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CLOSURE FOR CROWN CORK BOTTLES AND SIMILAR CONTAINERS

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2 Sheets-Sheet 1

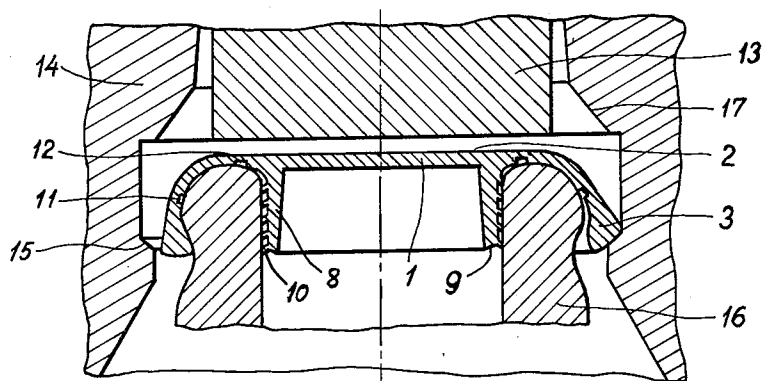


Fig. 1

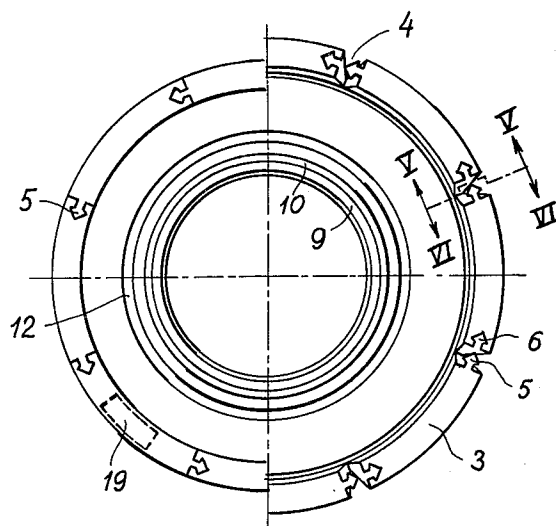


Fig. 2

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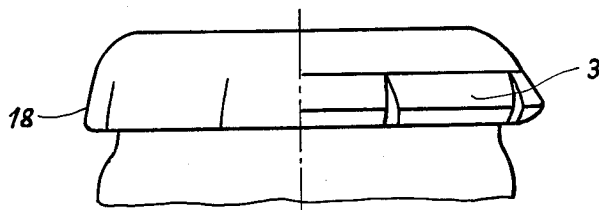


Fig. 3

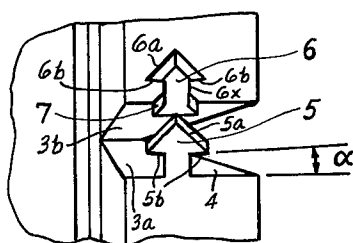


Fig. 4

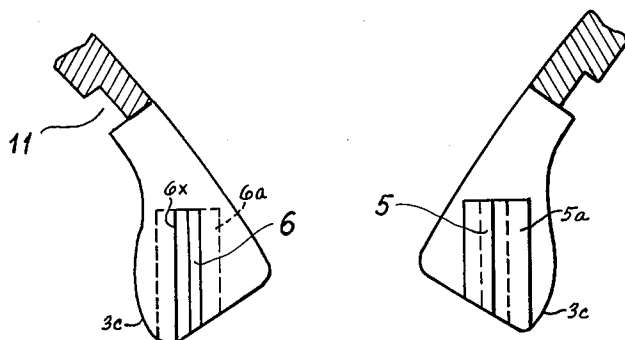


Fig. 5

Fig. 6

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## CLOSURE FOR CROWN CORK BOTTLES AND SIMILAR CONTAINERS

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7 Claims. (Cl. 215-41)

This invention relates to a closure for crown cork bottles and other containers having a cap holding shoulder behind a mouth thereof.

It is the object of the invention to devise a closure which can be made by injection moulding from a material of the plastic group and is suitable for taking the place of the metal caps with cork or plastic liner ordinarily used for crown cork bottles.

Plastic caps as hitherto made for bottles and other containers of the type referred to have been constructed with a skirt portion designed to surround the bottle neck and having an inward bead at the lower end thereof to engage behind the cap holding shoulder of the bottle. To place such a cap on a bottle mouth, the cap must undergo a widening sufficient to permit its bead to slide past the thickened neck portion forming the shoulder of the bottle. The force at which the bead of the cap will engage behind the shoulder of the bottle will depend on such elasticity as remains in the cap after it has been widened as described. This engagement force will in many cases be insufficient. Moreover these known plastic caps suffer from the drawback that they cannot be placed on the bottles by means of the ordinary crown cork bottling machines and cannot be removed from the bottles by means of ordinary crown cork cap openers. Finally, such a cap, when removed from a bottle, will not bear any distinct traces of having been removed and may be replaced by hand, thereby opening up a possibility of adulteration of the contents of the bottle before sale.

It is a more specific object of the invention to remedy these drawbacks of known caps made from materials of the plastics group.

According to the invention, a closure for crown cork bottles and other containers having a cap holding shoulder behind a mouth thereof is provided, which closure comprises a cap having a rim portion consisting of a plurality of mutually spaced rim sectors closable in end to end relationship around the cap holding shoulder of a bottle or other container on which the cap is placed and constructed with circumferentially engageable interlocking means.

In a cap constructed in this manner the grip of the cap behind the shoulder of the bottle does not depend on the elasticity of the plastics material but on positive interlocking. The cap can be made in the same outer shape as the ordinary metal caps and like these is applied to a bottle by the combination of an axial force exerted on the bottom of the cap and a radial contracting force exerted on a rim portion of the cap. It can therefore be applied by means of the ordinary bottling machines without any change. Likewise it can be removed by means of an ordinary cap opener which is applied in the ordinary way, viz, so as to effect a local widening and distortion of the rim portion whereby, in the novel construction here considered, the interlocking means between at least two rim sectors are disengaged. Since these interlocking means cannot be re-engaged by hand it will be clearly visible that the cap has been removed.

Further features and advantages of the invention will be apparent to those skilled in the art from the following the detailed description of one embodiment of the

invention, reference being made to the accompanying drawings in which

FIG. 1 shows an axial cross section of the closure as placed on a bottle top, as well as a tool for so placing the closure, the left hand half illustrating the cap and tool after completion of the closing operation, and the right hand half illustrating same before commencement of the closing operation,

FIG. 2 the closure as viewed from the bottom, the left hand half illustrating the cap in its closed state, and the right hand half illustrating the cap in its original state,

FIG. 3 the closure as viewed in side elevation, the left hand half illustrating the cap in its closed state, and the right hand half illustrating the cap in its original state,

FIG. 4 on a larger scale a fractional view of the zone of engagement between two rim sectors of the closure, as viewed from the bottom in the original state of the closure,

FIG. 5 a section on an enlarged scale along the broken line V-V in FIG. 2, and

FIG. 6 a section on an enlarged scale along the broken line VI-VI in FIG. 2.

The closure cap illustrated in the drawings is made from a material of the plastics group and comprises a circular top wall 1, the upper or outer face 2 of which may bear suitable inscriptions, decorations, or the like applied thereon as by printing, stamping, or in other conventional manner. The cap has a depending skirt or rim portion integral with the top wall 1 and which is formed by a plurality of rim sectors 3 which are separated by radial incisions 4 opening downwardly through the lower edge of the skirt, as illustrated in FIGURES 2, 3 and 4. The relatively circumferentially opposed or radial end faces 3a and 3b respectively of adjoining sectors 3 on opposite sides of each incision 4 converge upwardly, as is shown in detail in FIGURE 4; and the lower edges or extremities of the respective sectors are normally spaced apart across the lower ends of the incisions 4 in the normal state or condition of the cap as it is originally formed and before it is applied to a container, all as is illustrated in the right-hand half of FIGURE 2. The adjacent end faces 3a and 3b respectively of each pair of adjoining sectors are respectively formed with circumferentially directed snap fastener means 5 and 6 for interlocking engagement with each other incident to the movement of said end faces toward each other as the sectors 3 are flexed radially inwardly about their connections to the top wall 1 at the time the cap is being applied to the container. Thus, the snap fastener means interconnect the respective rim sectors 3 against circumferential separation after application of the cap to the container. In the illustrated embodiment, the snap fastener means are exemplified by a locking tongue or projection 5 affixed to and projecting circumferentially from one end face 3a of its associated sector for cooperative locking reception in an oppositely circumferentially directed socket 6 having its mouth opening through the adjoining end face 3b. As is best illustrated in FIGURES 4, 5 and 6, the locking tongue 5 includes an enlargement 5a adjacent its free end having one or more generally radially disposed locking faces 5b on the circumferential side thereof remote from its free end. Preferably, also, the enlargement 5a converges toward its free end for wedging reception in the mouth of the cooperating socket 6. The socket 6 in each instance has an entry portion 6x of smaller cross sectional dimension than the locking tongue enlargement 5a. This entry portion 6x extends circumferentially inwardly from the socket mouth 7 which preferably is arranged to diverge outwardly circumferentially for wedging reception of the

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enlargement 5a. At its inner end, the entry portion 6x opens into an enlarged portion 6a of the socket spaced inwardly from the socket mouth; and at the juncture of this entry portion and the enlarged portion 6a, the socket is provided with one or more generally radially disposed locking faces 6b, these locking faces 6b being directed inwardly away from the socket mouth 7 for abutting locking engagement with the respective locking faces 5b of the locking tongue or projection 5. Each sector 3 is formed near its lower extremity with an inwardly projecting flange 3c for locking reception beneath the usual external bead of the bottle neck.

Obviously, the inclined or tapering arrangement of the enlargement 5a and the socket mouth 7 facilitates the entry of the tongue into the socket and the necessary expansion of the entry portion 6x due to the wedging action of the enlargement 5a as the latter is forced through said entry portion for reception in the enlarged socket portion 6a.

To further facilitate the radial expansion of the socket incident to such insertion of the locking tongue, each of the sockets 6 is arranged to open downwardly through the lower edge or extremity of its associated sector; and similarly its associated locking tongue 5 is disposed at or closely adjacent the lower edge of its sector. In order to make the closed rim resistant to high bottle pressures, as will be explained in more detail in the following, the rear faces of the head portion of the projections 5 are inclined at an angle  $\alpha$  to the end faces of the sectors 3.

A sleeve portion 8 protrudes from the inner face of the bottom portion 1 and has a wall thickness decreasing in a direction away from said top wall 1. The sleeve portion 8 is designed to be introduced into the bottle mouth, and to facilitate such introduction the outer edge of the free marginal portion of the sleeve 8 is inclined at 9, thereby to facilitate the centering of the closure cap on the bottle neck. On its outer face the sleeve is constructed with spaced annular ribs 10 which are disposed at a downward inclination and are sufficiently flexible as to be urged radially outwardly against the inner wall of the bottle mouth under the influence of a pressure prevailing in the bottle, thereby to secure a good sealing and a firm seating of the cap within wide tolerances as regards the dimensions of the bottle mouth.

In the zone of transition between the sectors 3 and the bottom portion 1 an annular groove 11 is provided on the inner face of the cap. The groove 11 increases the flexibility of the connection between the rim sectors and the top wall thereby facilitating the contraction of the rim sectors around the shoulder of the bottle.

On the inner face of the cap there is also provided an annular groove 12 to receive irregularities of the type which will invariably occur in the zone in question of a bottle mouth as a result of the bottle moulding procedure.

The closure is applied to a bottle mouth in the following manner:

In an automatic closing machine of ordinary type the described caps, which in the original state have the same dimensions as ordinary metal crown cork caps, are sorted and brought into correct position in the chute of the closing machine where they are checked and rejected in case of faults, as usual. The caps assuming the correct position are successively conveyed to the closing tool of the revolving or intermittently operating closing machine. In the closing tool, which is represented in FIG. 1 by a piston 13 and a centering ring 14, the cap is located with the marginal edges of the sectors 3 in contact with a shoulder 15 of the centering ring 14, as illustrated in the right hand half of FIG. 1. If no bottle is fed forward to the closing tool before it performs its operating stroke, the cap remains in its original shape and is retained in the centering ring to thereby automatically prevent reception therein of another cap.

After a bottle, which is represented in FIG. 1 by its mouth portion 16, has been moved into position under

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the closing tool, the piston 13 is lowered and presses the cap against the bottle mouth, whereby the sleeve portion is introduced into the bottle mouth. Presently the centering ring 14 is lowered and urges the sectors 3 from a position at an inclination of about 30° inwards against the bottle neck whereby the projections 5 are introduced into the recesses 6, the latter being momentarily widened to permit such introduction.

During the closing process the grooves 11 and 12 improve the flexibility of the sectors 3. In the closed position the sectors are mutually interlocked to provide a continuous and smooth surface.

The center of curvature of each rim sector 3 is off-set outwards from the axis of the cap, the centers of curvature of all the sectors being located on a common circle concentric with the cap. Owing to this arrangement the ends of the rim sectors will engage the bottle neck first during the closing operation whereby the interlocking projections and recesses will be guided into correct engagement with one another. Moreover, owing to the described off-set arrangement of the centers of curvature of the rim sectors it will be easier to tilt the rim sectors out of engagement with one another by means of an ordinary bottle opener. On the other hand, the engagement between the projections and recesses is very firm as long as the rim portion is only subjected to circumferential stresses, such as is the case under the influence of the pressure prevailing in the interior of the bottle.

After the closure cap has been applied to the bottle neck in the manner described, the piston 13 and the centering rim 14 are again moved upwards. In order to prevent jamming of the cap in the centering ring 14 the outer flank 18 of the rim sectors is so constructed as still to be disposed at an inclination in the closed position of the cap. The closed bottle can therefore pass the narrowed zone of the centering ring without difficulty whereby the receiving chamber of the closing tool becomes ready to receive the next cap.

The cap may suitably consist of a tough low pressure polyethylene which will secure persistence of the interlocking of the rim sectors even with small dimensions of the projections 5 and recesses 6 and with high bottle pressures up to about 15 atm. and high temperatures up to about 80° C. In spite of the great toughness of the material, tolerances of the bottle neck diameter will be taken up by this material.

When the bottle is opened by means of an ordinary cap opener, the rim portion will be torn up an previously described by disengagement of the interlocking means of at least two of the rim sectors. If desired, the cap may also be constructed with one or more weakened zones 19 where the wall thickness is so reduced that tearing will take place there.

If desired, the cap may also be provided with a tearing-up strip which however should preferably be so constructed that it does not protrude beyond the contour of the cap since otherwise the latter cannot be applied by means of an ordinary bottling machine.

When the cap has been removed, it may be applied to the bottle again by hand in order to close the bottle for a relatively short period. Nevertheless it will be directly visible that the cap has been removed.

Before the cap has been removed the pressure in the interior of the bottle will urge the ribs 10 into sealing engagement with the inner wall of the bottle mouth and, besides, the inner pressure acting on the bottom portion of the cap will tend to urge the zone of transition between the rim sectors and the bottom portion into sealing engagement with the outer wall of the bottle mouth, viz by tending to straighten and thereby to radially contract the cap wall in the said zone so that there will in fact be two sealing zones between the interior of the bottle and the surroundings. In order that this effect should be obtained, the top wall should be rigid and it may therefore be constructed with a greater wall thickness than the zone,

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of transition between the top wall and the rim sectors.

I claim:

1. A closure for a container having an external bead encircling its neck below the container mouth, comprising a circular top wall, a plurality of rim sectors depending from the outer periphery of said top wall, said sectors being flexibly connected to said top wall for relative flexing in radial planes toward and away from an axis concentric with and perpendicular to said top wall, said top wall and said rim sectors being integrally interconnected parts of a unitary cap structure of flexible plastic material, each pair of circumferentially adjoining sectors having circumferentially opposed end faces disposed for relative movement into substantial endwise abutment when the said sectors are flexed radially inwardly toward said axis, circumferentially directed snap fastener means carried by said adjoining sectors at their said opposed end faces respectively for interlocking engagement with each other incident to such relative movement of the said faces, to secure said sectors against subsequent circumferential separation, said sectors respectively including inwardly projecting flanges adjacent their lower extremities for holding engagement beneath the said external bead of the bottle neck.

2. A closure for a container as defined in claim 1, in which said snap fastener means comprises a free ended locking tongue affixed to and projecting circumferentially from one said end face for cooperative locking reception in an oppositely circumferentially directed socket having its mouth opening through the other said end face.

3. A closure for a container as defined in claim 1, in which said locking tongue includes an enlargement adjacent its free end having a substantially radially disposed locking face on the circumferential side thereof remote from said free end, said socket having an entry portion of smaller cross sectional dimension than said enlarge-

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ment of the locking tongue extending circumferentially inwardly from its mouth and opening into an enlarged portion of the socket spaced inwardly from the socket mouth, a generally radially disposed locking face being disposed in said socket at the juncture of said entry portion and said enlarged portion and directed away from the socket mouth for abutting locking engagement with said locking face of the tongue.

4. A closure for a container as defined in claim 3, in which said socket mouth diverges outwardly circumferentially and said enlargement of the locking tongue converges toward its free end for wedging reception in said mouth.

5. A closure for a container as defined in claim 3, in which said socket opens downwardly through the lower edge of its said sector to facilitate radial expansion of its said mouth incident to the insertion therein of said enlargement of the locking tongue.

6. A closure as in claim 1 and further comprising a sleeve portion protruding from said top wall of the cap and constructed with flexible projections to engage the inner wall of the mouth of a bottle on which the cap is placed.

7. A closure as in claim 6 in which said flexible projections are formed by annular ribs extending at an inclination away from the bottom of the cap.

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