it has a different height to all of the others which are present in the lateral wall 3, which is also different to the height of the mark 311a of Figure 12.

[0159] The cap 1b has a coupling structure 2 with three starts, similar to that of Figures 5 to 10 and, that is to say, it has the three helical curved threads 201, each of which extends continuously for an angle α which is equal to 120° and begins every 120°.

[0160] Figure 16 also shows how there are three distinct optically recognisable marks 311b present, which are angularly spaced by the angle β which is also equal to 120° and they are in turn spaced relative to a starting position of each thread 201.

[0161] The cap 1b of Figures 14 to 16 may also optionally have two threads. Moreover, as illustrated in Figure 15, it can be seen how the cap 1b has an engaging element 313b which differs from the engaging element 313 of Figure 5 since it is shaped like a plurality of flaps, positioned circumferentially at a predetermined distance from the free edge 304, which are associated with each other in pairs, opposite each other, and project from the retaining portion 303 towards each other. The flaps are bent inwards towards the inside of the retaining portion 303 to form the engaging element 313b.

[0162] According to Figures 17 and 18 what is proposed is a further embodiment 1c of a cap 1 according to this invention which differs from the cap 1 shown in Figures 5 to 10 since it comprises a coupling structure 2c which is another variant of the coupling structure 2 and has three starts, that is to say, it has three helical curved threads 201c, each of which begins at each angle α which is equal to 120° but extends for an angle γ equal to 150°.

[0163] The cap 1c of Figures 17 and 18 has the height H2 equal to 15.18 mm. According to this invention, the first height T1 is equal to 6.66 mm, the second height T2 is equal to 8.52 mm and the ratio between the second height T2 and the first height T1 is equal to 1.28.

[0164] The three threads 201c are angularly interrupted in order to leave nine equally spaced vents 202c at 40° from each other, at which the thread 2c is absent.

[0165] It should be noticed that the caps 1a, 1b, 1c of Figures 11 to 18 have the first portion 309 of the lateral wall 3, without thread 2, and the second portion 310, provided with thread 2, for which it remains a valid fact that the ratio between the second height T2 and the first height T1 is less than or equal to 2.00, preferably less than or equal to 1.70, even more preferably less than or equal to 1.40.

[0166] In this way, although not having been illustrated, it can be guaranteed that the height H1 of the at least one connecting band (or of the connecting bands 306, 307, if there are two) obtained in the first portion 309, is of sufficient height to guarantee that the connecting band itself is sturdy and deformable.

[0167] According to this invention, if the connecting band is defined between the separating line 5 and the incision line 7, it may advantageously have a height H1 at least greater than or equal to 1.00 mm, preferably greater than 1.20 mm, even more preferably greater than 2.00 mm.

[0168] Other embodiments of caps according to this invention are possible, as regards the dimensions of the first height T1, of the second height T2 and the ratio between the second height T2 and the first height T1, as indicated below.

[0169] For example, in a first other embodiment of the cap 1, not illustrated, the second height T2 is equal to 6.79, the first height T1 is equal to 4.47 and the ratio between the second height T2 and the first height T1 is equal to 1.52; in a second other embodiment of the cap 1, not illustrated, the second height T2 is equal to 6.87, the first height T1 is equal to 4.05 and the ratio between the second height T2 and the first height T1 is equal to 1.70; in a third other embodiment of the cap 1, not illustrated, the second height T2 is equal to 9.79 and the first height T1 is equal to 5.32 and the ratio between the sec-

ond height T2 and the first height T1 is equal to 1.84; in a fourth other embodiment of the cap 1, not illustrated, the second height T2 is equal to 9.55 and the first height T1 is equal to 5.02 and the ratio between the second height T2 and the first height T1 is equal to 1.90.

[0170] In use, the cap 1 is applied on the neck of the container in the closed condition. The cap 1 is positioned in such a way that the engaging element 313 provided inside the retaining ring 301, in particular on the retaining portion 303 is below the locking ring which is present on the neck.

[0171] When the user wishes to open the container for the first time, the user grips the closing element 302 and rotates the closing element 302 around the axis Z, in order to unscrew the closing element 302 from the neck. Initially, the closing element 302 and the retaining ring 301 are rotated together around the axis Z, and they simultaneously move together in a direction parallel to the axis Z, away from the neck, the coupling structure 2 of the cap 1 engaging with the corresponding coupling structure of the neck of the container.

[0172] During the initial rotation of the closing element 302 and of the retaining element 301 away from the neck, the sealing element 8 continues to remain in contact with the inner wall of the neck so that it continues to make a seal.

[0173] This occurs until the engaging element 313 of the retaining portion 303 abuts against the locking ring provided on the neck. At this point, the locking ring prevents the retaining portion 303 from rising further along the axis Z, acting as a stop for the movement of the retaining portion 303, and therefore of the retaining ring 301, away from the neck.

[0174] The closing element 302, which is unscrewed by the user, continues to move along the axis Z away from the neck. The breakable bridges 503 are thereby tensioned, until causing them to break. The closing element 302 consequently separates from the retaining ring 301 along the separating line 5, but remains joined to the retaining ring 301 at the joining portion 305.

[0175] In particular with reference to Figures 8 to 10, 19 and 20, if the user continues to unscrew the closing element 302, so as to move the closing element 302 along the axis Z to remove it from the neck, the first connecting band 306 and the second connecting band 307 deform since they extend between the retaining portion 303, locked by the locking ring 202, and the joining portion 305, fixed and joined to the closing element 302, which moved away from the locking ring and was lifted upwards.

[0176] If the tab 308, or 308', is present, it also moves away from the locking ring whilst the first connecting band 306 and the second connecting band 307 are pulled upwards.

[0177] If present, the breakable elements 704 of the joining portion are thereby tensioned, until causing them to break.

[0178] Subsequently, the first connecting band 306 and the second connecting band 307 are spaced apart from both the closing element 302 and the retaining portion 303 and remain joined to each other in the joining portion 305.

[0179] The first connecting band 306 and the second connecting band 307 thus adopt a trapezium-shaped configuration, not illustrated. If the tab 308, or 308', is present it may be positioned in the smaller base of the trapezium.

[0180] If the first connecting band 306 has the same length as the second connecting band 307, the trapezium which may be described by them is of the Isosceles type. If, in contrast, the connecting bands 306, 307 have different lengths, they will adopt a scalene trapezium type shape. As regards the position of the tab 308, or 308' in the joining portion 305, it will be possible for the tab 308, or 308' to be positioned centrally or laterally.

[0181] The first connecting band 306 remains joined to the retaining portion 303 at an outer end of the first lateral stretch 702 of the incision line 7. Similarly, the second connecting band 307 remains joined to the retaining portion 303 at an outer end of the second lateral stretch 703 of the incision line 7, the outer end of the first lateral stretch 702 and the outer end of the second lateral stretch 703 externally delimiting the incision line 7 circumferentially. If the first connecting band 306 and the second connecting band 307 are positioned in a configuration angled relative to the retaining portion 303 and they converge in the joining portion 305, the tab 308, or 308' extends along an axis which is parallel to the axis Z.

[0182] Continuing to unscrew the closing element 302, the latter disengages from the coupling structure, or thread, made on the neck, so that the container can be opened. In contrast, the retaining portion 303 of the retaining ring 301 remains anchored to the neck.

[0183] The joining portion 305 defines a hinge band, which keeps the closing element 302 connected to the neck and around which the closing element 302 can rotate moving away from the neck and which at the same time deforms to allow rotation of the closing element 302 relative to the neck.

[0184] In other words, after having disengaged from the neck, the closing element 302 can be rotated around the joining portion 305.

[0185] In addition, the joining portion 305, the first connecting band 306, the second connecting band 307 and optionally the tab 308, or 308', are joined to each other and 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 305 alone.

[0186] The hinge arrangement is a part of the retaining ring 301 which is interposed between the retaining portion 303 of the retaining ring 301 and the closing element 302.

[0187] For a cap as shown in Figure 8, in the open condition, the connecting bands 306 and 307 can deform. Indeed, if we consider a first strip, directed towards the closing element 302 and a second strip directed towards

the end edge, the first strip can expand radially, without being subjected to a substantial twisting whilst the second strip can in contrast twist in order to pass below the first portion, interposing itself between the first strip and the outer surface of the neck. In this way, when the end edge of the first stretch 701 towards the dispensing opening of the container, the second strip of the connecting bands 306 and 307 is twisted and is below the first portion. This allows the closing element 302 to be kept stably fixed in the same position in the open condition.

[0188] Thanks to the sturdiness of the connecting bands 306, 307 and to their deformability, the connecting bands 306, 307 can twist without breaking. For a cap as shown in Figure 19 in which the projection 315 is present, in the open condition, the connecting bands 306 and 307 may bend but they are not subjected to a complete twist.

[0189] Indeed, the projection 315 comes to rest on the neck and allows the closing element 302 to be kept stably fixed in the open condition.

[0190] If, in contrast, a tab 308, or 308' is present, as shown in Figures 9 and 10, by moving the closing element 302 around the joining portion 305, after the closing element 302 and if necessary the tab 308, or 308', have disengaged from the neck, it is possible to move the closing element 302 into a position at the side of and at a distance from the neck, until the tab 308, or 308' is locked resting on the neck.

[0191] In the open condition, the end edge of the tab 308, or 308', intercepts the neck of the container and can rest near the locking ring of the neck since the locking ring prevents the tab 308, or 308' from rotating any further.

[0192] For example, the tab 308, or 308', can rest in the outer zone of the neck located between the locking ring and a lower thread 201 of the thread 2, or on the thread 2 itself, depending on the shape of the retaining ring 301, and/or of the locking ring of the neck and/or the height H of the tab 308, or 308'.

[0193] The end edge of the tab 308, 308' becomes directed towards the dispensing opening of the container and the tab 308 prevents the closing element 302 from being able to accidentally rotate towards the neck and around it.

[0194] In the case of the tab 308 of Figure 9, the end edge of the tab 308 remains aligned with the first free lower edge, and with the second free lower edge, of the connecting bands 306, 307.

[0195] In the case of the tab 308' of Figure 10, the end edge of the tab 308' projects relative to the connecting bands 306, 307.

[0196] When a user wants to close the container again, in order to be able to completely disengage the tab 308, or 308', or the projection 315, from the neck of the container, the closing element 302 must be moved further away. However, the tab 308, or 308', or the projection 315 may also optionally bend so as to disengage its end edge from the neck.

[0197] Again, it should be noticed that it is essential that the connecting bands 306, 307 have a suitable height, since the user must be able to pull and bend the connecting bands 306, 307, in order to open and close the container, even many times at least until he or she wants to dispose of the container as waste.

[0198] The caps 1, 1a, 1b and 1c previously described are made of plastic material, for example polypropylene (PP) or polyethylene (PE).

[0199] If PE is used, its density may range from low density to high density. In particular, it is possible to use high density polyethylene (HDPE).

[0200] The high density polyethylene (HDPE) used to make the caps previously described may have the following properties:

- density variable between 950 and 968 kg/m3;
- melt index variable from 0.3 to 20 g, in the following measuring conditions: 10 minutes, 190°C, 2.16 kg;
- molecular weight distribution wide, or narrow, or unimodal, or multimodal.

[0201] If PP is used, that material may be in the form of a homopolymer, or heterophasic copolymer, or even statistical copolymer.

[0202] The melt index of PP may vary from 2 to 20 g, in the following measuring conditions: 10 minutes, 230°C, 2.16 kg.

[0203] This invention is advantageously applicable to caps 1, 1a, 1b, 1c which are suitable for use, for example, on necks in the following list, each neck being associated with a respective code which identifies the name of the neck, the diameter of the outer surface of the neck, and the diameter of the dispensing opening of the neck, in accordance with the nomenclature of CETIE (www.cetie.org) or ISBT (www.bevech.org).

[0204] For each code, if the neck is also a European standard, the reference number is also provided.

GME30.39 25/22 mm
GME30.28 26/22 mm DIN EN 16594:2016
GME30.38 26/22 mm
GME30.37 26/22 mm
GME30.40 26/22 mm
GME30.24 27/22 mm EN 16067:2012
PCO1881 28/22 mm
PCO1810 28/22 mm
GME30.26 29/25 mm EN 16592:2015
GME30.21 30/25 mm EN 16064:2012
GME30.31 32/26 mm
GME30.36 32/27 mm
GME30.30 33/28 mm
GME30.25 38/33 mm
GME30.29 38/32 mm

Claims

1. A closing cap (1; 1a; 1b; 1c) for a container, com-

prising a lateral wall (3) extending around an axis (Z) and a transversal wall (4) positioned at one end of the lateral wall (3), a separating line (5) being provided on the lateral wall (3) to define a retaining ring (301), which comprises a retaining portion (303) which extends as far as a free edge (304) of the retaining ring (301) and is configured to internally engage with a locking ring of a neck of the container in such a way as to remain anchored to the neck, and a closing element (302) removably engageable with the neck, so as to open or close the container; the cap additionally comprising an incision line (7; 7'), which is also provided on the lateral wall (3) to define, together with the separating line (5) at least one connecting band (306; 307) for connecting the closing element (302) and the retaining portion (303) to each other; wherein the cap (1; 1a; 1b; 1c) comprises: a coupling structure (2; 2a; 2c) positioned inside the lateral wall (3) for removably coupling the closing element (302) to the neck of the container, the lateral wall (3) having a first portion (309), without the coupling structure (2; 2a; 2c) and on which the separating line (5) and the incision line (7; 7') are made, which has a first height (T1) measured along an axis parallel to the axis (Z) starting from the free edge (304), and a second portion (310) provided with the coupling structure (2; 2a; 2c), which has a second height (T2) measured along an axis parallel to the axis (Z) starting from the transversal wall (4); wherein the ratio between the second height (T2) and the first height (T1) is less than or equal to 2.00 so that the connecting band (306, 307) can be made in the first portion (309) with suitable dimensions.

2. The cap according to claim 1, wherein the ratio between the second height (T2) and the first height (T1) is less than or equal to 1.70, even more preferably it is less than or equal to 1.40.

3. The cap according to claim 1 or 2, wherein the ratio between the second height (T2) and the first height (T1) is greater than or equal to 1.0.

4. The cap according to one of the preceding claims, wherein a height (H2) of the cap along an axis parallel to the axis (Z) is greater than or equal to 10.0 mm and is less than or equal to 16.0 mm.

5. The cap according to claim 4, wherein the height (H2) is greater than or equal to 10.0 mm and less than or equal to 12.5 mm, even more preferably it is greater than or equal to 10.0 mm and less than or equal to 11.0 mm.

6. The cap according to one of the preceding claims, wherein the cap comprises a sealing element (8) which extends from the transversal wall (4) and, in use, is configured to be positioned inside a dispensing opening of the container in order to form a seal with an inner wall of the neck, wherein the height of the sealing element (8) is less than or equal to the first height (T1).

7. The cap according to one of the preceding claims, wherein at a distance from the free edge (304) equal to the first height (T1) there is a transition from the first portion (309) to the second portion (310), the separating line (5), or the incision line (7), being positioned at a distance less than or equal to 1.00 mm, preferably less than or equal to 0.50 mm from said transition, even more preferably equal to 0.40 mm, from said transition.

8. The cap according to one of the preceding claims, wherein the at least one connecting band (306; 307) comprises a first connecting band (306) and a second connecting band (307) which are defined between the separating line (5) and the incision line (7; 7'), and wherein the incision line (7; 7') comprises a first lateral stretch (702) and a second lateral stretch (703), which respectively define with a first part of the separating line (5), which extends from a first end (501) of the separating line (5), the first connecting band (306) and with a second part of the separating line (5), which extends from a second end (502) of the latter, the second connecting band (307).

9. The cap according to claim 8, wherein each connecting band (306; 307) has a height (H1) greater than or equal to 1.00 mm, preferably greater than or equal to 1.20 mm, even more preferably greater than or equal to 2.00 mm.

10. The cap according to claim 8, or 9, wherein the separating line (5) extends around the axis (Z) between a first end (501) and a second end (502) and is circumferentially interrupted so as to leave the retaining ring (301) and the closing element (302) joined by a joining portion (305) which has an angular extent less than that of the incision line (7; 7') and extends circumferentially in the angular extent of the incision line (7; 7'), the connecting bands (306; 307) connecting the joining portion (305) and the retaining portion (303) to each other; the incision line (7; 7') being positioned between the separating line (5) and the free edge (304) and additionally comprising a central stretch (701; 701'), positioned between the first lateral stretch (702) and the second lateral stretch (703), which has an end edge configured to be directed, when the cap (1; 1a; 1b; 1c) is in the open condition, towards the neck, or towards the dispensing opening, of the container.

11. The cap according to claim 10, wherein the cap comprises a tab (308; 308') whose end edge is formed by the central stretch (701; 701') and whose lateral

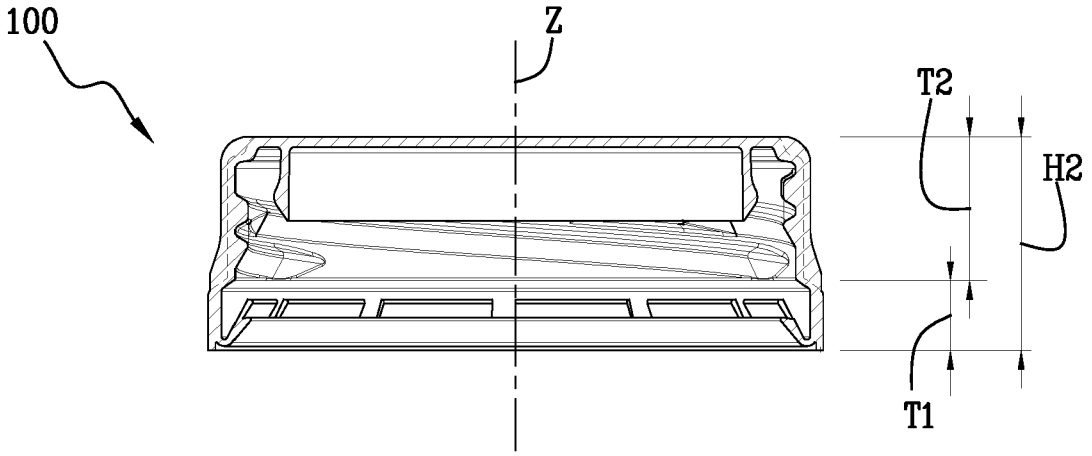
edges are formed by two cutting lines (6) which extend from the central stretch (701; 701') towards the closing element (302), the cutting lines (6) being formed by cuts passing through an entire thickness of the lateral wall (3).

12. The cap according to claim 11, the first lateral stretch (702) and the secondo lateral stretch (703) of the incision line (7) are aligned with each other and lie in a first plane parallel to a separating plane in which the separating line lies; and wherein the central stretch (701) lies in the same first plane to form a tab (308) aligned with the connecting bands (306; 307), or wherein the central stretch (701') lies in a second plane parallel to the separating plane and parallel to the first plane to form a tab (308') projecting relative to the connecting bands (306; 307).

13. The cap according to claim 10, wherein a centre line of the separating line (5) and a centre line of the incision line (7) are positioned angularly opposite each other and also wherein the separating line (5) and the incision line (7) have equal angular extent which is greater than 180°.

14. The cap according to claim 8, or 9, wherein the separating line (5) extends around the axis (Z) between a first end (501) and a second end (502) and is circumferentially interrupted so as to leave the retaining ring (301) and the closing element (302) joined by a joining portion (305) which has an angular extent less than that of the incision line and extends circumferentially in the angular extent of the incision line, and wherein the separating line (5) is positioned between the incision line and the free edge (304); wherein the incision line comprises a central stretch positioned between the first lateral stretch and the second lateral stretch, which has a top edge positioned facing an end edge of the closing element (302).

Fig.1



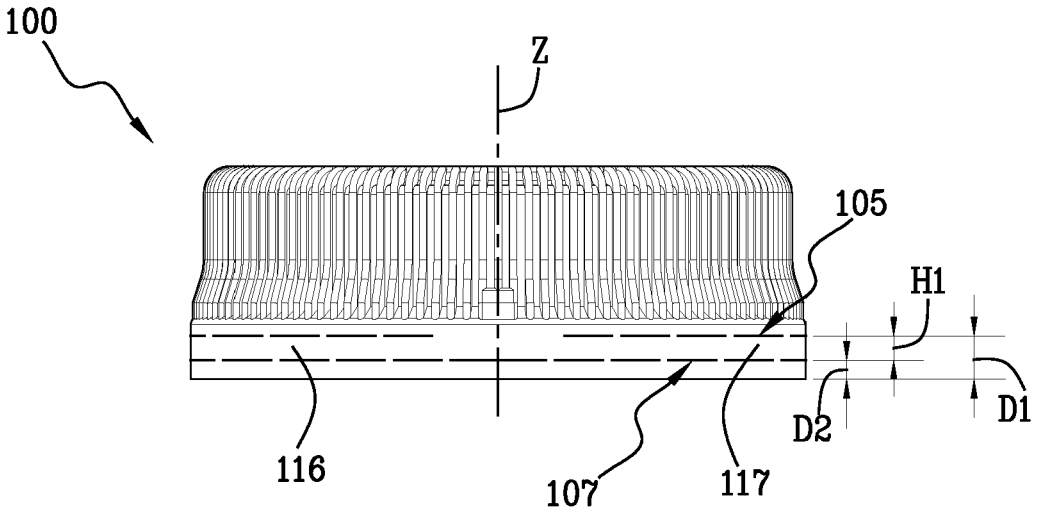
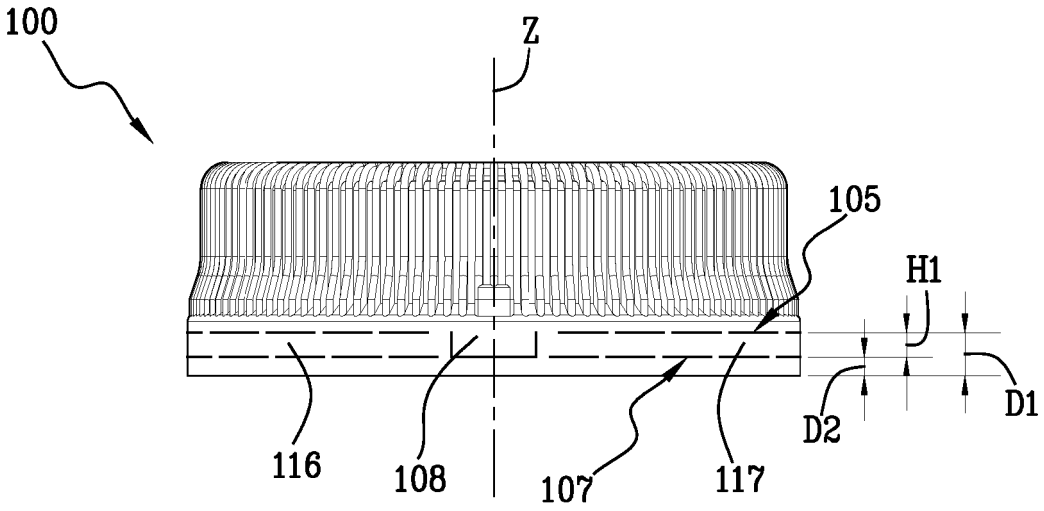


Fig.2

Fig.3


100
Z
105
H1
D1
D2
116
108
107
117

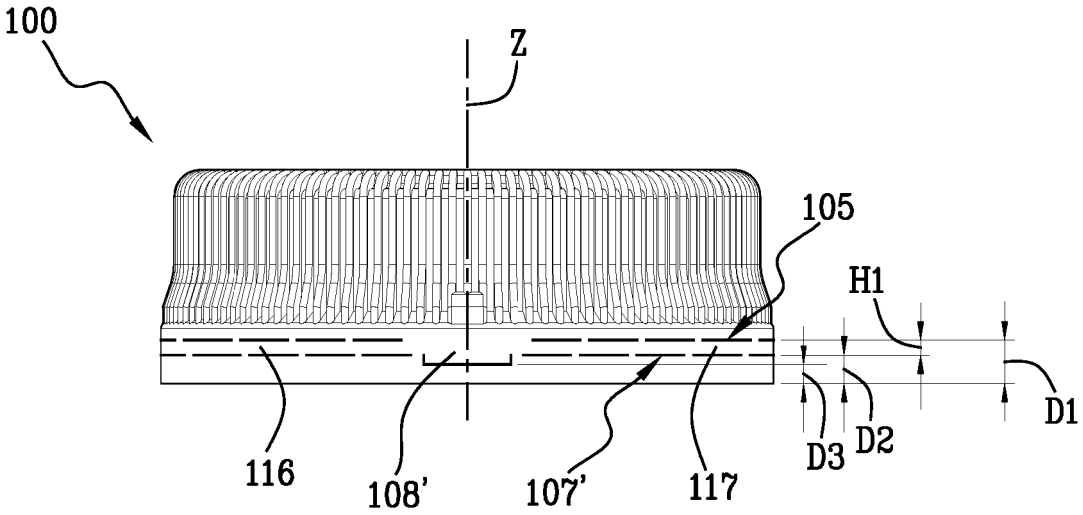

100
Z
105
H1
D1
D3
D2
116
108'
107'
117

Fig.4

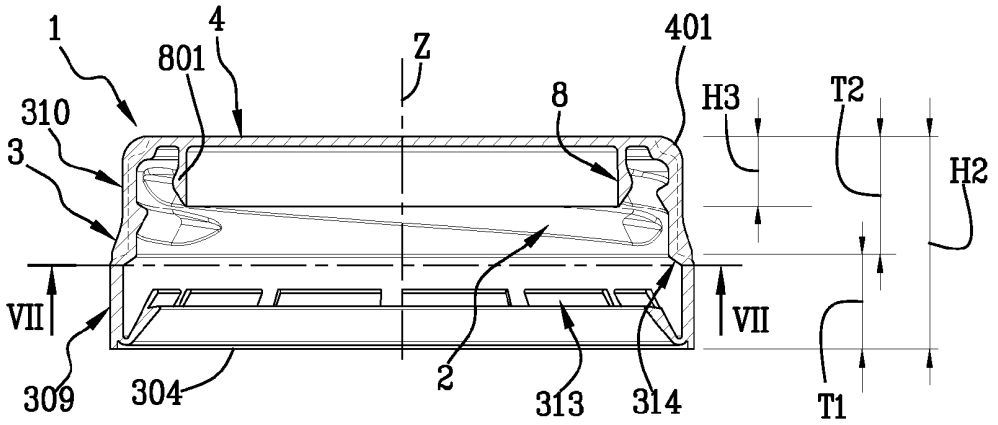


Fig.5

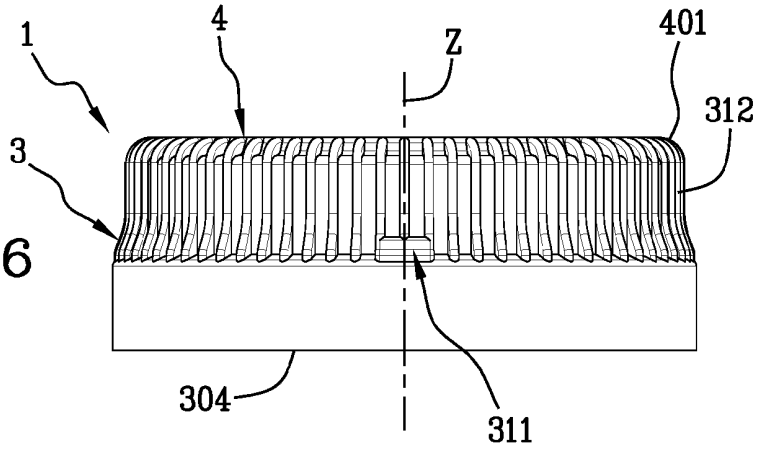


Fig.6

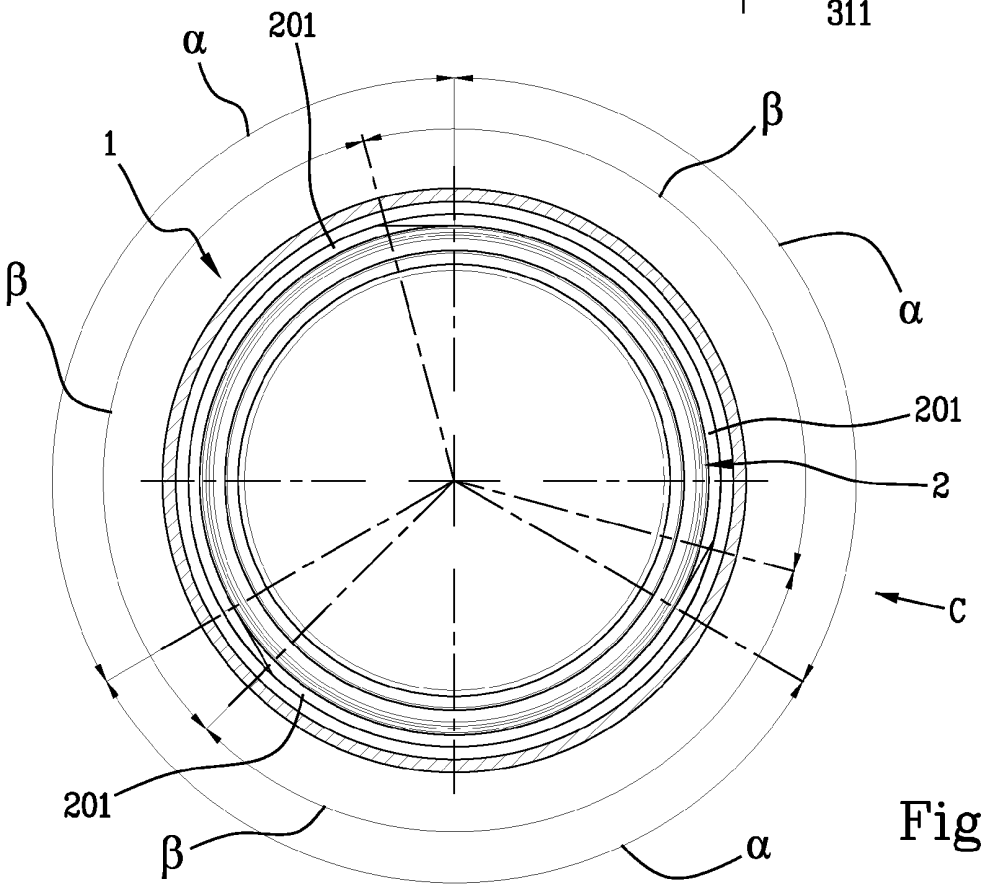


Fig.7

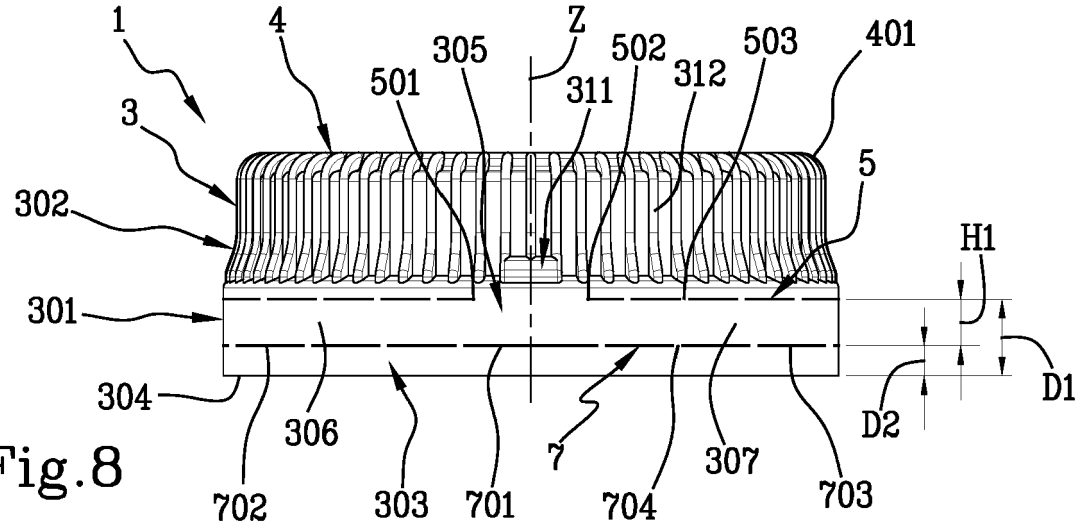


Fig.8

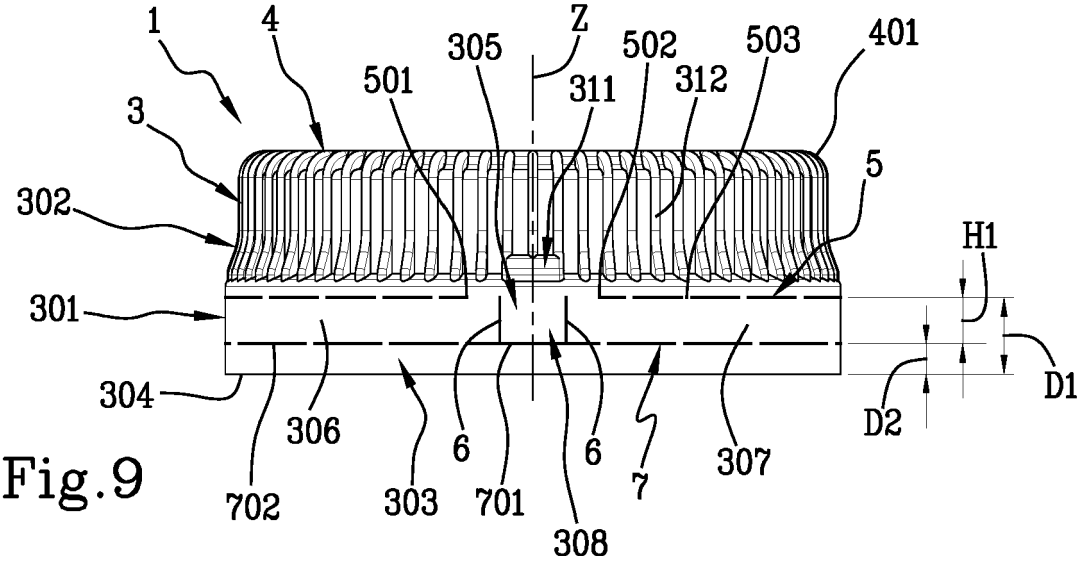


Fig.9

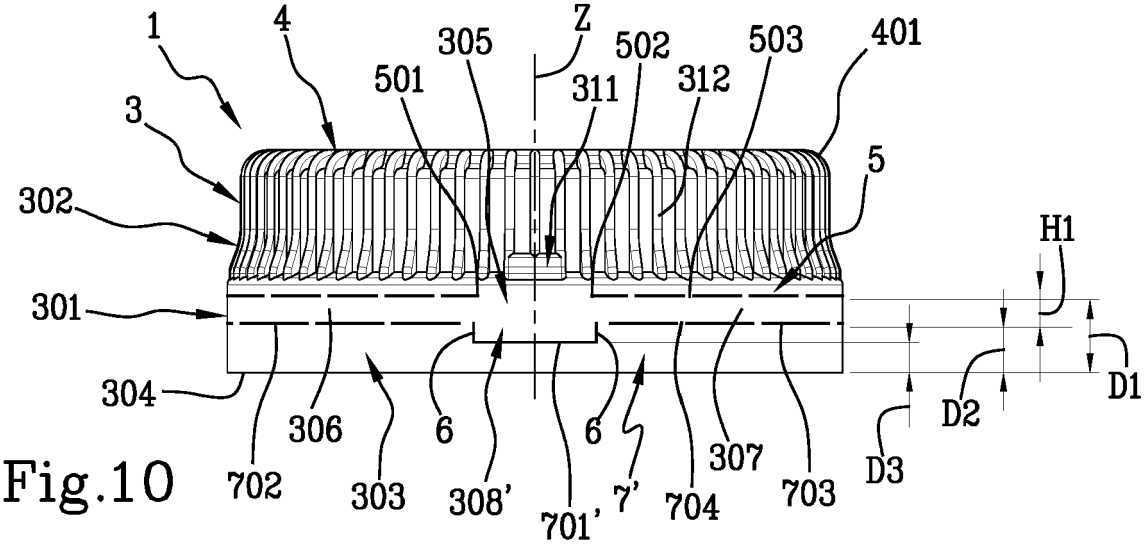


Fig.10

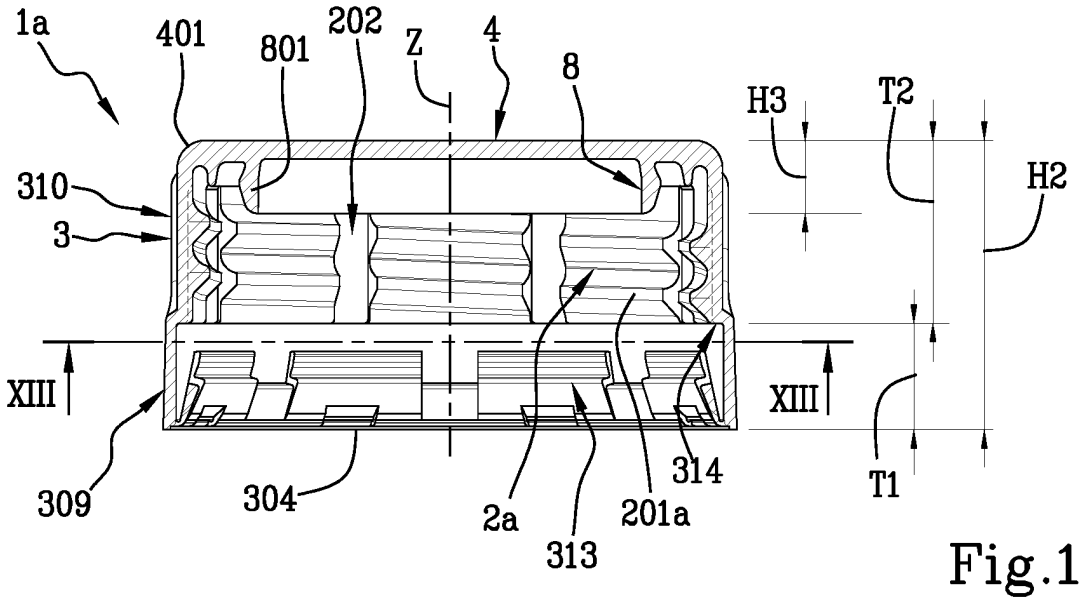


Fig.11

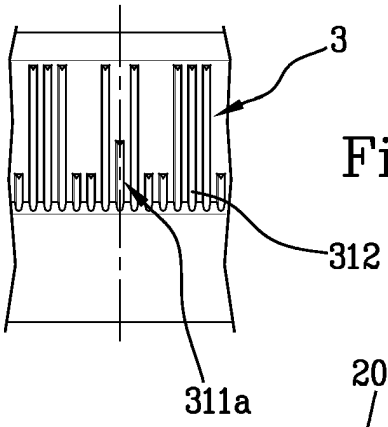


Fig.12

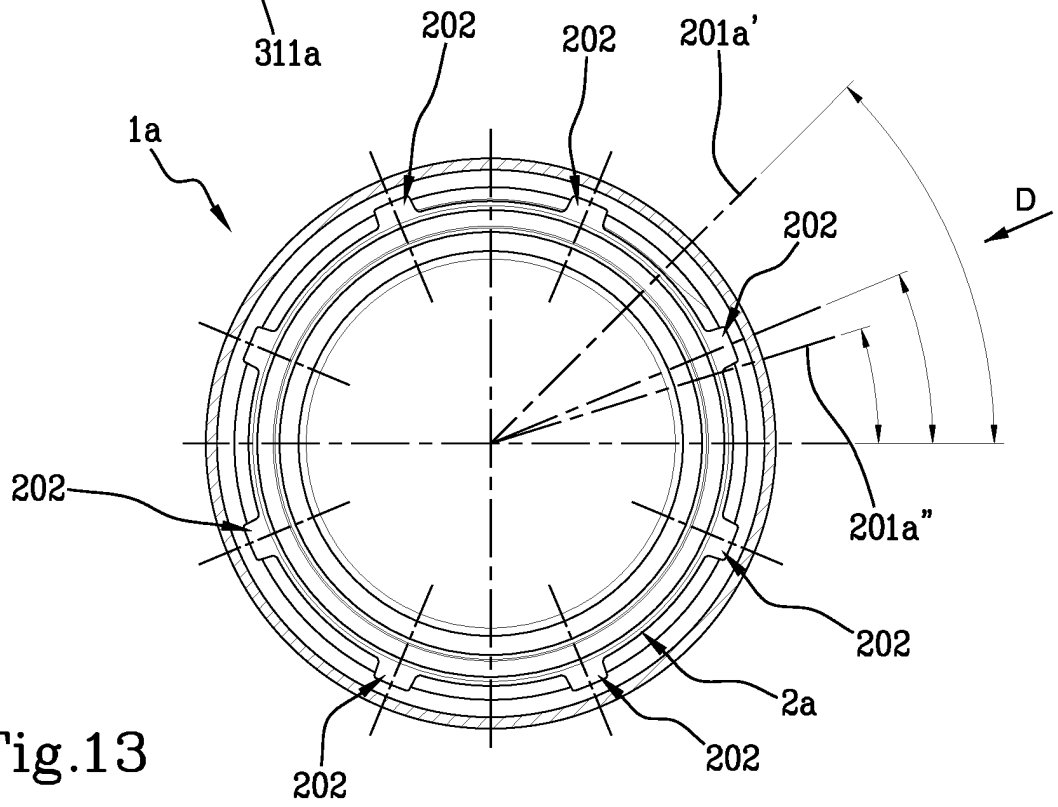


Fig.13

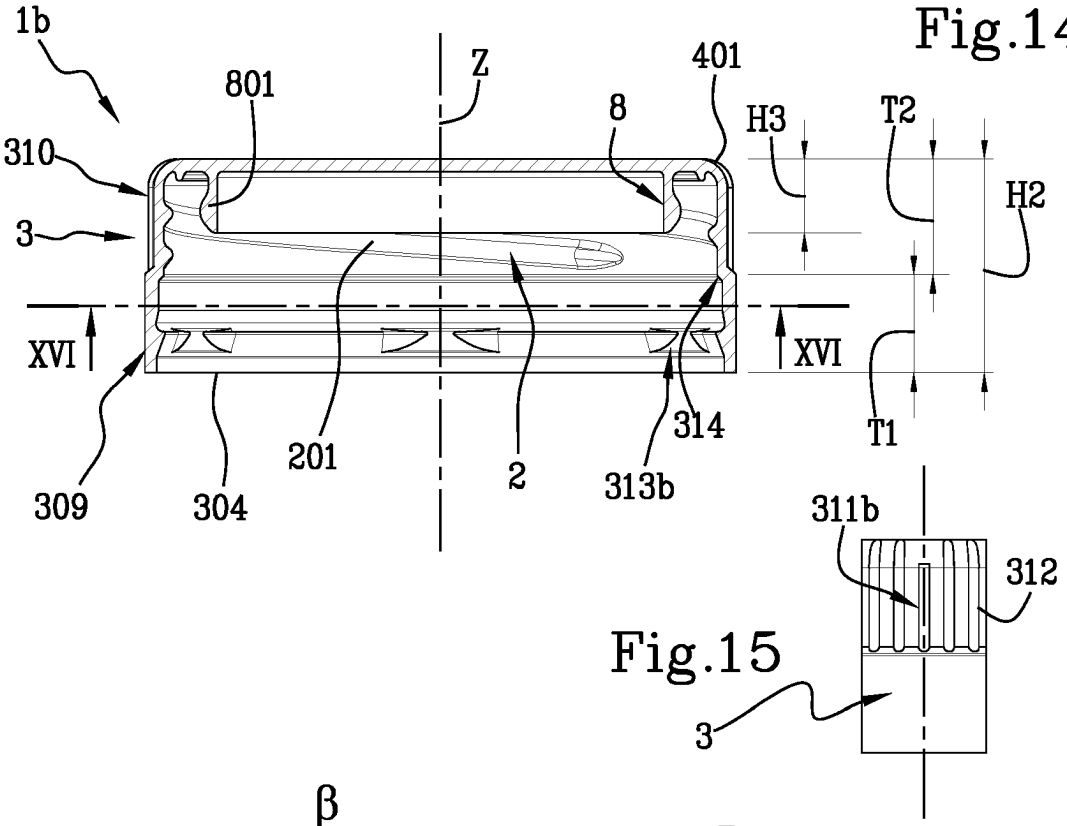


Fig.14

Fig.15

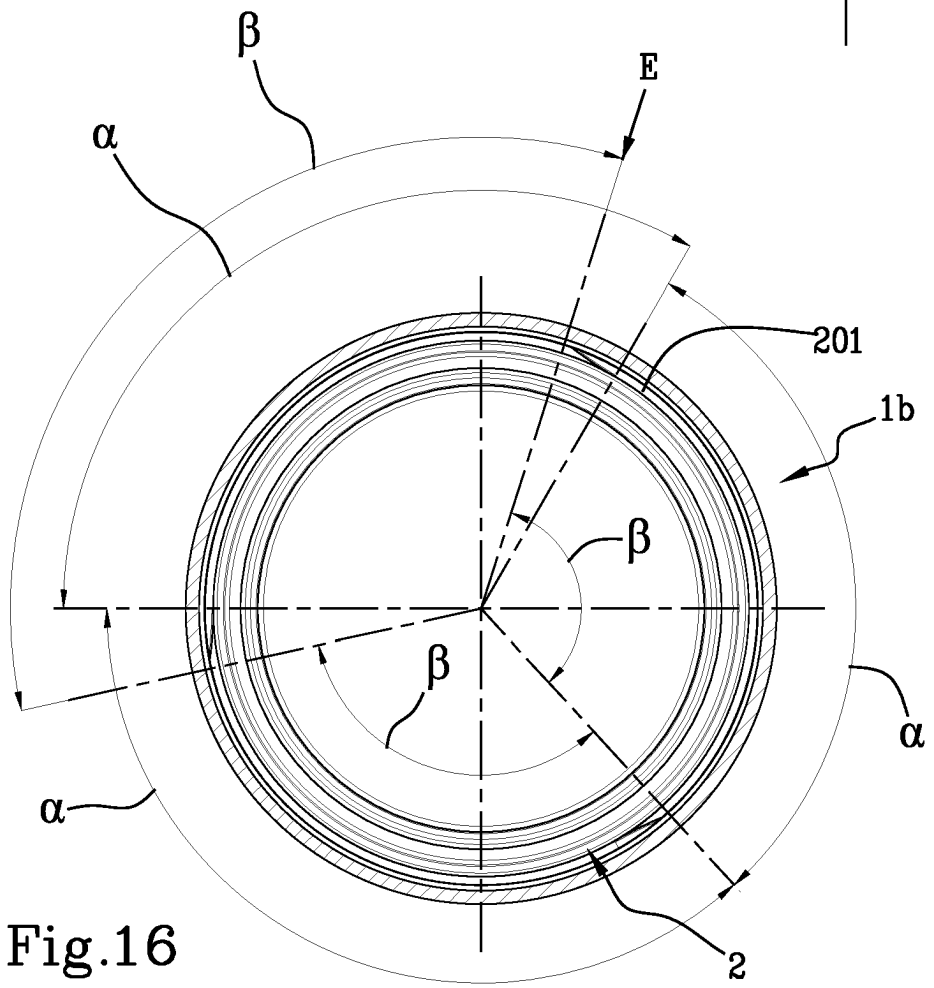


Fig.16

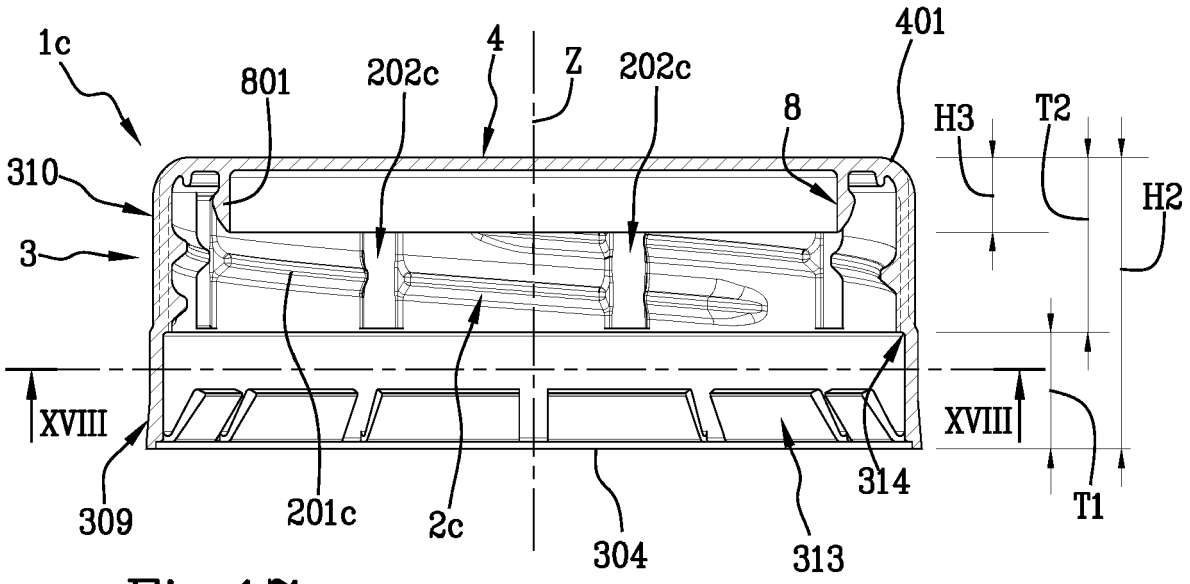

1c
801
202c
4
Z
202c
401
8
H3
T2
H2
310
3
XVIII
XVIII
309
201c
2c
304
313
314
T1

Fig.17

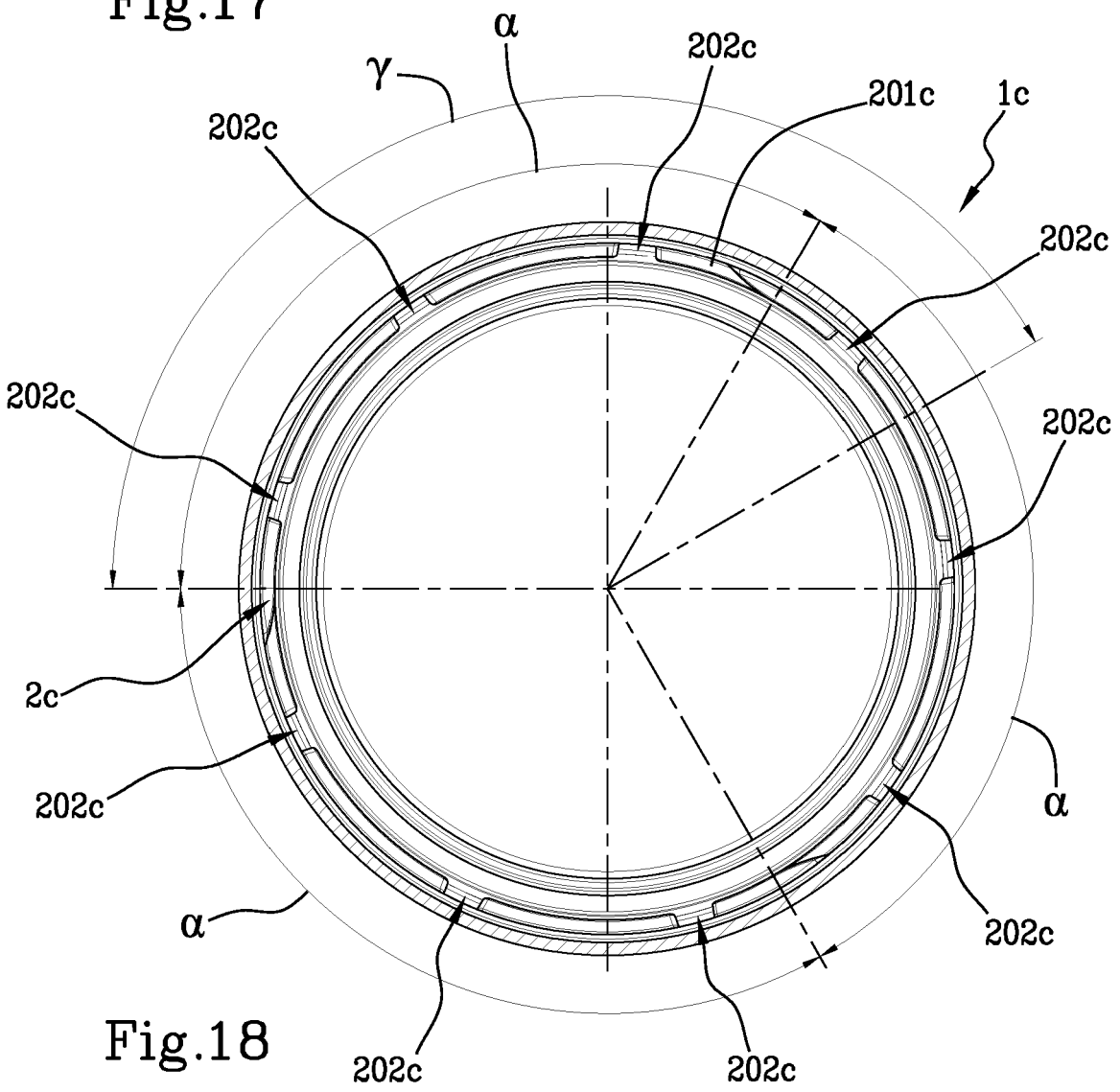

α
γ
202c
202c
201c
1c
202c
202c
202c
2c
202c
α
α
202c
202c
202c

Fig.18

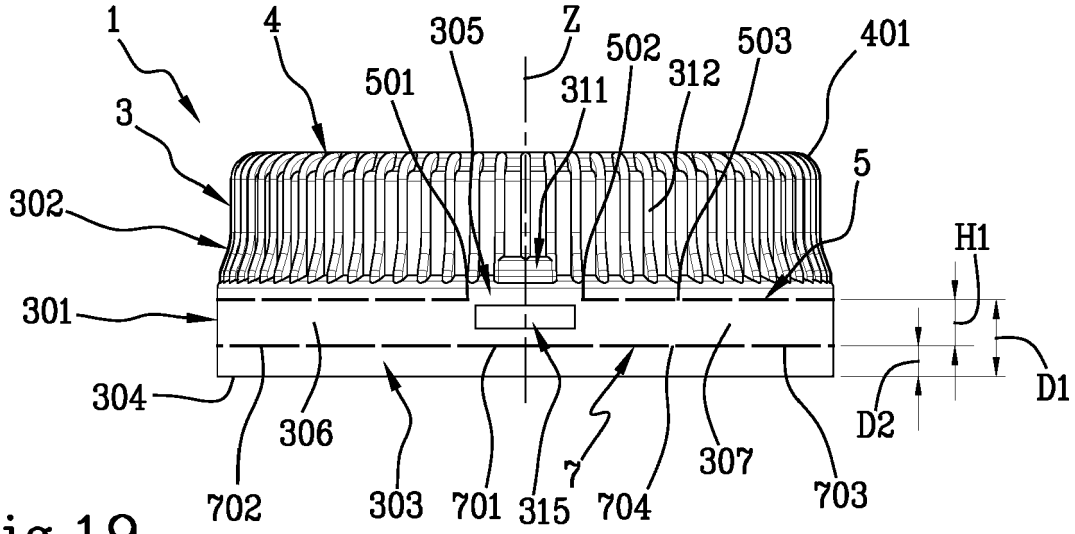

1
4
305
Z
502
503
401
501
311
312
3
5
302
H1
301
304
306
D1
D2
307
702
303
701
315
704
703
7

Fig.19

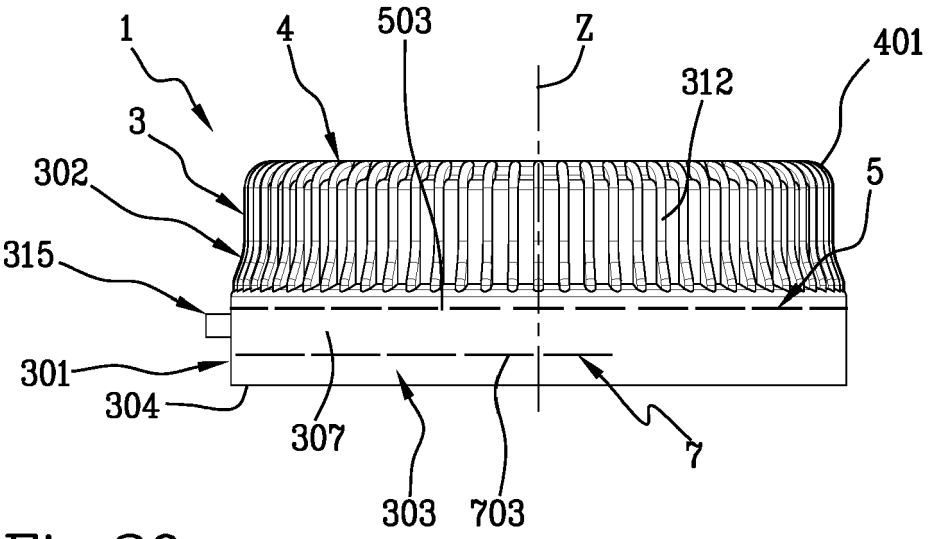

1
4
503
Z
401
312
3
5
302
315
301
304
307
303
703
7

Fig.20

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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