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PATENT SPECIFICATION

DRAWINGS ATTACHED

L169,250

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COMPLETE SPECIFICATION

Bottle Closure

We, BEECHAM GROUP LIMITED, a British Company, of Beecham House, Great West Road, Brentford, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to bottle closures wherein the cap is adapted to be easily gripped in the hand and removed by a simple twisting motion through not more than 90°, and at the same time the inter-relationship between the bottle and the cap when the cap is in position on the bottle provides a novel and aesthetically pleasing design.

When liquid consumer goods are packaged in bottles it is essential that the contents should be readily and easily accessible. Thus it is essential that the cap or closure device shall be easily removable without the need to apply any excessive forces or pressures. On the other hand, when the bottle is closed by the cap being in position on the bottle it is essential that the closure should be liquid-tight and not liable to be displaced by chance, for instance when the goods are in transit or when the bottle is being shaken prior to use. These are the pre-requisites of any cap and bottle device but other factors come into operation in particular circumstances. For example with mass produced bottle and caps it is essential that the bottles and caps should each separately be relatively cheap to produce without any especially intricate interengaging surfaces or devices which need to be designed and constructed to excessively close tolerances. Thus simple caps with only one component member which can be moulded in one piece out of readily available cheap materials such as plastics are particularly suitable. It is also advantageous that caps should be applicable to the bottles in simple manner by machines. Another factor is that when all of the goods in the bottle will not be used at once the bottle should be

[Price 4s. 6d.]

re-closable as readily as it is openable.

Apart from the technical factors in choosing a closure mechanism, there are factors of artistic design. Thus in the packaging of goods for the retail trade, especially toiletry goods, it is particularly important that the overall appearance of the container and the general presentation of the goods is aesthetically pleasing. Consumer demand is such that attractive packaging of goods can play a vital role in selling them. Fashions in designs change and one current trend is towards "smooth lines" or in other words towards designs which incorporate few edges, convolutions, changes in diameter, ribbings, etc. and leave an overall smooth continuous outline. There can also be some selling advantages in having designs which are distinct and novel or provide a slightly different appeal to that of the designs of competitors' packages.

The bottle-neck and cap arrangement of this invention fulfils all of the above criteria of design and has many other technical advantages which will be elaborated after the closure has been described.

The attached drawings illustrate the invention:—

Fig. I is a frontal view of the upper region of the bottle with the cap in position.

Fig. II is a side view of the upper region of the bottle with the cap in position.

Fig. III is a plan view of the top of the bottle with the cap removed.

Fig. IV is a plan view of the inside of the cap.

It will be seen from the views III and IV that the top of the bottle and the cap therein illustrated are substantially elliptical in plan.

Fig. V is a vertical section through the upper part of the bottle with cap removed and taken through a major axis (or line AA) of the ellipse.

Fig. VI is a vertical section of the upper part of the bottle taken through a minor axis (or line BB) of the ellipse.

Fig. VII is a vertical section through the major axis (line AA) of the cap and bottle showing the cap in position on the bottle.

Fig. VIII is a cross section along the line DD shown on Fig. VII.

Figures IX, X and XI show variations of the bottle closure which are described later, and the invention can firstly be described by reference to Figures I to VIII.

In Figures I and II, 1 is the plastics cap and 2 is the body of the bottle. The bottle has a peripheral ledge 3 at the boundary of the body 2 and the neck and shoulder region: (the neck and shoulder are not visible on Figures I and II as they are hidden by the cap, but they can be easily seen on Figures V and VI of the bottle alone). The side walls or skirt 4 of the cap 1 conform at their lower edge 5 with this ledge 3. Thus the outer surface of the upper region of the body of the bottle and outer surface of the cap skirt provide a continuous surface interrupted only where 5 is spaced from 3.

Figures III, V and VI may be advantageously viewed together and show the upper part of the bottle with the cap moved. Immediately adjacent to the ledge 3 already referred to is a ramped or bevelled shoulder portion 6. The surface of this ramped shoulder portion may take on a variety of shapes, as will be explained below, but in the illustrations I to VIII it is essentially ellipsoidal or convex dome shaped and this embodiment will be described first of all. As the shoulder 6 extends upwards it gradually becomes less elongated or elliptical in horizontal cross section until it becomes of circular cross section and it merges into a cylindrical neck 7 (best seen on Figures V and VI). The neck 7 itself splays out at the top into an annular flange 8 bearing inclined frusto-conical or cylindrical surfaces 9, 10, 11 and 12 and the neck portion encloses the delivery aperture 13 of the bottle. It can be seen that the shoulder 6 and the upper region of the body 2 with its peripheral ledge 3 have half-turn or two-fold symmetry about the vertical axis running through the upper portion of the body and through the neck, that is to say, if the bottle is rotated through 360° about this vertical axis it comes into an identical position after 180°. The neck itself is of course completely axially symmetrical.

The cap will now be described: its outer shape can easily be appreciated by reference to Figures I and II which show side views of it in position on the bottle, and Figure IV which shows a plan view of the inside, the top outside plan being a plan ellipse of the same outside dimension as that shown in Figure IV. The cap's construction can best be understood by reference to Figures IV, VII and VIII. It may be described as having an inverted hollow cup shape with an elliptical top surface 14 and downwardly extending side walls or skirt 4. Inside the cap are two

strengthening ribs 15 and 16 which are substantially rectangular in shape except for a V-shaped cut-out at the bottom. The two inclined surfaces of the V-shaped cut-out are labelled on rib 15 as surfaces 17 and 18 terminate at an apex 19. The slope and position of these faces 17 and 18 (and the corresponding faces on rib 16) are such that they are just tangential to the shoulder 6 of the bottle when the cap is in the position, as can clearly be seen on Figures VII and VIII, particularly VIII. The cap also has an inwardly extending plug in the form of a short cylindrical wall 20 extending from and integral with the top surface 14. When the cap is on the bottle, this cylindrical plug fits inside the delivery aperture of the neck of the bottle as can be seen on Figure VII. Concentric with this cylindrical plug 20 is a second sealing member in the form of a cylindrical wall 21 of larger diameter than 20 and which itself carries an annular inwardly extending bead 22. When the cap is in position of the bottle, the bottle neck 7, or more precisely the annular flange 8 thereon, is gripped between the cylindrical plug 20 and the cylindrical wall 21 with bead 22 of the cap.

The mode of fitting the cap to the bottle is to approximately line-up the cap and bottle and then apply a simple downward push. If the bottle and cap are not exactly in mating position the downward push will cause the V-cut faces of the ribs 15 and 16 to press against the bottle shoulder 6 and the natural tendency will be for the cap ribs to ride down the slope of the shoulder to centralise the apex 19 above the major vertical sectional axis of symmetry. Thus the cap cannot be applied wrongly. The cap itself is made of a slightly elastic or deformable material such as plastics and the downward push will force the flange 8 on the bottle neck between the plug 20 and other wall 21. It will be gripped between them when the annular flange 22 rides down below the bottle neck flange 8, to the position as shown on Figure VII. Thus the cap will be locked on the bottle neck once the cap is in this position.

The liquid-tight seal will be formed between the various contacting surfaces of the bottle neck flange 8, (including the inner surface of the neck delivery aperture 13), and the outer cylindrical surface of the wall 20, the portion 23 of the top surface 14 sealing members 20 and 21, and the inner surface and bead of sealing member 21. The plug 20 can provide a wiping action of the bottle neck aperture 13 and provide a partial seal itself if it is a tight fit. A more complete seal can be effected by the cap bead 22 urging the top of the bottle neck flange 8 upwards against the surface 23 of 14 between the cylindrical walls 20 and 21 in tight abutment. Yet another seal can be provided by a circular edge be-

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105 40
110 45
115 50
120 between 55
125 60
130 65

ellipse



tween any of the inclined surfaces 9, 10, 11 and 12 on flange 8 biting into the plastics wall of 20 or 21 or the surface 23 of 14 between members 20 and 21 thereby producing line contact with consequent high pressure along it. Variations of this gripping and sealing action will be apparent to those skilled in the art. Other variations can be made such as the cylindrical wall 20 being chamfered or tapered on the outer edge near its lower extremity, in order to facilitate the flange 8 on the bottle neck passing it. Furthermore, the concentric cylindrically walled sealing member 21 may merge into the skirt or side wall 4 of the cap so that at the two point where a vertical section along the minor axis of the horizontal elliptical cross section cuts the skirt, the skirt wall 4 and sealing member 21 are in fact one common wall at this point. Many other sealing arrangements and snap-lock devices and variations are known in the container art which can be adapted to the cap and bottle of this invention and so the arrangement can simply be described as "a snap-lock liquid-tight sealing arrangement to close the aperture of the bottle neck".

When the cap is in position on the bottle, its removal is effected by simply gripping the cap lightly and turning it out of register with the bottle. This turning action will cause one of the surfaces 17 or 18 on the V-cut in rib 15 and an opposite surface in the V-cut in rib 16 to ride up the shoulder 6 of the bottle, and also the cap skirt 4 to ride up the shoulder 6. The net effect will be that the bottle shoulder acts as a cam lifting the cap upwards in a substantially spiral path for up to a quarter turn until the sealing bead 22 inside the cap is above the bottle neck flange 8, that is to say until the snap-lock is broken, after which the cap can simply be lifted off. If either a clockwise or anticlockwise moment is applied to the cap, the same cam like action will follow urging the cap upwards until the seal and grip between bead 22 and neck flange 8 is broken. The mechanical principle of the lifting action can be likened not only to that of a cam and follower in a machine, but also to that of a simple course pitch screw thread. The cam like operation lifting the cap in less than a quarter of a turn gives a considerable mechanical advantage over conventional screw on caps *et cetera* and facilitates the easy breaking of the snap-lock sealing arrangement referred to in the previous paragraph. No upward force need be applied to remove the cap, though if it is applied in addition to the turning moment it will obviously assist removal.

It will be appreciated that the exact shape of the ramped or bevelled shoulder 6 of the bottle can be varied somewhat, provided that it is still convex in cross section along the lines (DD) where the ribs contact it. Thus an alternative construction is that shown on Figure IX wherein the shoulder is concave along the line (AA) through the major axis. However,

when a moment is applied to the cap about a vertical axis through the bottle neck axis and cap centre, the effect will still be the same, namely that the V-cut-out in the ribs will ride up the convex shoulder causing the cap to be lifted upwards and off the bottle.

One obvious advantage of this type of removal is that the shape of the cap is such that it can be held easily in the hand even when wet or slippery.

Various other modifications can be made to the bottle neck and cap without departing from the inventive principle. Thus the elliptical plan shape of the bottle and cap illustrative above can be varied slightly making the plan view nearer to a rectangle. This is illustrated at Figure XI which shows the inside of a cap made to this modification in a similar view to that of Figure IV and showing the ribs 15 and 16, the now rectangular top surfaces 14 and the now rectangular skirt 4.

The V cut-out in the ribs 15 and 16 shown at Figure VIII could be slightly rounded to more closely follow the curvature of the convex surface of 6, provided that the same lifting action would be obtained. A compromise between such a rounded cut-out in the ribs and the V cut-out which is shown at Figure VII is to simply truncate the V and this modification is illustrated at Figure X, where the horizontal portion 26 merely cuts off apex 19 of the V. It will be observed that inclined surfaces 25 and 27 of the rib are substantially tangential to shoulder surface 6, but the surfaces need not actually touch, provided that when the cap is turned out of register the inclined surfaces do quickly come into contact with the bottle shoulder to give the cam like lift. Furthermore, although it is usually more efficient to have two such ribs 15 and 16, the principle could be applied when the cap had only one such rib.

In addition to the variations directly concerned with the inventive principle of this cap closure, variations can be made in the bottle itself and particularly in its shape. These variations may be in the artistic design of the bottle or they may be dictated by practical considerations; for example the bottle neck may have a transfer ring or gripping flange 24 as shown on Figure IX for use by automatic lifting machinery in the preparation of the bottles, but although such a transfer ring will be on the neck it will not interfere with the essential features of the construction for this invention.

WHAT WE CLAIM IS:—

1. A cap-sealed bottle wherein the bottle comprises a body, a shoulder portion and a neck, the shoulder portion commencing inwards from the top of the body thereby leaving a peripheral ledge at the uppermost boundary of the body, and wherein the shoulder portion and the upper region of the body immediately adjacent to the shoulder have half-turn sym-

tween any of the inclined surfaces 9, 10, 11 and 12 on flange 8 biting into the plastics wall of 20 or 21 or the surface 23 of 14 between members 20 and 21 thereby producing line contact with consequent high pressure along it. Variations of this gripping and sealing action will be apparent to those skilled in the art. Other variations can be made such as the cylindrical wall 20 being chamfered or tapered on the outer edge near its lower extremity, in order to facilitate the flange 8 on the bottle neck passing it. Furthermore, the concentric cylindrically walled sealing member 21 may merge into the skirt or side wall 4 of the cap so that at the two point where a vertical section along the minor axis of the horizontal elliptical cross section cuts the skirt, the skirt wall 4 and sealing member 21 are in fact one common wall at this point. Many other sealing arrangements and snap-lock devices and variations are known in the container art which can be adapted to the cap and bottle of this invention and so the arrangement can simply be described as "a snap-lock liquid-tight sealing arrangement to close the aperture of the bottle neck".

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metry about a vertical axis of the bottle such that their plan view is substantially elliptical or oblong the shoulder having a convex surface along any vertical plane parallel to the minor axis of the elliptical or oblong plan and extending upwards to merge into the neck of circular cross-section; and wherein the cap is made of resilient plastics material and comprises an inverted hollow cup-shaped member having a downwardly extending skirt the lower edge of which skirt conforms with the peripheral ledge on the body of the bottle, and snap-lock liquid-tight sealing arrangement internal of the skirt to close the aperture of the bottle neck, the cap having at least one internal rib which is adapted to ride up the convex surface of the bottle shoulder when the cap is turned out of register with the bottle and thereby to release the snap-lock seal and cap from the bottle.

2. A cap-sealed bottle according to claim 1 wherein the cap is provided with two internal ribs adapted to ride up the convex surface of the bottle shoulder one of said ribs being on each side of the central axis of the bottle neck.

3. A cap-sealed bottle according to either

claim 1 or 2 wherein the internal rib or ribs of the cap are substantially rectangular extending between the longer sides of the cap skirt and have a substantially V-shaped cut-out at their base adapted to ride up the convex bottle shoulder when the cap is turned out of register with the bottle. 30

4. A cap-sealed bottle according to claim 1 wherein the top of the body of the bottle, and the shoulder are elliptical in plan and the shoulder is substantially ellipsoidal in shape, the cap being provided with two internal ribs extending between the longer sides of the elliptically walled cap skirt one of the ribs being on each side of the central axis of the bottle neck and which ribs are substantially rectangular in shape with a substantially V-shaped cut-out at their base adapted to ride up the bottle shoulder when the cap is turned out of register with the bottle. 35 40 45

5. A capped bottle substantially as described in the foregoing specification with particular reference to the drawings. 50

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