ABSRTACT OF THE DISCLOSURE

A skirted cap in tightenable relationship with the mouth-area of a bottle, operates upon being tightened to compress a fitment located between the cap and mouth area, and having perimetral inner and outer sealing flanges, downwardly and outwardly respectively said flanges tending toward distortion against said mouth-area during the tightening operation.

The present invention comprises a novel means for locking a cap to a container so as to render the same tamper-proof in respect to substances from which children should be safeguarded, this specification being a continuation-in-part of United States patent application Ser. No. 423,992 filed on the 7th day of January 1965.

It is a particular object of the present invention to provide a novel tamper-proof container or vial which will be saleable at a commercially acceptable price, which will provide an outstandingly positive locking action over a long period of use, which will be capable of completely sealing liquids as well as solids, which will permit, under sufficiently high pressure, as for example due to heat, the escape of gases, which includes means whereby the novel spring-biasing and sealing fitment cannot be deformed due to excessively heavy-handed treatment, in which the aforesaid fitment may readily be attached and detached, and particularly may be applied under surgical or sterile conditions to the mouth of the container prior to the attachment of the enclosing cap, and in which the fitment can if desired be permanently and rotatably secured to the cap in a variety of different ways, it being understood that the present cap is nevertheless perfectly easy for an adult to unlock, and this inconspicuously without the child being able to see how it is done until such child has reached an age when it is no longer necessary to safeguard from it the substances which the present container is intended to enclose.

With the foregoing considerations in view, and such other objects, purposes or advantages as may become apparent from consideration of this disclosure and specification, the present invention consists of the inventive concept embodied in the method, process, construction, arrangement of parts, or new use of any of the foregoing, as herein particularly exemplified in one or more specific embodiments of such concept, reference being had to the accompanying figures in which:

FIGURE 1 is a fragmentary elevation, predominantly in cross-section showing an enlargement of the presently preferred embodiment of the present inventive concept.

FIGURE 2 is a perspective detail depicting one of the receptacle elements and one of the externally off-set upwardly projecting abutments associated therewith for the purpose indicated.

FIGURE 3 is a predominantly cross-sectional elevation of an alternative form of the present inventive concept.

FIGURE 4 is a section on the line 4-4 of FIGURE 3.

FIGURE 5 is a section on the line 5-5 of FIGURE 3.

It being understood that FIGURES 4 and 5 apply substantially equally to the embodiment of FIGURE 1.

FIGURE 6 is a fragmentary detail in cross-sectional elevation of a second alternative form of attachment of a fitment to a cap and a modified cap centre-portion.

In the drawings like characters of reference designate similar parts in the several figures.

The inventor is aware of the spring member for tamper-proof vials according to U.S. Patent No. 3,072,276 issued to A. Nichols and dated Jan. 8, 1963. He is also aware of such means of preventing a cap from becoming inadvertently unscrewed from a container such as that disclosed in U.S. Patent No. 1,514,337 to Rappenecker dated Nov. 24, 1924, and also Italian Patent No. 495,545 issued to Padova in 1954.

The present invention however embodies features believed to be distinctly novel over the teachings aforesaid. Proceeding therefore initially to summarize the invention conceptually with reference to the embodiments thereof depicted it will initially be understood that the inventor claims no novelty for the vessel or outer cap by which is meant, and by which is only meant, the type of locking means consisting essentially of projecting elements and receptive elements each of which latter have a spiral profile and a cap retention recess, such as shown in the above patent to Nichols.

Continuing to summarize therefore the invention is characterized by the combination with a rotatably lockable and downwardly tightenable cap such as the aforesaid, of a circular resilient fitment collectively designated A bearable against the underside of cap B, the fitment including an outer annular region D which inclines circumferentially outwardly and downwardly away from the cover portion E of cap B, an inner sealing flange F on the underside of fitment A near its perimeter, projectable into and bearable against the mouth G (which may be chamfered as depicted or otherwise) of vessel H, and an outer sealing flange J bearable against the edge K of the vessel mouth, such outer flange being formed of the perimetal ring of material of fitment A which surrounds inner flange F, the relative conformation of the inner flange F and mouth G being such that the outer annular region D is of shallow domed conformation at least when the inner flange has entered mouth G and is under pressure thereagainst.

In particular reference to the last preceding passage, it will be noted that the whole fitment A is shown to be of shallow domed configuration, and that the region D is shown to be so even although not under stress. The inventor prefers that the fitment should be of the configuration depicted. On the other hand, the region D might be of shallow frusto-conical configuration, in other words "flat sloping and annular." However, to be of any resilient value, such flat slope would have to yield into domed configuration when the flange F comes up against mouth G. Accordingly the relative conformation of the outer surface of inner flange F and mouth of the container should be such that the region D, if frusto-conical, is caused to assume a yieldable, spring-biasing, in otherwise domed, configuration. This of course means that either the outer surface of F must be curved as shown or else, if vertical, the mouth G must be chamfered. One or other condition is sufficient to achieve the desired end—which however, it is repeated, is best achieved by prefabricating into a domed configuration (and preferably again wholly domed configuration) all as shown.

Having summarized some but not all of the novel features of the present invention, a detailed description follows in which numerals may indifferently be substituted for the foregoing letters.
Cap B comprises the aforesaid cover portion, and a surrounding skirt portion 50. In the vicinity of the lower edge 51, and projecting inwardly therefrom, are spaced projecting elements 52 of rectangular configuration, for preference, though without materially of such configuration. An enlarged circular and shallow recess or well 53 is formed on the underside 54 of cover portion E.

At intervals, and projecting outwardly, from the upper edge (or mouth) of vessel H are receptive elements collectively designated 55 of the configuration clearly depicted on FIGURES 1 and 2 and including the sloping under-profile 56, and cap retention recesses 57 into which the elements 52 are caused to snap (upwardly) upon the cap being rotated clockwise after it has been lowered from the position of FIGURE 1 so that the skirt surrounds the mouth G of the vessel H and the outer flange J is resting on K.

Fitament A is provided with the upwardly projecting concentrically disposed element collectively designated 58, the recess 53 and the element 58 constituting recipient means for connecting fitament A and cap B together.

Element 58 is provided with the outwardly projecting ring and an annular undercut therebeneath as a result of which the same is capable of engaging and entering the complementary annular undercut configuration 60 constituting the wall of the well 53.

Upon the underside of outer flange J, a bead 61 projects, and the same may be half round, V shaped or of any other desired configuration. It is intended to be accommodated within the annular complementary recess 62 formed upon the vessel mouth-edge K.

A further novel feature of the present invention resides in the abutments 63, such abutments constituting conterminous and upwardly projecting features externally offset from the external surface 64 of vessel H.

In view of the foregoing, a contemplation of the accompanying FIGURES 1 and 2 will indicate that when the cap B is lowered, the outer and preferably inwardly slightly curving annular surface 65 of inner flange F and the lower corner of outer flange J will come to rest substantially simultaneously against the chamfered surface 67 and surface K. If now the cap be rotated clockwise with a certain amount of pressure with the palm of the hand downwardly upon the cover portion E, the elements or lugs 52 will ride smoothly downwards against the profile 56 until recess 57 is encountered. While so riding down, clearly there will be a tendency for the fitament A to flatten from the shallow domed configuration depicted. Being very small in actual fact, the actual distortion thereof is not too easily discernible. In any event bead 61 enters recess 62 (although the bend and recesses are not essential to the present invention). Surfaces 65 and 67 come into interfacing sealing relationship.

At this time, and with normal pressure exerted upon cover portion E, the fitament A is not excessively flattened.

Hence the perimeter 68 should not be in contact with the inner surface 69 of abutments 63. If however excessive force is applied, these two surfaces would come into contact. The abutments are therefore designed to protect the fitament A against undue distortion since it would be extremely difficult to compress the fitament further after surfaces 68 and 69 were in contact.

When the elements 52 enter recesses 57, pressure upon the cap is relieved and the cap snaps up and is obviously now locked against rotation in either direction until again down pressure to the cover portion E, the elements or lugs 52 will ride upwardly and the fitament A will be flattened. When the cap is rotated this time counterclockwise.

An important feature of the present invention resides in the provision of a fitament A (generally though perhaps not necessarily, of plastic) that the same can readily be snapped out of the shallow well 53. Thus, for example, should a large quantity of such fitaments be preserved under sterile hygienic conditions and handled under such conditions. Specifically, they may be applied to the mouth G of containers H under such conditions.

Then, with the contents enclosed the caps B may be applied under more ordinary industrial conditions.

From all the foregoing it will be observed that there has been designed a novel closure for a cap having the purpose stated whereby a spring bias, and a highly effective sealing action is achieved, and this without excessive binding of the seal in the mouth of the bottle, due to the provision of the combination of outer flange and inner flange F, the first of which projects a downward movement of the fitament and the second of which provides a perfect seal without binding.

Proceeding next to describe the alternative modification of the present inventive concept as depicted in the accompanying FIGURES 3 through 5, the same represents a tamper-proof fluid tight enclosure embodying a container collectively designated 10, having a circular opening 11 and a cap collectively designated 12 for covering said opening.

For attaching cap 12 to container 10, inter-engaging interrupted shoulder portions are provided, projecting from the container in the vicinity of the opening 11, and from said cap 12. These portions will now be described in greater detail, it being understood that the same may be varied as to configuration, and do not, as such, alone comprise the present invention.

Around the outside perimetre of container 10 are projecting conformationally collectively designated 13. As exemplified there are four of such conformation arranged in two diametrically opposed pairs. However, in actual practice more of such configurations will be provided usually some 6 or so in number. Such conformation provide recessed entrances or skewed passageways therebetween for the admission of the inwardly projecting shoulder portions 15 formed upon and projecting from the mouth of the container 10.

The conformation 13 include cammed surface portions 18 and 19 similar to those which have already been described in connection with the accompanying FIGURES 1 and 2, against which the shoulder portions 15 may move and be guided into the socket or locking portions 20 (corresponding to 57 already referred to). It will be appreciated however that the inter-engaging arrangements just described have little or no utility unless associated with spring means whereby the shoulder portions 15 will be securely locked in place.

The resilient plastic sealing element collectively designated 21 constitutes the novel means by which the inventor, in the present case secures cap 12 to a container such as 10 in association with inter-engaging arrangements such as have just been described. Proceeding therefore to explain the construction of element 21 in association with container 10 and cap 12, the same will be seen to embody an upper conave-o-convex disc (substantially similar to the cross-sectional configuration of fitament A), secured to the convex upper side of which, and centrally, is an upwardly projecting element 23 which may be of any configuration such as will provide a grip at least against the underside of the cover portion of cap 12. Two such conformation are depicted in the accompanying FIGURES 3 and 6. The element 23 shown in FIGURE 3 is in the form of a small upwardly projecting and upset protuberance or nose. As will be seen it is snugly maintained in aperture 24 formed centrally upon the covering portion 25 of cap 12. The aperture need not be perforation clear through material as shown but may be a blind aperture entering only from the underside. The disc 22 should rotate freely in virtue of the convexity aforesaid, it will be apparent that there is a minimum surface contact between the upper convex surface 26 and the undersurface 27 of portion 25. This particularly is the case with the configuration of the arc 36, wherein FIGURE 6 in section upon either side of the aperture 24 is seen to be thickened somewhat and convex upon the underside.

Projecting downwardly from the concave undersurface 28 in the vicinity of the perimeter of disc 22 is an annular
inner flange 29 and spanning the perimeter 30 of flange 29 is a planar diaphragm 31. This diaphragm is co-
terminous with flange 29 and disc 22. As a result it will be clearly apparent that the sealing element 21 is hollow and provided with a sealed interior air-filled chamber 32 which provides permanent resilience apart from and in addition to that which is inherent in the (usually plastic) material of which the element 21 is preferably, though not necessarily, formed. A second annular and outer flange 33 surrounds the sealing element 21 externally at flange 29. The under-
surface 34 of flange 33 may seat upon the face 35 of container 10 if desired. Generally however the principal sealing factor will be found to reside in the comple-
mentarity of the interior annular chamfer 36 with which the opening 11 is preferably provided, and the taper seen to exist at least upon the external surface of annular flange 29.

The observed annular taper provided upon flange 29 is also preferably, though not necessarily, slightly con-
veX outwardly as regarded in vertical central cross-section between its edges of junction 37 and 38 respectively with disc 32 and diaphragm 31. As a result of all the forgoing it will readily be apparent that a very effective sealing and spring means has been provided in one and the same element to effect a secure locking action between the inter-engaging shoulder portions such as 13 and 15.

Reverting to the preferred embodiment of FIGURES 1 and 2, it should be noted in connection with the flange F and buttresses 63 and expansion of flange J against the latter that this may occur notwithstanding the outward bearing of flange F against mouth G (whether chamfered as shown or vertical in which case F would bear against the inner edge of K.) It could occur for instance in the event that D or F are of different stiffness, and particu-
larly if D be substantially stiffer than F as may often be the case, or having regard to the slight cross-sectional convexity of the outer surface of F in contrast to the shown flat chamfer 67 which obviously provides an initial annular kiss-fit which on expansion would become inter-
facial, and on excessive expansion could lift 61 out of 62. Accordingly the inventor considers it to be inventive and desirable to provide either the limiting buttresses 63 or the flange J alone or both of these, according to cir-
cumstances, to prevent permanent fitment distortion and/or excessive penetration of F into the container and resultant over-tight frictional fit.

With reference to FIGURE 6, it is to be appreciated that the thickened centre portion 70, while it may extend out to the corners 71 (see FIGURE 3) is generally only a thickened centre portion as indicated by the phantom lines 70 of FIGURE 3. Such a thickened portion is well suited to accommodate the particular form of nose 72 which, in virtue of the complementary slopes 73 and 74, together with the shoulders 75 provides a form of nose which can very easily and effectively be pushed into place, held there snugly, and will not too easily be retracted.

What is claimed is:

1. In a tamper-proof container and closure assembly for substances from which children should be safely guarded, embodying a vessel and a cap therefor having cover and skirt portions, said vessel and cap being of the type having locking means co-acting between the mouth of said vessel and said cap and consisting essentially of projecting elements said receptive elements and receptive elements each having a sloping profile and a cap retention recess, for securing said cap and vessel together upon the application of a relative rotary effort between said ves-
sel and cap which places said cap under increasing spring bias by the bearing of said projecting elements against the profiles of said receptive elements until said projecting elements enter said retention recesses, characterized by a circular resilient fitting bearable against the underside of said cover portion, said fitting including an outer ann-
ular region which inclines circumferentially outwardly and downwardly away from said cover portion, an inner seal fitting on the underside of said fitting near its perimeter projecting into and bearable against the mouth of said vessel, and an outer sealing flange bearable against the edge of said vessel-mouth, said outer flange being formed of the perimetrical ring of material of said fit-
ment which surrounds said inner flange, the relative con-
formation of said inner flange and mouth being such that said outer annular region is of shallow domed conformation at least when said inner flange has entered said mouth and is under pressure thereagainst.

2. The invention according to claim 1 in which said vessel-mouth-edge and the underside of said outer flange are provided with an annular recess and complementary projecting bead receptive therein.

3. The invention according to claim 2 in which the underside of said outer flange is provided with said bead.

4. The invention according to claim 1 which includes externally off-set abutments projecting upwardly from said vessel-mouth-edge to limit perimetrical expansion outwardly of the outer perimeter of said fitment upon downward bias thereon by the cover portion of said cap in the locking of same onto said vessel.

5. The invention according to claim 1 which includes a diaphragm spanning said inner flange so as to provide a fitment having a hollow sealed interior.

6. The invention according to claim 1 which includes a recipient means upon the upper side of said fitment and the underside of said cap cover portion for connecting the two rotatably together.

7. The means according to claim 6 by which said fit-
ment is readily attachable and removable from said cap.

8. The invention according to claim 1 which includes an upwardly projecting, concentrically disposed element upon the upper side of said fitment, the underside of said cap cover portion being complementarily conformed to rotatably accommodate said element.

9. The invention according to claim 8 in which said concentrically disposed element is in the form of a ring hav-
ing an annular undercut to engage said complementary conformation.

10. The invention according to claim 8 which includes a diaphragm spanning said inner flange so as to provide a fitment having a hollow sealed interior.

References Cited

UNITED STATES PATENTS

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JAMES B. MARBERT, Primary Examiner.