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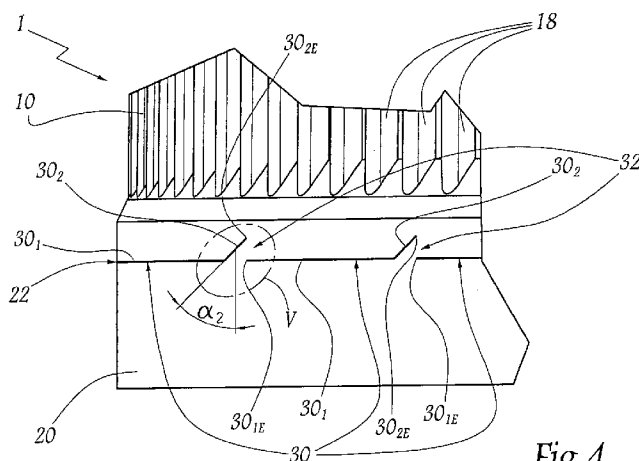
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(54) Title: CLOSURE FOR A NECK OF A CONTAINER, CONTAINER NECK EQUIPPED WITH SUCH A CLOSURE AND METHOD FOR FABRICATING SUCH A CLOSURE



(57) Abstract: The present plastic closure (1) comprises a skirt (10) adapted to be screwed and unscrewed on a container neck (2) around an axis of rotation (X-X) and a tamper evident band (20) adapted to abut in rotation around this axis against protrusions (5) or recesses of the neck. A plurality of slits (30) distributed along a peripheral direction around this axis are located between the skirt and the tamper evident band, so that any two immediately adjacent slits among this plurality have respective peripheral ends (30IE, 302E) facing each other and separated from each other by a frangible bridge (32) that links the skirt and the bands and that is provided to be broken when the skirt is unscrewed for the first time. In order to provide a closure both easy to open for the first time and reliable during its prior assembling around the neck, the facing peripheral ends of two immediately adjacent slits among this plurality are offset one with respect to the other in the direction of the axis of rotation.

CLOSURE FOR A NECK OF A CONTAINER, CONTAINER NECK EQUIPPED WITH SUCH A CLOSURE AND METHOD FOR FABRICATING SUCH A CLOSURE

This invention concerns a closure for a neck of a container, made of plastic material. This invention also concerns a container neck equipped with such a closure and a method for fabricating such a closure of plastic material.

In the domain of packaging liquids, it is known to equip the neck of a bottle with a plastic closure comprising a tubular skirt intended to surround the neck. Especially, the skirt of the closure is held onto the bottle neck by a thread system which allows to screw and unscrew the skirt around an axis of rotation corresponding to the central axis of the neck.

In order to indicate to the consumer whether the closure has been tampered with before its first opening by this consumer, it has become conventional to provide the closure with a tamper evident band which is joined to the skirt by a plurality of frangible bridges. In practice, when the neck is considered as vertically extending with its pouring opening directed upwards, each frangible bridge links the lower end of the skirt and the upper end of the tamper evident band. These bridges are either integrally molded into the closure, between the skirt and the tamper evident band, or are formed by a cutting blade which slits the closure between the skirt and the tamper evident band. In either case, these bridges are each colinear to the axis of rotation of the skirt and they are distributed along a peripheral direction of the closure, so that they define a peripheral break-off line between the skirt and the tamper evident band. The tamper evident band is provided with internal protrusions which vertically engage with a retaining flange formed on the neck. Thus, when the skirt is unscrewed for the first time, the band engages the neck and is restrained from moving upwards with the skirt. In the same time, the frangible bridges stretch and break in tension, which give visual and sometimes audio indication that the closure has previously been opened or removed.

Recent innovations in tamper evidency have trended toward the tamper evident band having internal means that interact with the retaining flange of the bottle neck in such a way as to prevent the band from rotating with the skirt. For example,

these means comprise ribs extending from an inside surface of the band and sized in order to abut in rotation around the axis of rotation of the skirt against corresponding protruding surfaces delimited by the retaining flange of the neck. With such anti-rotation means, the tamper evident band is efficiently maintained around the retaining flange of the neck, contrary to the bands that vertically abut against the retaining flange and which tend to be driven in rotation together with the skirt when the user grasps the whole closure and unscrews it around the axis of rotation.

However, with such an anti-rotation tamper evident band, the frangible bridges are prevented from breaking in tension and are caused to break, instead, in shear. In practice, the rotational torque of the skirt required to break the bridges in shear is substantially much higher than that required to break them in tension, which causes more difficulty for the consumer to access the product in the bottle.

A theoretical solution might be to reduce the size and/or the quantity of the known bridges and to maintain their current configuration. But such a solution leads to provide bridges which break when the closure is initially fitted around the bottle neck.

The invention aims at providing a closure with an anti-rotation tamper evident band, which is both easy to open for the first time and reliable during its prior assembling around a neck of a container.

For this purpose, the invention concerns a closure for a neck of a container, made of a plastic material and comprising:

- a tubular skirt provided with an inside surface adapted to be screwed and unscrewed on a thread of the neck around an axis of rotation,
- a tamper evident band provided with an inside surface adapted to abut in rotation around the axis of rotation against at least one protrusion of the neck, and
- a plurality of slits distributed along a peripheral direction around the axis of rotation and located between the skirt and the tamper evident band in the direction of the axis of rotation,

wherein any two immediately adjacent slits among the plurality of slits have respective peripheral ends facing each other and separated from each other by a frangible bridge that links the skirt and the tamper evident band and that is provided to be broken when the skirt is unscrewed from the neck for the first time, characterized in that the facing peripheral ends of two immediately adjacent slits among the plurality of slits are offset one with respect to the other in the direction of the axis of rotation.

The main idea on which the invention is based is to provide the frangible bridges in such a manner that, even if the tamper evident band is prevented from rotating with the skirt during the first unscrewing of this latter, these bridges do not break exclusively in shear. Thanks to the invention, each frangible bridge located between the facing peripheral ends of two immediately adjacent slits does not mainly extend in a direction parallel to the axis of rotation of the skirt, but is at an angle to a plan perpendicular to this axis of rotation because these facing ends are axially offset in the direction of the axis of rotation, that is to say situated one above the other in the direction of the axis of rotation. Therefore, as the skirt is rotated off the neck whereas the tamper evident band is prevented from rotating with the skirt, the frangible bridges break, totally or partly, in tension, which reduces the torque required to break them.

According to further aspects of the invention, this closure might incorporate one or several of the features recited in dependant claims 2 to 10.

The invention also concerns a container provided with a neck, characterized in that the neck is equipped with a closure as defined here-above.

Besides, the invention concerns a method for fabricating a closure suitable for equipping a neck of a container, the method comprising at least the following steps of:

- molding a plastic material in a single piece comprising:

- a tubular skirt provided with an inside surface adapted to be screwed and unscrewed on a thread of the neck around an axis of rotation, and
- a tamper evident band provided with an inside surface adapted to abut in rotation around the axis of rotation against at least one protrusion of the neck, and
- slitting a plurality of slits, distributing these slits along a peripheral direction around the axis of rotation and locating these slits between the skirt and the tamper evident band in the direction of the axis of rotation, so that any two immediately adjacent slits among the plurality of slits have respective peripheral ends facing each other and separated from each other by a frangible bridge that links the skirt and the tamper evident band and that is provided to be broken when the skirt is unscrewed from the neck for the first time,

characterized in that, during the step of slitting, the facing peripheral ends of two immediately adjacent slits among the plurality of slits are provided, being offset with respect one to the other in the direction of the axis of rotation.

The invention will be better understood on the basis of the following description which is given in correspondence with the annexed figures and as an illustrating example, without restricting the subject matter of the invention. In these figures:

- figure 1 is a view in side elevation of a closure according to the invention,
- figure 2 is a half of a longitudinal cross-sectional view of the closure of figure 1, mounted on the neck of a bottle,
- figure 3 is a partial section through the closure and the neck along line III-III of figure 2,
- figure 4 is an enlarged scale view of the circled detail IV in figure 1,
- figure 5 is a schematic enlarged scale view of the circled detail V in figure 4, and
- figures 6 to 12 are views similar to figure 4, illustrating, respectively, different forms of embodiment according to the invention.

The closure 1 shown in figures 1 to 5 is provided to be mounted on a neck 2 of a container, for example a bottle 3, of which only the upper part is visible in figures 2 and 3. Neck 2 has a substantially tubular shape defining a longitudinal central axis X-X.

In the present description, the terms "upper" and "up" correspond to a direction essentially parallel to axis X-X and going from the body of bottle 3 towards its neck 2, that is to say a direction directed towards the upper part of figures 1, 2, 4 and 5, whereas the terms "lower" and "down" correspond to an opposite direction.

Closure 1 comprises a tubular skirt 10, centred on a longitudinal axis which is merged with axis X-X when the closure is mounted on neck 2, as shown in figure 2. Skirt 10 is closed at its upper end by a top wall 12 which lies in a plane perpendicular to axis X-X. The lower face of top wall 12 is provided with sealing lips 13 which are suitable for being tightly pressed on the upper end of neck 2 in order to allow closure 1 to close neck 2 tightly.

An inside surface 14 of skirt 10 is provided with a screw thread 16 which is complementary for a thread 4 formed by the outside face of neck 2. Thus, skirt 10 can be screwed and unscrewed on the neck around axis X-X, by the cooperation between threads 4 and 16. In order to allow the consumer to grasp and to drive in rotation the skirt more easily, the outside face of the skirt is advantageously provided with elongated ribs 18 which are distributed along the outside periphery of the skirt and which extend in length in respective directions parallel to axis X-X.

Closure 1 further comprises a tamper evident band 20 which has an essentially annular shape centred on an axis which is merged with axis X-X when the closure is mounted on neck 2. Band 20 is situated under skirt 10 and forms a downwardly extension of the skirt, with axial interposition of a break-off line 22, which will be described in detail hereafter.

As shown in figure 3, band 20 has an inside surface 24 provided with ribs 26 projecting toward axis X-X from surface 24. These ribs are sized for abutting in rotation around axis X-X against complementary ribs 5 outwardly projecting from a

flange 6 formed by the outside face of neck 2 under thread 4. In practice, each of ribs 5 and 26 has an elongated shape in a direction parallel to axis X-X, in order to delimitate a substantial contacting surface 5A or 26A for the contact between the band and the flange. Thanks to the cooperation by contact between ribs 5 and 26, the band is prevented from rotating around axis X-X, in anticlockwise on figure 3, which corresponds to the sense of rotative driven of skirt 10 for unscrewing the skirt from the neck. Consequently, when the skirt is rotated off the neck, the tamper evidence band is prevented from rotating with the skirt, which causes line 22 to break.

Break-off line 22 comprises slits 30 distributed along the break-off line, advantageously in a regular manner as shown in figure 4. Each slit 30 forms a through opening in closure 1, which separates skirt 10 and band 20 in the direction of axis X-X. In other words, each of the slits is defined both by an upper edge 30A which is delimited by a peripheral portion of the lower end of skirt 10, and by a lower edge 30B, which is delimited by a peripheral portion of the upper end of band 20, as partly shown in figure 5.

When seen in side elevation, as on figures 1, 4 and 5, each of slits 30 is constituted, successively along break-off line 22, by two straight parts 30₁ and 30₂. Part 30₁ has a longitudinal end 30_{1E} opposite to part 30₂ and extends in a length in a direction perpendicular to axis X-X. Part 30₂ has a longitudinal end 30_{2E} opposite to part 30₁ and extends in a length in a direction inclined with respect to the direction of axis X-X, forming with this latter a downwardly angle of inclination α_2 strictly lower than 90°, especially equal to 45°.

Between any two immediately adjacent slits among the slits 30, closure 1 includes a material portion which forms a frangible bridge 32. More precisely, each of these bridges separates from each other the respective ends 30_{1E} and 30_{2E} of two immediately adjacent slits 30, which face each other along the periphery of the closure. For example, if figures 4 and 5 are considered, the slit among slits 30, which is represented on the left part of the figures, and the slit among slits 30, which is represented on the right part of the figures, have, respectively, their right peripheral

end 30_{2E} and left peripheral end 30_{1E} which are facing each other, delimitating between them one of the bridges 32.

The bridges 32 form continuous material links which connect skirt 10 and tamper evident band 20. In other words, skirt 10, band 20 and bridges 22 located between them are integral with each other, forming a single piece made of plastic material. Thus, in order to fabricate closure 1, a plastic material is molded in a single piece including skirt 10 and tamper evident band 20. Once this single piece is molded, slits 30 are formed, by a slitting process using for example a cutting blade which cuts through the peripheral wall of the plastic single piece. This cutting blade is moved with respect to the closure in order to provide parts 30₁ and 30₂ for each slit 30.

After its fabrication, closure 1 is mounted on neck 2, being for example fitted around the neck along axis X-X.

When the consumer opens closure 1 for the first time, he or she unscrews skirt 10 around axis X-X. As ribs 5 and 26 prevent tamper evident band 20 from rotating with the skirt, bridges 32 break. More precisely, stresses are applied to the material constituting each bridge 32 until the bridge breaks, which is caused by a failure propagating through the bridge, between the facing ends 30_{1E} and 30_{2E} associated to this bridge. Due to the shape of slits 30, these facing ends 30_{1E} and 30_{2E} are not aligned in a plan perpendicular to axis X-X but are offset one with respect to the other in the direction of this axis. This axial offset between the ends 30_{1E} and 30_{2E} causes the failure of the frangible bridge to be essentially in tension, that is to say in a direction parallel to axis X-X or slightly inclined with respect to this axis. Thus, the torque required to break each of the bridges 32 is low, in the sense that this torque is substantially lower than that which would be required to break the bridges exclusively in shear.

The failure of the bridge 32 which is shown on figure 5 is schematically illustrated: the hatched area referenced 34 schematically corresponds to the area of the bridge, through which the failure of the bridge propagates between ends 30_{1E} and 30_{2E}. In view of figure 5, it is understood that the failure in tension of bridges 32

occurs thanks to the axial offset of facing ends 30_{1E} and 30_{2E} , in the sense that both the part of upper edge 30A for end 30_{1E} is axially offset with respect to the part of upper edge 30A for end 30_{2E} and the part of lower edge 30B for end 30_{1E} is axially offset of the part of lower edge 30B for end 30_{2E} . In other words, the part of each bridge 32, which is under stress when closure 1 opens for the first time, is at an angle with respect to a plan perpendicular to axis X-X of rotation of skirt 10.

In figures 6 to 12 are shown seven different forms of embodiment of the invention, in which elements similar to those of the first embodiment shown in figures 1 to 5 bear identical references. As clearly illustrated by these figures, each of these seven forms of embodiments is different from the first embodiment by the shape of their respective pluralities of slits, which are respectively referenced 40, 50, 60, 70, 80, 90 and 100 and consequently by the shape of their associated frangible bridges, which are respectively referenced 42, 52, 62, 72, 82, 92 and 102.

In the form of embodiment shown in figure 6, each of slits 40 of break-off line 22 is constituted, in a successive manner along the periphery of the closure, by a first part 40_1 similar to part 30_1 of each of slits 30, by a part 40_2 similar to part 30_2 of each of slits 30, and by another part 40_3 which, when the closure is seen in side elevation as on figure 6, is straight and extends in length in a direction perpendicular to axis X-X. Thus, parts 40_1 and 40_3 are parallel to each other. Part 40_1 has a longitudinal end 40_{1E} opposite to part 40_2 . Part 40_3 has a longitudinal end 40_{3E} opposite to part 40_2 . Each of bridges 42 is delimited between the ends 40_{1E} and 40_{3E} which respectively belongs to two immediately adjacent slits among slits 40 and which face each other.

The form of embodiment of figure 6 shows that, at the facing ends of two immediately adjacent slits 40, the respective corresponding terminal parts 40_1 and 40_3 of these two slits are not inclined to each other, unlike the parts 30_1 and 30_2 of the slits 30.

In the form of embodiment shown in figure 7, each of slits 50 of break-off line 22 is successively constituted by a part 50_1 , a part 50_2 and a part 50_3 , which are respectively similar to parts 40_1 , 40_2 and 40_3 of each of slits 40. Like the facing ends 30_{1E} and 30_{2E} or 40_{1E} and 40_{3E} of two immediately adjacent slits 30 or 40, the facing

ends 50_{1E} and 50_{3E} of two immediately adjacent slits among slits 50 are offset one with respect to the other in the direction of axis X-X. However, unlike these ends 30_{1E} and 30_{2E} or 40_{1E} and 40_{3E} , the ends 50_{1E} and 50_{3E} are not aligned in a direction parallel to axis X-X, but are aligned in a direction inclined with respect to the direction of this axis, so that at least a portion of part 50_3 of one of two immediately adjacent slits is located vertically above at least a portion of part 50_1 of the other of the two slits.

The form of embodiment of figure 7 may be more difficult to fabricate because it is required more sophisticated movements for the blade which cuts the closure to provide slits 50, with respect to the movements of the same blade to provide slits 30 or 40. However, the axial overlapping of parts 50_1 and 50_3 , at the facing ends 50_{1E} and 50_{3E} , allows bridges 52 to stretch and to break essentially and even exclusively in tension.

In the form of embodiment shown in figure 8, each of slits 60 of break-off line 22 is constituted, in a successive manner along the periphery of the closure, by a first part 60_1 which, when the closure is seen in side elevation as in figure 8, is straight and extends in length in a direction inclined to the direction of axis X-X, by a second part 60_2 similar to part 30_1 of each of slits 30, and by a third part 60_3 similar to part 30_2 of each of slits 30. Part 60_1 forms with the direction of axis X-X a downwardly angle of inclination α_1 similar to angle α_2 for part 30_2 or 60_3 . In the represented form of embodiment, parts 60_1 and 60_3 are parallel to each other. In other words, angle α_1 is identical to angle α_2 .

The form of embodiment of figure 8 shows that, at each of bridges 62 which is delimited between the facing ends 60_{1E} and 60_{3E} of two immediately adjacent slits among slits 60, the respective corresponding terminal parts 60_1 and 60_3 of these two slits do not necessarily include at least one part perpendicular to the direction of axis X-X, but can be both inclined with respect to this direction.

In the form of embodiment shown in figure 9, each of slits 70 of break-off line 22 is constituted, in a successive manner along the periphery of the closure, by first, second and third parts 70_1 , 70_2 and 70_3 which are respectively similar to parts 40_1 ,

40₂ and 40₃ of each of slits 40, and by a fourth part 70₄. When the closure is seen in side elevation as on figure 9, each part 70₄ is straight and extends in length in a direction inclined with respect to the direction of axis X-X, forming with this latter a downwardly angle of inclination β_4 geometrically similar to angle α_2 for part 70₂. Unlike angle α_2 , angle β_4 is strictly upper than 90°, especially equal to 135°.

Thus, the geometrical straight continuation of part 70₄ beyond the corresponding end 70_{4E} of each slit 70 is convergent toward part 70₁ of the immediately adjacent slit, unlike part 30₂ or 60₃ with respect to 30₁ or 60₁. By that way, the stresses in each bridge 72 during the breaking of line 22 are essentially concentrated in the area of bridge where parts 70₄ and 70₁ of the associated two immediately adjacent slits 70 are closer to each other.

In the form of embodiment shown in figure 10, parts 80₁, 80₂, 80₃ and 80₄ of each of slits 80 are similar to parts 70₁, 70₂, 70₃ and 70₄ of slits 70, except that the facing ends 80_{1E} and 80_{4E} of two immediately adjacent slits 80 are not aligned in a direction parallel to axis X-X, but are aligned in a direction inclined with respect to the direction of axis X-X, with at least a terminal portion of part 80₁ and at least a terminal portion of part 80₄ located above each other. With respect to the form of embodiment of figure 9, the form of embodiment of figure 10 has substantially the same technical interest as the form of embodiment of figure 7 with respect to the form of embodiment of figure 6.

In the form of embodiment shown in figure 11, each of slits 90 is constituted by a straight segment which is inclined with respect to the direction of axis X-X. Each segment forms with the direction of axis X-X an angle of inclination α different from 90°. Thus, the two facing ends 90_E of two adjacent segments are axially offset one with respect to the other, forming between them one of bridges 92.

In the form of embodiment shown in figure 12, each of slits 100 is constituted by a curved segment. In order to create a regular wave of break-off line 22, the sign of curvature of two immediately adjacent slits 100 are different, which allows the two facing ends 100_E of these two immediately adjacent slits to be offset one with respect to the other in the direction of axis X-X.

The forms of embodiment of figures 11 and 12 show that each of slits 90 or 100 of break-off line 22 is not necessarily constituted by different elementary straight parts, unlike slits 30, 40, 50, 60, 70 and 80.

Different technical variants can be considered for the closures described hereabove. For example, each of these closures can optionally include other components, like a sealing disc added against the lower face of top wall 12. Besides, tamper evident band 20 can be more extended in length under flange 6 of neck 2, especially in order to label or decorate the lower part of the neck.

Furthermore, the means for preventing tamper evident band 20 from rotating with skirt 10 are not limited to the form illustrated in figure 3. In particular, in addition to or in substitution of ribs 5, the outside face of neck 2 can be provided with recesses, against which the ribs 26 abut in rotation. In the same way, ribs 26 can be replaced or completed by recesses delimited in inside surface 24 of band 20. In any case, surface 24 and the outside face of neck 2 are shaped to cooperate in order to fix band 20 in rotation around the neck.

CLAIMS

1. A closure (1) for a neck (2) of a container (3), made of a plastic material and comprising:

- a tubular skirt (10) provided with an inside surface (14) adapted to be screwed and unscrewed on a thread (4) of the neck around an axis of rotation (X-X),
- a tamper evident band (20) provided with an inside surface (24) adapted to abut in rotation around the axis of rotation against at least one protrusion (5) or recess of the neck, and
- a plurality of slits (30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100) distributed along a peripheral direction around the axis of rotation and located between the skirt and the tamper evident band in the direction of the axis of rotation,

wherein any two immediately adjacent slits among the plurality of slits (30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100) have respective peripheral ends (30_{1E}, 30_{2E} ; 40_{1E}, 40_{3E} ; 50_{1E}, 50_{3E} ; 60_{1E}, 60_{3E} ; 70_{1E}, 70_{4E} ; 80_{1E}, 80_{4E} ; 90_E ; 100_E) facing each other and separated from each other by a frangible bridge (32 ; 42 ; 52 ; 62 ; 72 ; 82 ; 92 ; 102) that links the skirt (10) and the tamper evident band (20) and that is provided to be broken when the skirt is unscrewed from the neck for the first time, characterized in that the facing peripheral ends (30_{1E}, 30_{2E} ; 40_{1E}, 40_{3E} ; 50_{1E}, 50_{3E} ; 60_{1E}, 60_{3E} ; 70_{1E}, 70_{4E} ; 80_{1E}, 80_{4E} ; 90_E ; 100_E) of two immediately adjacent slits among the plurality of slits (30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100) are offset one with respect to the other in the direction of the axis of rotation (X-X).

2. Closure according to claim 1, characterized in that each slit (30) is delimited by a first edge (30A) on the side of the skirt (10) and by a second edge (30B) on the side of the tamper evident band (20), and in that, at said facing peripheral ends (30_{1E}, 30_{2E}) of two immediately adjacent slits (30), the respective first edges of these two immediately adjacent slits are axially offset one with respect to the other and the respective second edges of these two immediately adjacent slits are axially offset one with respect to the other.

3. Closure according to one of the previous claims, characterized in that said facing peripheral ends (30_{1E} , 30_{2E} ; 40_{1E} , 40_{3E} ; 60_{1E} , 60_{3E} ; 70_{1E} , 70_{4E} ; 90_E) of two immediately adjacent slits (30 ; 40 ; 60 ; 70 ; 90) are aligned in a direction parallel to the axis of rotation (X-X).

4. Closure according to one of claims 1 and 2, characterized in that said facing peripheral ends (50_{1E} , 50_{3E} ; 80_{1E} , 80_{4E}) of two immediately adjacent slits (50 ; 80) are aligned in a direction inclined with respect to the direction of the axis of rotation (X-X), respective parts (50_1 , 50_3 ; 80_1 , 80_4) of the two immediately adjacent slits being above one the other in the direction of the axis of rotation.

5. Closure according to any of the previous claims, characterized in that, when the closure is seen in side elevation, each slit (30) is constituted by, successively:

- a first straight part (30_1) extending in length in a direction perpendicular to the direction of the axis of rotation (X-X), and
- a second straight part (30_2) extending in length in a direction inclined with respect to the direction of the axis of rotation, forming an angle of inclination (α_2) different from 90° .

6. Closure according to one of claims 1 to 4, characterized in that, when the closure is seen in side elevation, each slits (40 ; 50) is constituted by, successively :

- a first straight part (40_1 ; 50_1) extending in length in a direction perpendicular to the direction of the axis of rotation (X-X),
- a second straight part (40_2 ; 50_2) extending in length in a direction inclined with respect to the direction of the axis of rotation, forming an angle of inclination (α_2) different from 90° , and
- a third straight part (40_3 ; 50_3) extending in length in a direction perpendicular to the direction of the axis of rotation.

7. Closure according to one of claims 1 to 4, characterized in that, when the closure is seen in side elevation, each slit (60) is constituted by, successively:

- a first straight part (60_1) extending in length in a direction inclined with respect to the direction of the axis of rotation (X-X),
- a second straight part (60_2) extending in length in a direction perpendicular to the direction of the axis of rotation, and
- a third straight part (60_3) extending in length in a direction inclined with respect to the direction of the axis of rotation,

wherein the first and third parts (60_1 , 60_3) respectively form with the direction of the axis of rotation, on a same side of slits (60), two angles of inclination (α_1 , α_2), which are both strictly lower or strictly upper than 90° .

8. Closure according to any of claims 1 to 4, characterized in that, when the closure is seen in side elevation, each slit (70 ; 80) is constituted by, successively:

- a first straight part (70_1 ; 80_1) extending in length in a direction perpendicular to the direction of the axis of rotation (X-X),
- a second straight part (70_2 ; 80_2) extending in length in a direction inclined with respect to the direction of the axis of rotation,
- a third straight part (70_3 ; 80_3) extending in length in a direction perpendicular to the direction of the axis of rotation, and
- a fourth straight part (70_4 ; 80_4) extending in length in a direction inclined with respect to the direction of the axis of rotation,

wherein the second and fourth parts (70_2 , 70_4 ; 80_2 , 80_4) respectively form with the direction of the axis of rotation, on a same side of slits (70 ; 80), two angles of inclination (α_2 , β_4), one of these two angles being strictly lower than 90° whereas the other is strictly upper than 90° .

9. Closure according to one of claims 1 to 4, characterized in that each slits (90) is constituted by a straight segment inclined with respect to the direction of the axis of rotation (X-X), forming an angle of inclination (α) different from 90° .

10. Closure according to one of claims 1 to 4, characterized in that each slit is constituted by a curved segment (100), the signs of curvature of two immediately adjacent slits being different.

11. Container (3) provided with a neck (2), characterized in that the neck is equipped with a closure (1) according to any of the previous claims.

12. Method for fabricating a closure (1) suitable for equipping a neck (2) of a container (3), the method comprising at least the following steps of:

- molding a plastic material in a single piece comprising:
 - a tubular skirt (10) provided with an inside surface (14) adapted to be screwed and unscrewed on a thread (4) of the neck around an axis of rotation (X-X), and
 - a tamper evident band (20) provided with an inside surface (24) adapted to abut in rotation around the axis of rotation against at least one protrusion (5) or recess of the neck, and
- slitting a plurality of slits (30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100), distributing these slits along a peripheral direction around the axis of rotation (X-X) and locating these slits between the skirt (10) and the tamper evident band (20) in the direction of the axis of rotation, so that any two immediately adjacent slits among the plurality of slits have respective peripheral ends (30_{1E}, 30_{2E} ; 40_{1E}, 40_{3E} ; 50_{1E}, 50_{3E} ; 60_{1E}, 60_{3E} ; 70_{1E}, 70_{4E} ; 80_{1E}, 80_{4E} ; 90_E ; 100_E) facing each other and separated from each other by a frangible bridge (32 ; 42 ; 52 ; 62 ; 72 ; 82 ; 92 ; 102) that links the skirt (10) and the tamper evident band (20) and that is provided to be broken when the skirt is unscrewed from the neck for the first time,

characterized in that, during the step of slitting, the facing peripheral ends (30_{1E}, 30_{2E} ; 40_{1E}, 40_{3E} ; 50_{1E}, 50_{3E} ; 60_{1E}, 60_{3E} ; 70_{1E}, 70_{4E} ; 80_{1E}, 80_{4E} ; 90_E ; 100_E) of two immediately adjacent slits among the plurality of slits (30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100) are provided, being offset one with respect to the other in the direction of the axis of rotation (X-X).

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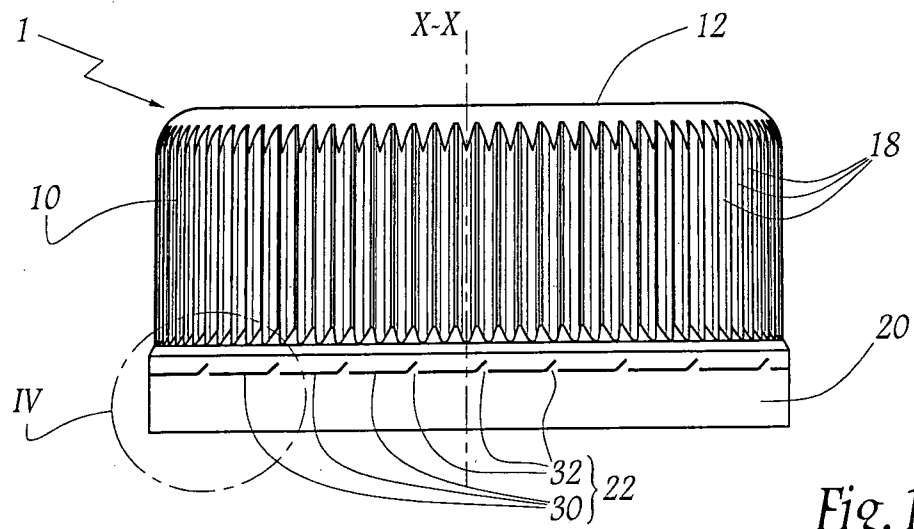


Fig. 1

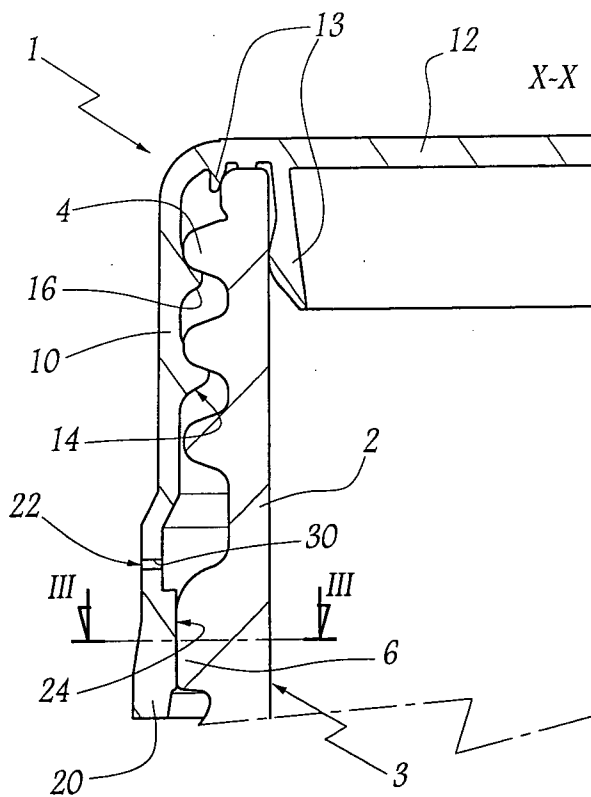


Fig. 2

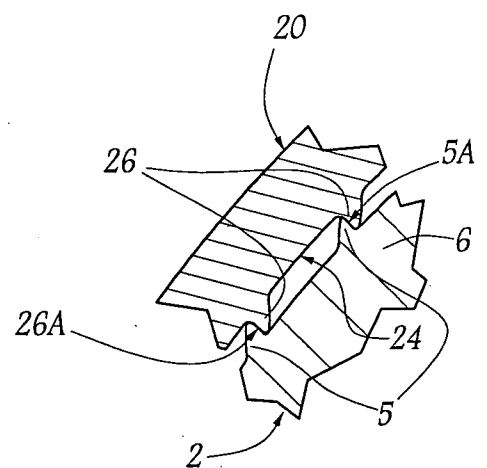


Fig. 3

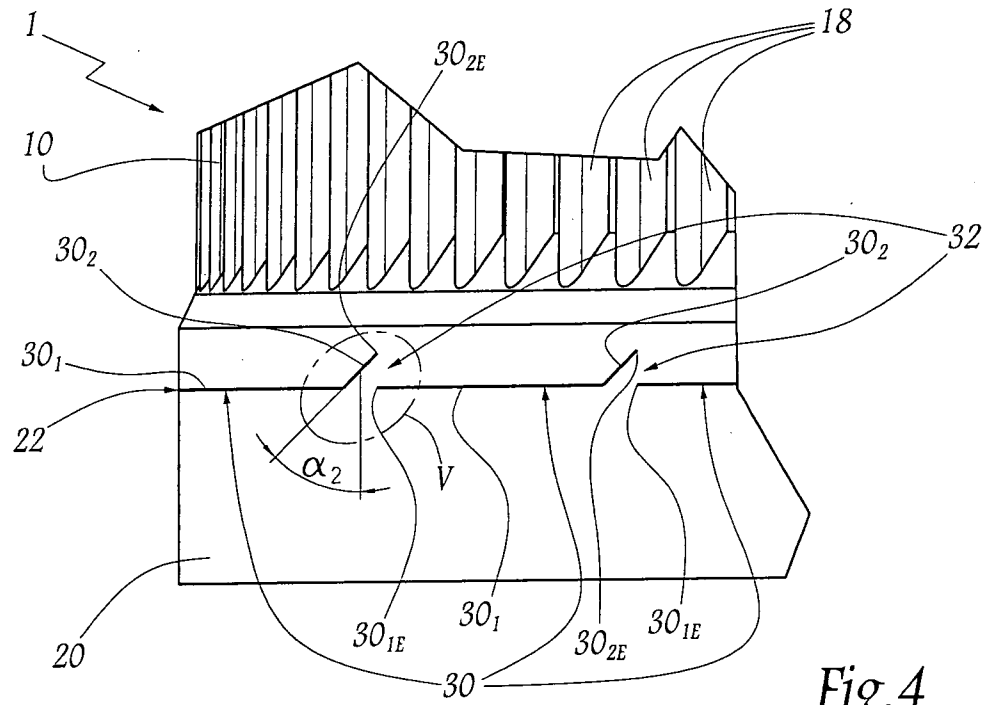


Fig.4

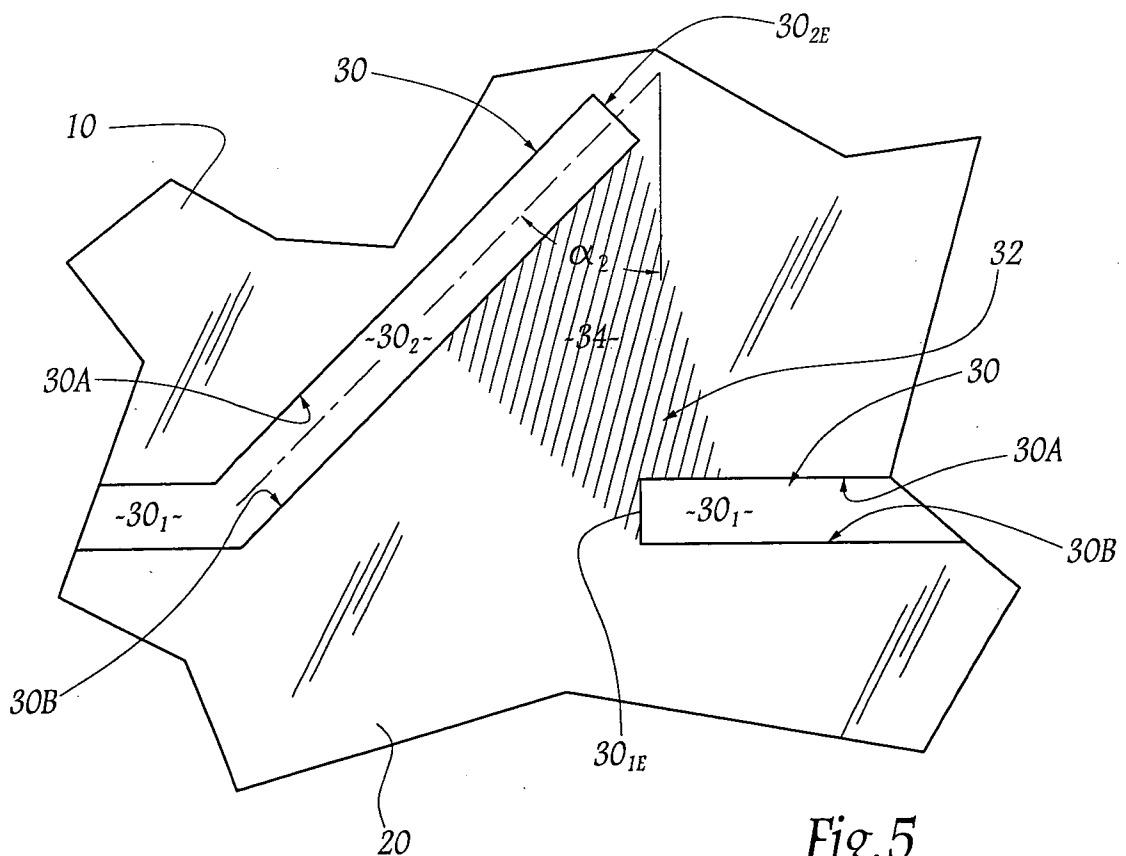


Fig.5

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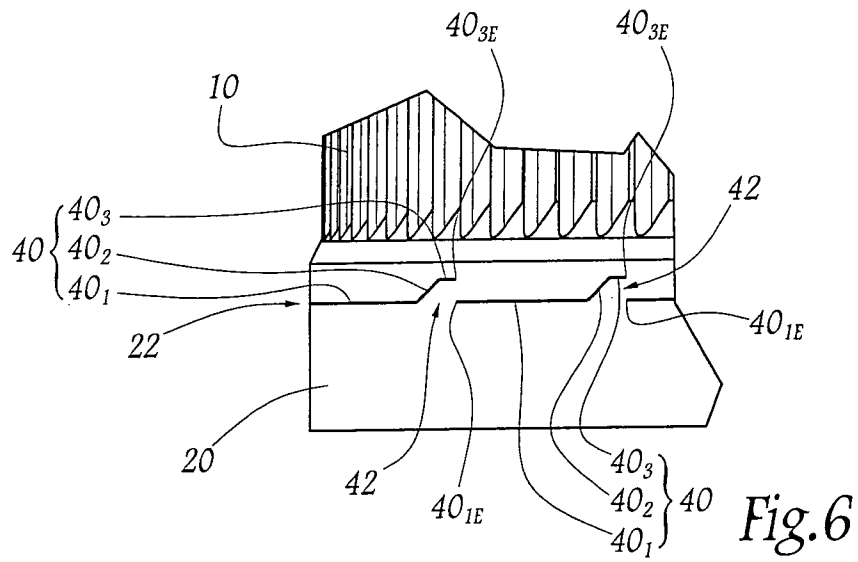


Fig. 6

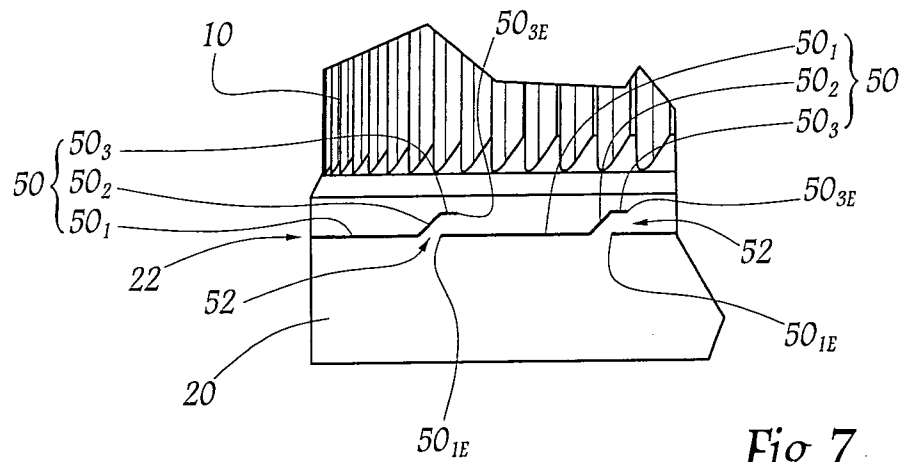


Fig. 7

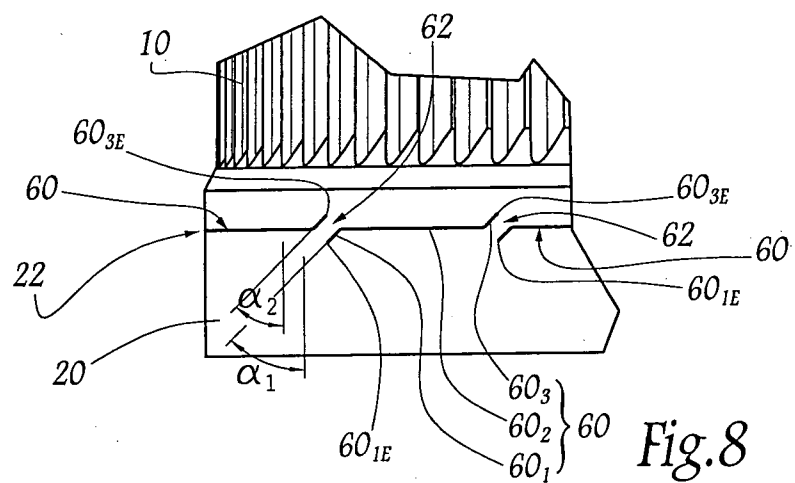
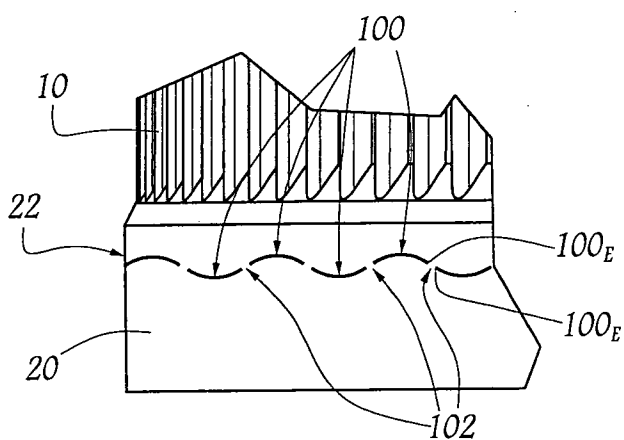
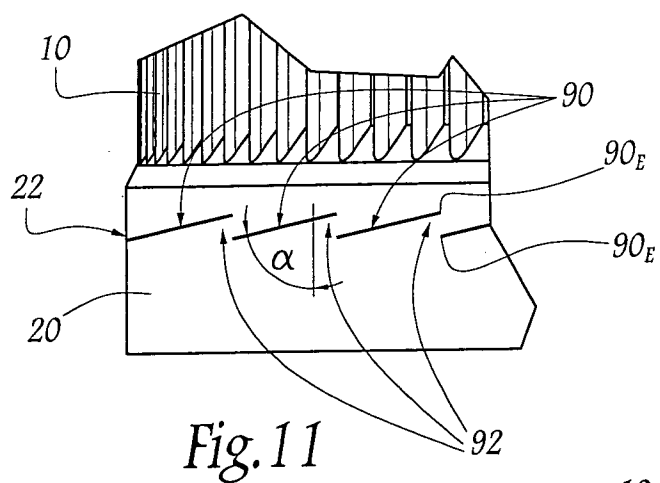
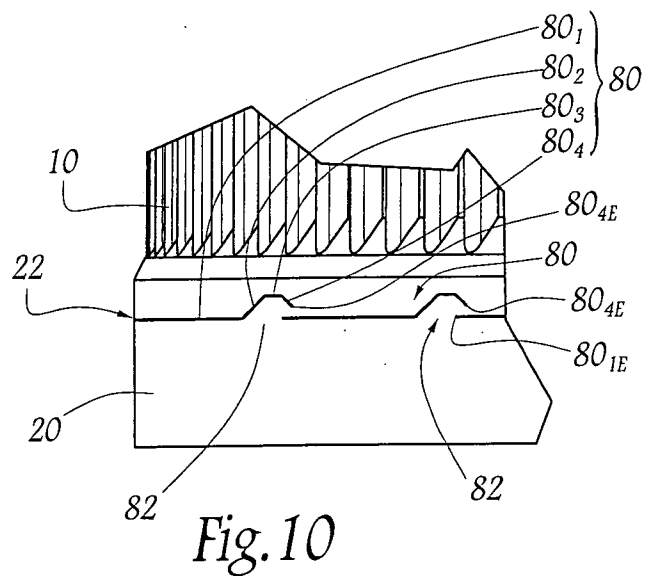
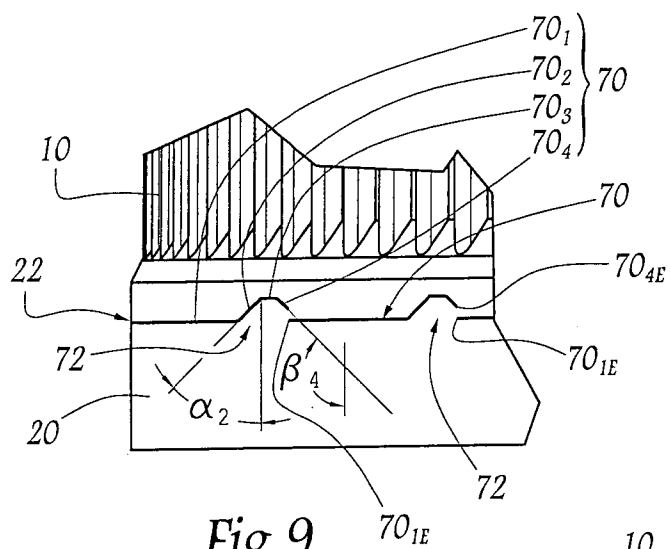


Fig. 8

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2007/002470

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D41/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 784 281 A (ROZENBERG OLEG [US]) 15 November 1988 (1988-11-15) column 5, lines 8-49; figure 1	1-13
X	FR 2 639 031 A (BOUCHONS PLASTIQUES [FR]) 18 May 1990 (1990-05-18) page 2, lines 9-14; figure 1	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

19 December 2007

Date of mailing of the international search report

10/01/2008

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2007/002470

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4784281	A	15-11-1988	NONE	
FR 2639031	A	18-05-1990	NONE	