ABSTRACT OF THE DISCLOSURE

A simplified dispensing closure cap construction having a tubular body through which the product passes, and having an orifice screw cap axially movable on the body between a raised dispensing position and a lowered seating position. The upper edge of the tubular body has a curved upper surface of helical inclination, engageable with a cooperating surface of sloped configuration in the cap, to provide for positive axial raising movement of the cap when it is turned in unscrewing direction.

BACKGROUND

This invention relates to dispensing screw-type closure caps wherein a stationary body holds captive a screw cap which has the discharge orifice.

In some prior closure caps of the type referred to, the axial movement of the screw cap as the latter is turned is effected solely by screw threads. Where the cap is of yieldable plastic and is used with a glue product or the like, it is not uncommon for the threads to strip part each other and fail in their function and for the glue to collect and harden in pockets, clogging the passages and rendering the cap and dispenser useless.

Other closure caps utilize a supplemental inclined or helical track surface at the base of the body, which is cooperable with lugs on the cap to effect a forceful axial or raising movement as the cap is turned. This, while effective, obtains the desired result at the expense of an increase in diameter of the screw cap and body.

SUMMARY

The present invention obviates the above disadvantages, and objects of the invention are to provide a novel and improved, especially simple, dispensing screw-type captive closure cap construction wherein interior, product-collecting pockets are largely eliminated, wherein a wiper and displacement action removes residual product which might harden and later cause difficulty, and wherein a positive raising movement of the cap is had. In response to its being turned in the unscrewing direction, all without requiring an enabling increase in the cap diameter. This is accomplished by forming the top edge of the tubular body portion itself with at least one and preferably two upper surfaces of helical inclination, and by forming, inside the top of the screw cap, cooperate surfaces which are engageable with the surfaces of helical inclination to force the cap axially upward when it is unscrewed, and to wipe clean the helical surface and displace the product therefrom, and from adjoining areas. Since the helical surfaces take the place of the prior circular unbroken top edge, no increase in the diameter of the cap is required.

Other objects and advantages are to provide an improved cap construction as above, wherein the surfaces of helical inclination and stop members are especially adapted to facilitate drainage of product into the container after each use, wherein improved movement limiting stops are provided to fix the extent of turning of the cap, wherein the limiting stops are arranged to minimize difficulty when a push-on type of assembly of the cap to the body is utilized, wherein effective sealing means are had between the cap and the body, wherein means are provided to trap a small quantity of the product for lubricant purposes wherein the product has such characteristic, wherein a yieldable locking of the cap to the body is effected for the closed position of the cap, and wherein the construction involves a minimum number of plastic parts which can be easily molded.

Other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is an axial sectional view through a dispensing cap construction as provided by the invention. The screw cap part is shown lowered and in the closed position.

FIG. 2 is a view like that of FIG. 1, but showing the screw cap part in the raised, dispensing position.

FIG. 3 is a top plan view of the cap construction of FIGS. 1 and 2.

FIG. 4 is a fragmentary view, partly in side elevation and partly in vertical section, showing the upper portion of the body part of the cap construction.

FIG. 5 is a view like that of FIG. 4, taken at right angles to the plane of the FIG. 4 view.

FIG. 6 is a top plan view of the body part shown in FIGS. 4 and 5.

FIG. 7 is a fragmentary vertical sectional view taken on the line no. 7—7 of FIG. 1.

FIG. 8 is an axial sectional view through a dispensing cap construction, illustrating another embodiment of the invention.

FIG. 9 is a top plan view of the body part of the cap construction of FIG. 8.

FIG. 10 is a side elevational view of the body part shown in FIGS. 8 and 9.

The improved cap construction as provided by the invention comprises a tubular body part 10 having a base portion 12, a lower tubular portion 14 and an upper tubular portion 16 of slightly smaller diameter than the lower portion 14. The body part 10 may constitute an integral permanent portion of the top of a container. Or, it may comprise a screw cap (or other type cap) which is constituted as a separate piece, and is attached to the container either permanently or temporarily. The base portion 12 may be thought of as the top wall of the screw cap, for example. The tubular portion 14 has one or more external screw threads 18, which are engageable with cooperating internal screw threads 20 of a cap part 22 having generally the shape of an inverted cup.

The cap part 22 is axially movable on the body 10 in response to its being turned, this being effected by the cooperating screw threads 18, 20 as will be understood. In its top wall 24 the cap 22 has a discharge orifice 26, and the body 10 carries a cooperable stopper member comprising a closure pin 28 which is adapted to close and seal the orifice 26 as illustrated in FIG. 1. When the cap 22 is in the raised, dispensing position the pin 28 is out of the orifice 26 whereby the latter may discharge product which is being forced upward through the tubular body 10.
It will be noted that the cap 22 is not greatly larger in diameter than the body portions 14, 16, the difference being due to the cooperative screw threads 18, 20 and to the thickness of the cap construction. The cap construction can be held to a relatively small figure which is determined in large part by the required diameter of the bore 30 of the body, through which the product is forced.

In accordance with the present invention, positive-acting cap means is provided to assure upward axial movement of the cap 22 when it is turned in the unscrewing direction, even though considerable restraint is placed on the cap against such movement, as by a viscous product, a glue-type product or the like, and even though such product may have hardened on the interior surfaces of the cap construction. The means do not require any increase in the outside diameter of the cap construction whatsoever, yet are extremely effective in causing the cap part 22 to move axially upward when it is unscrewed.

In accomplishing this, the upper tubular portion 16 of the body 10 is provided on its upper edge with at least one curved, inclined upper surface 34, and preferably, as shown in the figures, with two such surfaces 34. The surfaces 34 have a generally helical inclination, and this term is used herein in a non-restrictive sense, being intended to denote any slope, curvature or inclination of the surfaces 34 of screw-like nature. For cooperation with the upper edge surfaces 34 of the body 10, the cap part 22 has in its upper portion at least one downward-facing surface 36, and preferably two such surfaces 36 which are respectively engageable with the inclined surfaces 34.

Preferably, the surfaces 34 have a pitch which is equal to that of the cooperative screw threads 18, 20, of the body and cap, and the surfaces 36 of the cap ride on the inclined surfaces 34 as the cap is guided by the screw threads 18, 20, during the unscrewing operation. The downward-facing surfaces 36 of the cap are preferably the bottom surfaces of inwardly disposed, vertically extending lugs 38 in the cap, said lugs having sloping side faces or bevels 40 as seen in FIG. 7. As seen in FIG. 1, the downwardly facing surfaces 36 of the lugs 38 are in the nature of undercuts when viewing the lugs 38 from the inside out as in FIG. 7. The surfaces 36 may be considered as following a helical curve corresponding to the curve set out by the surfaces 34 of the body 10. If the surfaces 34 are sloped transversely, whereby their highest portions are located radially outermost. This is clearly seen in FIGS. 4 and 5, and such configuration of the surfaces 34 enables a close fit to be had with the undersurfaces 36 of the lugs 38 which, as already mentioned, may be considered as giving the lugs an undercut configuration. The transverse slope of the inclined surfaces 34 provides a distinct advantage in that it tends to facilitate drainback of the product into the container after each use. In connection with such drainback, the stopper means comprises the pin 28 carried by the body 10 and supported by a pair of diametrically opposite support webs 42 having bottom edges 44 which are located above the level of the lowermost portions of the tracks or inclined surfaces 34. This is clearly seen in FIGS. 1, 2, 4 and 5. In consequence there is no likelihood of pockets being formed by the support webs 42 in conjunction with the inclined surfaces 34, and this is an important feature of the invention.

Referring to FIG. 1, it will be seen that the lugs 38 are resting at the lower ends of the inclined tracks 34. As the screw cap 22 is turned in the unscrewing direction, the lugs 38 will traverse the tracks 34 through a total path of slightly less than 180°, forcing the cap 22 up relative to the stop 36, and overcomes any tendency for hardened product, glue or the like, to cause malfunction of the cap construction. Additionally, the movement of the lugs 38 along the tracks 34 is characterized by a wiping action, whereby the tracks are wiped clean and the product which is wiped off is either discharged from the orifice 26 or returned to the container. A similar but reverse operation occurs when the cap 22 is screwed down to the stopped position of FIG. 1 from the dispensing position of FIG. 2.

Additionally, an important feature of the invention involves the displacing action which occurs when the side faces 46 of the stop lugs 38 engage the cooperating body portion 62 of the stop lugs 58. With such engagement the product is squeezed or displaced from the stop lugs and into the bore 30 of the body 14, to return to the container. The collecting of product in pockets inside of the cap structure is thus largely eliminated, and this is an extremely important consideration where the product is glue or other substance having a tendency to harden and stick.

Also, in accordance with the invention, the cap 22 has an inner cylindrical surface 46 which is continually in sealing engagement with the outer cylindrical surface 48 of the body portion 16, thereby preventing product from passing into the lower portions of the cap construction and contaminating the screw threads 18, 20. The cap 22 optionally may be provided with a small sealing bead 50 at the bottom edge of the cylindrical portion 46, if it is desired that a very small amount of the product should be trapped within a cap construction. This is of advantage where the product is of a creeping or lubricating nature. The cap 22 also has an annular sealing surface 52 which is cooperative with a sealing bead 54 of the body for the closed position of the cap construction as shown in FIG. 1. An additional bead 56 is provided at the bottom of the sealing surface 52, for cooperation with the bead 54 of the body, to releasably lock or detain the cap 22 in the closed position of FIG. 1.

The yieldability of the molded plastic body 10 and cap 22 play a part in the functioning of the beads 50, 54 and 56 as will be understood, this being also true of the sealing engagement between the pin 28 and orifice 26. In accordance with the invention, the lugs 38 are adapted to function as positive, failure-resistant stops which limit the downward turning movement of the cap 22 and also the upward turning movement of the cap. In effecting this, the invention provides cooperative stop shoulders or lugs 58 on the inner edge of the body portion 16, which are engageable respectively with the lugs 38 in the cap. The stop lugs 58 are disposed at the junctures of the high and low portions of the tracks 34, as clearly seen in FIGS. 4 and 5, and thus are adapted to engage the lugs 38 for both the lowered and the raised positions of the cap 22 as shown. For the raised position of the cap 22, side surfaces 60 of the lugs or shoulders 58 are engaged by the side surfaces 40 on the lugs 38. For the lower position of the cap 22, side surfaces 62 of the shoulders 58 are engaged with side surfaces 40 of the lugs 38. Such construction provides a positive stop means which is resistant to a considerable extent to failure even if appreciable force is applied to the cap 22 in the screwing or unscrewing directions.

Due to the yieldability and rounded shapes of the cooperative thread elements 18, 20 the cap 22 may be assembled to the body 10 by a "push-on" operation wherein the cap is merely axially forced over the body portion 16, 14. In order to minimize any difficulty in such assembly, in the case where the lugs 38 may by chance be aligned with the lugs 58, the latter are provided with sloping top surfaces 64 which can cooperate with the sloped downwardly facing surfaces 36 of the cap 22 to cause the cap 22 to be pushed downward. Accordingly, for all possible starting positions of the cap 22, a push-on assembly will result in the cap being forcibly turned and brought into the lowest sealing position of FIG. 1.

Another embodiment of the invention is illustrated in FIGS. 8, 9 and 10, wherein the outer screw cap part has
a total turning movement of slightly less than 360° as compared with the 180° movement of the previous embodiment.

As shown, there is a tubular body part 68 having a single helical top edge 70 characterized by lower and higher end portions 72, 74 respectively which are separated by an upwardly stop lug 76. The tubular body part 68 has radial ribs 78 supporting a closure pin 80 which is cooperable with the top orifice portion 82 of an outer screw cap part 84. The screw cap 84 has a single internal stop lug 86 adapted to ride on the helical top edge 70 of the tubular body 68, said stop lug 86 being engageable with either one side or the other of the stop lug 76 of the tubular body 68.

In essentially all other respects, the cap construction of FIGS. 8–10 is similar to that already described in connection with the embodiment of FIGS. 1–7, and accordingly further description is not given herein. Essentially the main difference between the embodiment of FIGS. 8–10 and the preceding embodiment consists in the greater turning movement of the screw cap 84, as compared with the screw cap 22. Whereas the screw cap 22 has a turning movement of slightly less than 180°, the screw cap 84 has a total turning movement of slightly less than 360°.

It will now be understood from the foregoing that I have provided a novel and improved plastic cap construction of the captive closure-type, wherein a positive raising movement of the cap results from its being unscrewed even though the cooperating screw thread means are of a nature to permit easy stripping of the threads in the event of restraint being imposed. The positive raising movement of the cap is had without involving any additional diametrical size, and the means providing raising movement is additionally utilized to provide positive stops for limiting the unscrewing movement of the cap. Effective sealing surfaces are provided between the cap and body, as well as an impactive lock for holding the cap releaseably in the sealing position. Means are provided to minimize difficulty where a push-on assembly of the cap is utilized, and the construction is adapted to involve a minimum number of parts, each of which may be easily and readily molded of suitable plastic substance. Accordingly, the cost of the closure construction is held to a low figure while at the same time distinct advantages are had as enumerated above.

With the present construction it is possible to achieve a relatively large diameter of passage for the product, while at the same time maintaining the smallest outside diameter. A small outside diameter is advantageous because it can adapt to the smallest possible base. Variations and modifications may be made within the scope of the claims, and portions of the improvement may be used without others.

I claim:
1. A dispensing closure cap construction comprising, in combination:
(a) an upright tubular body adapted to be carried on a container, the bore of said body constituting a discharge passage for product to be dispensed from the container,
(b) a cap axially movable on said body and surrounding the same,
(c) said cap having in its top portion a discharge orifice,
(d) cooperative stopper means on said tubular body and cap, said stopper means being closed to prevent flow of product from the cap when the latter is in a lower position on the body, said means being open when the cap is in a raised position, wherein the improvement comprises:
(e) the upper edge of the body comprising a curved upper surface having a helical inclination,
(f) said cap having in its upper portion a downwardly facing surface cooperative with the inclined surface of the body to shift the cap from the lower to the raised position in response to its being turned, thereby to open the stopper means.
2. A cap construction as in claim 1, wherein:
(a) the tubular body has an exterior cylindrical surface,
(b) said cap having an interior cylindrical surface engaged at all times with the cylindrical surface of the body whereby a continual seal is had at all times between the body and cap.
3. A cap construction as in claim 2, wherein:
(a) the interior cylindrical surface of the cap has a small annular bead engaged with the exterior cylindrical surface of the body.
4. A cap construction as in claim 2, wherein:
(a) the body has an exterior annular bead,
(b) said cap having an interior annular groove adapted to receive said bead of the body when the cap is in said lower position, to releasably lock the cap therein.
5. A cap construction as in claim 2, wherein:
(a) the body has an exterior annular bead below its exterior cylindrical surface,
(b) said cap having an annular interior sealing surface engaged with said bead when the cap is in said lower position to effect an additional seal between the body and cap.
6. A cap construction as in claim 1, wherein:
(a) cooperative screw threaded means are provided on the body and cap, having the same pitch as the inclined surface of the body, said screw means effecting upward and downward axial movement of the cap in response to its being turned respectively in opposite directions,
(b) said inclined surface of the body and cooperative surface of the cap constituting a positive axial drive which prevents stripping of the thread means when the cap experiences restraint against raising movement as it is being turned.
7. A cap construction as in claim 1, wherein:
(a) the inclined surface of the body and cooperative surface of the cap are sloped transversely and have their highest portions located radially outwardly.
8. A cap construction as in claim 1, wherein:
(a) the cap has stop shoulders and the body has cooperative stop shoulders at the ends of its inclined surface,
(b) said shoulders limiting turning of the cap in one direction.
9. A cap construction as in claim 8, wherein:
(a) the stop shoulders of the body have sloped top surfaces of helical inclination similar to the helical inclination of the upper edge of the body,
(b) the stop shoulders of the cap having sloped lower surfaces of similar helical inclination whereby engagement of said top and lower surfaces during a push-on assembly of the cap to the body will tend to turn the cap so as to effect disengagement between said surfaces of the shoulders.
10. A cap construction as in claim 1, wherein:
(a) the cap has stop shoulders and the body has cooperative stop shoulders at the ends of its inclined surface,
(b) said shoulders limiting both clockwise and counterclockwise turning of the cap.
11. A cap construction as in claim 1, wherein:
(a) the body has a pair of said inclined surfaces located in diametrically opposite locations, and the cap has a pair of cooperative surfaces respectively engaging said inclined surfaces.
12. A cap construction as in claim 11, wherein:
(a) the body has stop shoulders at the ends of the inclined surfaces, and the cap has shoulders engageable respectively with said stop shoulders to limit turning of the cap in at least one direction,
(b) said cooperative stopper means comprising a pin carried by and disposed centrally in the body, and
7 (c) support webs for the pin, extending outward therefrom in opposite directions and connecting with the interior of said stop shoulders of the body.

13. A cap construction as in claim 12, wherein:
(a) the lowest portions of the inclined surfaces of the body are closely adjacent, and at a lower level than, the bottom edges of the support webs to facilitate drainback of product from said surfaces.

<table>
<thead>
<tr>
<th>References Cited</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STATES PATENTS</td>
</tr>
<tr>
<td>2,769,582 11/1956 Schlicksupp ------ 222—521 X</td>
</tr>
<tr>
<td>3,059,821 10/1962 Kubiliunas ----------- 222—521</td>
</tr>
</tbody>
</table>

STANLEY H. TOLLBERG, Primary Examiner.