

SELF-CENTERING CONTAINER CLOSURE

The present invention relates to a self-centering container
5 closure particularly of the type adapted for utilisation with
a gaseous liquid.

Container closures moulded in one piece from a plastics
material are well known in the art. One such is disclosed in
10 our earlier European Patent No. 0136088 which relates to a
container closure moulded in one piece from a plastics
material and comprising a top (or crown), a dependent skirt
the radially inner surface of which is formed with screw
thread, a surface which is flared in a direction away from the
15 top being formed on the internal surface of the skirt where
it joins the top, and an annular resilient flexible fin
extending downwardly and outwardly from the underside of the
top at a position spaced regularly inwardly in said flared
surface and having a length such as to permit at least its
20 portion adjoining its free edge to lie against said flared
surface when the fin is deformed outwardly by the rim of the
neck of a container to which the closure is to be applied.

Whereas closures of this type work satisfactorily but there
25 remains the problem of centralising the cap on the container
in a really reliable way and of preventing "cocking" which is
occasioned during capping. During capping it is difficult to
ensure that the plane of the crown becomes perpendicular to
the axis of the container neck prior to rotation. This is not
30 always possible during high speed capping and accordingly a
problem arises when the caps are screwed rapidly onto the
container necks. Whereas a certain tolerance in the screw-
thread portions can allow a degree of "cocking" to be
corrected during capping, it is relatively easy to destroy the
35 closures during the capping procedure due to this defect.

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Container closures including downwardly depending internal bore seals are also known in the art. The purpose of these arrangements is to enable a cap to be rapidly screwed onto a container neck such that the rim of a container neck seals
5 against the underside of the crown, whereas the internal bore of the container neck is in sealing contact with the bore seal annulus.

10 In a full bottle of a carbonated beverage as the temperature rises, gas tends to come out of solution and to increase the gas pressure in the container. This tends to force the underside of the crown of container closure upwardly thereby overcoming the lateral pressure exerted on the inner face of the prior art bore seals and thereby allows a fluid path to
15 open up between the outer face of the bore seal and the inner face of the container neck towards the rim. Simultaneously a doming effect impairs the seal between the underside of the crown and the rim of the container neck. Accordingly gaseous escape paths are generated and gas escapes from the container.
20 The consumer can therefore be left with a "flat" contents. This effect is accentuated if scratches are present on the rim of the container neck because these also tend to allow gas to escape. This is an especial problem with recycled containers.

25 The present invention has as its object the alleviation of these problems by providing closures of the foregoing general type provided with means for self-centering during capping and means for alleviating the problem of cocking.

30 In a further aspect of the present invention, the invention also provides means for reducing the incidence of doming. The arrangement of the invention can also reduce the possibility of successful tampering because the closure is retained substantially coaxial in the container neck.

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The invention is characterised by a continuous or discontinuous locator annulus depending downwardly from the



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under surface of the crown and disposed radially inwardly of the fin annulus, the locator annulus extending downwardly by a distance greater than that of the fin and having an outer diameter just smaller than the inner diameter of the container neck with which it is to be used. The distance may be up to 100% longer than the corresponding distance from the underside of the crown to the fin.

The fin may be bulbous at its remote end and may be provided with a neck contact surface inclined inwardly and upwardly towards the crown for contact in use with the outer rim of the container neck. Preferably the central point of an articulation portion of the fin is located along a line parallel to the axis of the closure and within the outer one half of the diameter of the container neck with which the closure is to be used. In a preferred embodiment, the central point of the articulation portion is within the outer one third or even one quarter of the diameter of the container neck.

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The articulation portion may have a radial thickness greater than one quarter of the radial thickness of the bulbous fin. This means that when the closure has been centered on the neck by operation of the locator annulus, the inclined surface of the bulbous fin contacts the outer rim of the container neck and, since the closure is rotating and since the bulbous fin is a relatively strong annulus, the inclined surface thereof tends to further ensure centering of the closure prior to and during deformation. By this means, "cocking" is alleviated since contact under rotation tends to locate the closure in its correct orientation perpendicular to the axis of the closure.

The angle of the inclined plane of the bulbous fin is preferably between about 35° and 55° and most preferably about 45° relative to the axis of the container closure.

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- The remote end of the locator annulus may be chamfered or the radially outer remote end thereof may be inwardly and downwardly inclined so as to present an outwardly and upwardly inclined surface to the inner rim of the container neck.
- 5 Preferably the upper end of the inclined plane of the locator annulus terminates at or adjacent a notional plane horizontal to the axis of the closure which is also generally coincident with the lower end of the inclined contact surface of the bulbous fin. Thus, the two mutually opposed inclined planes
- 10 respectively of the bulbous fin and the locator annulus operate sequentially upon a container rim. The angle of the inclined plane of the locator annulus is preferably 25° to 35° relative to the axis of the container closure.
- 15 It will also be appreciated that the positioning of the locator annulus radially inwardly of the fin has the effect of strengthening the crown against "doming". Thus a combination of the fin (preferably bulbous) and the locator annulus is particularly effective in resisting doming and its
- 20 effects on the seal achievable by the fin outboard thereof. The closures of this type are most preferably made by injection moulding.
- The invention will now be described, by way of illustration
- 25 only with reference to the accompanying drawings which show in Figures 1 and 2 fragmentary elevations illustrating the closures in accordance with the present invention prior to, and on application.
- 30 The closure 10 is moulded in one piece from a resilient plastics material and has a top (crown) 11 and a dependent skirt 12 formed with an internal screw thread 13 and external knurling 14. A corner region 15 at the upper end of the skirt is thickened and has a conically flared internal surface 16
- 35 extending at an angle of about 30° from the axis of the closure 10. Spaced radially inwardly of the surface 16 is a resilient bulbous fin 18 which extends from an articulation



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point 26 on the under side of the top 11. The bulbous fin 18 thus depends downwardly from the articulation point 26. The radially inner surface 27 extends generally parallel to the plane of the skirt 12 whereas the radially outer portion 28 of the bulbous fin is curved generally radially outwardly and downwardly to define at its remote end an outer sealing portion 19. The outer sealing portion is conjoined to the inner radially inner surface 27 by means of an inclined plane 25 having an angle of about 45°.

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Closures of this type may be produced, preferably by injection moulding, with or without a tamper evident band. Preferably the skirt terminates in a plurality of frangible bridges 34 supporting a tamper evident band 35 for cooperation with a plain security band 36 on the outer neck portion of a container neck 20 in the usual way.

In use, the container closure 10 is applied to a neck 20 of a container so that the rim 21 of the container neck moves upwardly as in Figure 1 to adopt the position shown in Figure 2. As it does so, the inclined plane 25 of the bulbous fin 18 comes into contact with the outer rim portion 22 of the container neck 20 while the closure 10 is being rotated during the capping operation. This has the subsequent effect of assisting in a centering action such that the axis of the container closure and the container neck become coaxial with more certainty. Further rotation of the container closure 10 relative to the container neck 20 causes the container neck to move upwardly relative to the container closure to adopt the position shown in Figure 2. It will be noted in that the articulation of point 26 is disposed approximately one third of the radial distance between the inner and outer surface of the container neck such that the bulbous fin 18 is deformed radially outwardly to seal between the inclined surface 25 and conically flared internal surface 16. At the same time, because of this radial displacement, there is a pivotal force applied to the internal surface of the crown closure which

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tends to resist doming in conjunction with the locator annulus 30 referred to below.

Arrangements of the foregoing type are used with the main
5 feature of the invention shown in Figures 1 and 2, i.e. the
locator annulus 30. Disposed radially inwardly of the bulbous
fin 18, the locator annulus 30 has a external diameter 32
which is just smaller than the inner diameter of the internal
surface 29 of the container neck. The locator annulus 30 is
10 provided therefore with a radially inner face 31, a radially
outer face 32, said radially outer face 32 culminating towards
its remote end in an annular inclined plane 33 which extends
upwardly and outwardly towards the inner face of the container
neck 29.

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In use during the capping procedure, the inner rim portion 23
which is radiused comes into contact with the inclined plane
of the locator annulus 33 which has the effect of centering
the container closure on the container neck. As the cap is
20 rotated, there is relative movement between the container neck
20 and the closure 10 such that it adopts the position shown
in Figure 2. Because the locator annulus is not intended as
a seal but essentially and primarily as a locator means, the
sealing effect is to be found between the outer rim portion
25 22 and the bulbous fin 18. The effect of this is that because
the closure 10 is correctly orientated relative to the
container neck 20 the problems of "cocking" and centering are
correctly addressed.

30 Further and probably as importantly, because the locator
annulus is disposed in-board of the bulbous fin, it tends to
strengthen the central portions of the crown 11. This resists
doming.

35 The locator annulus 30 has the further effect of retaining the
closure coaxially upon the container neck thus resisting
tampering.

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It will thus be seen that during application of the closure 10 to the container neck 20, the rim of the container 21 first comes into contact with the inclined surface 33 of the locator annulus 30 prior to any contact of the bulbous fin 18. This
5 tends to center and directly orientate the closure relative to the container neck. Subsequently the outer rim portion 22 of the container neck 20 comes into contact with the inclined plane 25 which has a further centering and anti-cocking action as a primary factor with the secondary effect of causing the
10 bulbous fin 18 to articulate at the point 26 as such that the surface 28 comes into contact with the conically flared internal surface 16 thereby causing effective sealing.

It will also be appreciated that by virtue of the relative
15 thickness of the bulbous fin 18 taken with the effects of the locator annulus, a more effective seal is provided than previously. The locator annulus also tends to absorb all lateral forces of application generated by the combination of the application of force and the helical angle of the
20 container/closure threads. This ensures that none of these forces impinge upon the bulbous fin 18 such that the same is inconsistently engaged with the container.

The locator annulus and the stiffness of the closure crown
25 together have the effect that any doming of the crown under pressure will only take place within the circumference of the locator annulus 30. This has two effects. In the first place it reduces the effects of doming upon the bulbous fin 18 thus ensuring that the fin does not get pulled out of sealing
30 engagement with the container during cases of extreme doming. Further the locator ring acts as a stiffening rib which resists and reduces the degree of doming exerted by the internal force. This tends to reduce storage problems when the containers are stacked.

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This invention is particularly desirable when applying a closure to returnable containers where there is a risk of

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possible damage to the outside corner/surface of the container which might provide a leakage path past the bulbous fin seal in high temperature storage conditions where doming can be expected.

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The inventive closures are preferably made by injection moulding of high density polyethylene plastics materials. The locator annulus is intended to have no sealing properties and hence needs to be used in conjunction with a primary seal for
10 example as hereinbefore set forth.

The invention provides therefore a closure as hereinbefore set forth and an assembly thereof with container closure.



CLAIMS:

1. A container closure moulded in one piece from a plastics material and comprising a crown 11, a dependent skirt 12, the
5 radially inner surface of which is formed with a screw thread 13, a surface 16 which is flared in a direction away from the top being formed on the internal surface of the skirt where it joins the crown and an annular resilient fin 18 extending downwardly and outwardly from an articulation position 26 on
10 the underside of the top at position spaced radially inward of said flared surface having a length such as to permit at least its portion adjoining its free edge to lie against the flared surface 16, wherein the fin is deformed outwardly by the top of the neck of the container to which the closure is
15 to be applied,
characterised by a continuous or discontinuous locator annulus 30 depending downwardly from the undersurface of the crown 11 and disposed radially inwardly of the fin 18, the locator annulus extending downwardly by a distance greater than the
20 fin 18 and having an outer diameter just smaller than that of the inner diameter of the container neck 20 with which it is to be used.
2. A container closure as claimed in claim 1 characterised
25 in that the fin 18 is bulbous at its remote end and is provided with a rim contact surface 25 inclined inwardly and upwardly toward the crown for contact in use with the outer rim 22 of the container neck 20, and wherein the fin is bulbous and the central point of articulation 26 of the
30 bulbous fin 18 is located along a line parallel to the axis to the closure and within the outer one half of the diameter of the container neck 20 with which it is to be used.
3. A container according to either preceding claim wherein
35 the central point of articulation 26 is located within the outer one third of the container neck diameter.





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4. A closure according to any preceding claim wherein the articulation portion has a radial thickness greater than one quarter of the radially thickness of the bulbous portion of a fin 18.

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5. A closure according to any preceding claim wherein the inclined surface of the bulbous fin at an angle to the axis of the closure of 35° to 55°.

10 6. A closure according to any of claims 1 to 5 wherein the distance between the underside of the crown and the remote end of the locator annulus 30 is up to 100% longer than the distance between the underside of the crown and the remote tip 19 of the fin 18.

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7. A closure according to any of claims 1 to 6 wherein the remote end of the locator annulus 30 terminates in an outwardly and upwardly inclined portion 33 to present an outwardly and upwardly inclined surface to the inner rim 23
20 of the container neck 20 during capping.

8. A closure according to claim 7 wherein the upper end of the inclined portion of the locator annulus terminates at or adjacent a notional plane horizontal to the axis of the
25 closure which plane is below or coincident with, the free end 19 of the bulbous fin 18.

9. A closure according to claim 8 wherein the mutually opposed inclined planes respectively of the locator annulus
30 33 and the bulbous fin 25 are adapted to operate sequentially on opposite sides of the rim 21 during capping.

10. A closure according to any of claims 1 to 9 wherein the angle of the inclined plane 33 of the locator annulus 30 is
35 25° to 35° relative to the axis of the closure.

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11. A closure according to any preceding claim wherein the skirt portion terminates in a plurality of frangible bridges supporting a tamper evident band for cooperation with a plain security band on the outer neck portion of the container.

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12. A closure according to any preceding claim made by injection or compression moulding.

13. An assembly of a container having a screw threaded neck
10 and a closure according to any one of the preceding claims.

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