Dec. 31, 1963 W. R. BARVIN 3,115,979

CAP FOR CONTAINERS

Filed Nov. 13, 1962

FIG. 1.

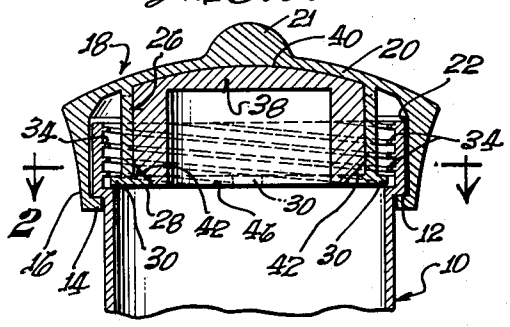


FIG. 2.

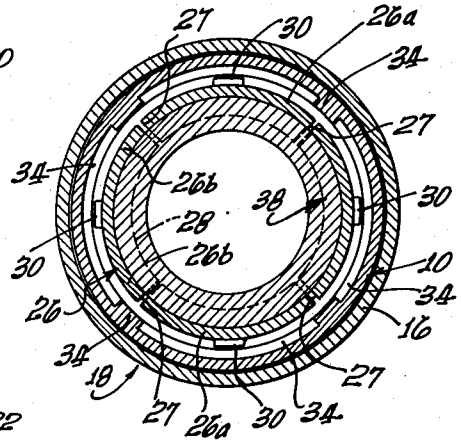


FIG. 3.

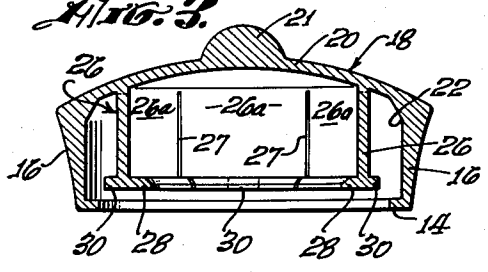
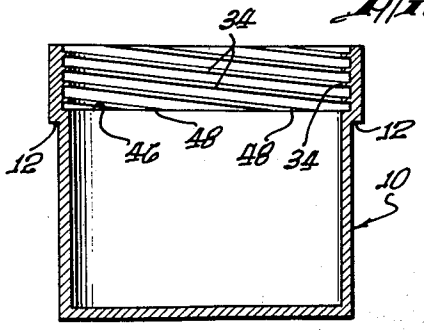


FIG. 4.



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CAP FOR CONTAINERS

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10 Claims. (Cl. 215—9)

The present invention has to do with caps for containers, such for instance as vials or bottles containing poisonous or harmful liquids or solids; and the general objective is to provide a cap structure quite unlikely, by anyone not knowing the necessary removal operations, and particularly or impossible for a young child to remove. The invention is characterized by the necessity of two distinctly different simultaneous operations to enable cap removal. It is applicable to containers of any type or shape, containing any contents.

In the typical and illustrative form of the invention explained here in preferred detail, a forcible downward pressure on the lid of the cap expands a lug or series of lugs (which in effect may represent sections of an external thread or threads) outwardly into engagement with an internal thread or sets of internal threads on the container top. Providing that downward pressure is then maintained long enough to keep or to cause the thread elements to remain in inter-engagement, the cap can then be forced off the container by revolving the cap on the container. Preferably the angular extent of cap revolution for complete removal is quite large—here illustrated typically as being 360 degrees.

A typical illustrative embodiment of the invention is shown in the accompanying drawings, in which:

FIG. 1 is a central vertical section;

FIG. 2 is a section on line 2—2 of FIG. 1;

FIG. 3 is a vertical control section of the lid or outer part of the cap; and

FIG. 4 is a vertical section showing a typical formation of a container adapted to take the cap of the invention.

In the drawings, container 10 is shown with an external downwardly facing annular shoulder 12 a short distance below its circular top. An inwardly facing annular flange or rib 14 on the lower edge of outer circular wall 16 of the lid 18 is adapted to elastically snap under shoulder 12 in a manner well known for bottle and vial caps. The upper wall 20 of the lid is dome shaped, and the material of the lid is sufficiently flexible that the dome center may be pressed down, the dome top fulcruming at its outer circular edge at the points indicated at 22 where the dome top overlies the upper edge of the container. The entire lid may be made of an elastically flexible plastic such as that used for bottle and vial caps. If desired a liquid seal may be formed at the points 22 at the upper edge of the container. A central protuberance 21 may be provided on the dome top of the lid, to locate downward thumb pressure centrally.

Although the lid wall 16 may be slitted up some distance from its bottom, it is elastically stiff enough against expansion that it cannot at all easily be pried off the containers by the ordinary prying operation to expand the flange 14 over the container shoulder 12. And the bottom edge at flange 14 is stiff enough that flattening of the dome top 20 does not materially expand it.

The lid structure has a depending integral structure, here shown typically as a circular wall 26 spaced internally from lid outer wall 16, and preferably vertically slitted as shown at 27. That depending wall 26 has an annular internal flange 28 at its lower end. Externally at its lower end wall 26 carries one or more thread engaging lugs 30, here shown as four in number.

Interiorly, the upper part of the container has helical thread-like inwardly projecting ridges 34 with intervening spaces just sufficiently wide to take the lugs 30 when

those lugs are expanded into those spaces. In normally container-closing position with wall 26 and its carried lugs 30 not expanded, as shown in FIG. 1, the outer edges of lugs 30 lie just inward of the inner circular edges of the thread ridges 34.

An expander, or camming member 38 has an upper face 40 lying under the dome top 20 of lid 18, and has a lower conical camming surface 42 which normally rests on the inner edge of flange 28 as shown in FIG. 1. The expander has relatively little flexibility as compared with that of the lid structure and is preferably hollow, as shown. And the forcible flattening of the dome top of the lid does not expand the lower edge of outer lid wall 16 sufficiently to expand its internal flange 14 from under, or to make it easily removable from under the container shoulder 12. Downward flattening pressure on dome top 20 of the lid forces expander 38 down and the camming face at 42 forces the lower flanged edge of wall 26, and its lugs 30, outwardly. On being forced outwardly, the lugs ride out at an elevation to ride over the container shoulder 46.

As shown here, there are four equally spaced lugs 30 and four spaced helical thread ridges 34. Each of those thread ridges starts, at bottom, at the upwardly facing annular shoulder 46; those four bottom starting points, two of which are shown at 48 in FIG. 4, being spaced apart by 90°. Each of those four thread ridges has such a helical pitch that it reaches the container top in, say, 360° of rotation. If, on expansive projection, the lugs strike the inner edges of thread ridges 34, rotation of the cap (left-handed as here shown) brings the lugs to position to enter between ridges. Continued down pressure on the lid then projects the lugs into the screw-thread formation, and continued cap rotation then forcibly lifts the whole cap, forcibly pulling the cap flange 14 up over container shoulder 12, and then, at the end of 360° rotation, freeing the cap to be lifted off. The cap is replaced simply by pushing it down over the container top with the lugs 30 retracted. To facilitate that, the upper edge of the container may be exteriorly bevelled.

In the design as here shown, it will be noted that, with the lugs 30 located at a small elevation above the lid flange 14, the forcible lifting action will lift that flange to a position close to the contanier top where the cap can easily be pulled off. In the design here shown it requires something like or over a half-revolution of the cap to forcibly pull the lid flange 14 entirely free of the container shoulder 12. The extent of that necessary revolution may be increased by decreasing the helical pitch of the screw threads. The inter-engaging lug and screw-thread design may be such that, once the lugs are completely engaged with the thread by downward pressure on the dome top and simultaneous rotation of the cap, they will remain in such engagement without continuation of the down pressure. But, in any case, there must be simultaneous down pressure on the dome and cap rotation for some period.

The inner lug-carrying wall 26 is preferably longitudinally slitted, as shown at 27 in FIGS. 2 and 3, to facilitate expansion. And the lower edge of that wall and the lugs may be expanded not only by the expander 38 but also by the wall segments being swung out by reason of their solid mounting on the cap dome when that dome is flattened down. In fact, the said expansion may be entirely caused by such flattening and the internal expander 38 eliminated. As an example of this, assume expander 38 omitted, and wall 26 slitted at 27 in four locations between the lugs 30, as shown in FIG. 2. Each arcuate section 26*a*, integrated at its top with lid dome 20, is reinforced by its curved edges 26*b* against bending in a vertical radial plane, in the same manner as such section

would be reinforcedly stiffened by an inner flange in a radial plane extending up and integrated with dome 20. Thus, on flattening of 20, those relatively stiff segments will be thrown outwardly at their lower end and move lugs 30 out to engage the thread formation.

It is also remarked that the location of the screw-threads and the engaging lugs, on the container and cap respectively, may be reversed. The screw threads may be on the cap wall 26 and the engaging lugs or similar elements on the container. And that is true whether or not wall 26 is slitted and is moved out expansively by expander 38 or by the action just described.

Although a single, radially projectible lug engaging a single screw thread may be sufficient to forcibly lift the cap flange from under the container shoulder, it is preferred to utilize a plurality of such lugs symmetrically spaced around the cap axis to obtain a symmetric upward pull on the cap.

The utilization of screw-thread ridges in the same number as that of the engaging lugs located at a common level, as here shown, necessitates at the most only a small angle of cap rotation to place the lugs in position to enter the screw thread spacings. On the other hand, if the number of threads is less than that of the lugs, say, one continuous thread, then the lugs distributed circularly on a helix the same as that of the thread, would, in full effect, be the same as a continuous thread. In such a design it may require cap rotation up to as much as 360° to enable the two parts to inter-engage. From that position of interengagement, the helical thread or threads would then continue circularly for, say, 360° to reach an elevation to forcibly lift the cap free of the container.

I claim:

1. A container cap structure, embodying the combination, with a container having a circular top portion with an external downwardly facing shoulder, of

a hollow lid member having a dome-shaped top wall and a depending outer circular wall adapted to fit over the upper portion of the container,

said lid member being composed of an elastically flexible material and having an internal flange on the outer circular wall below the dome top adapted to forcibly contract under the container shoulder,

an internal hollow formation rigidly attached to and depending from the lid dome wall, spaced inwardly of the lid outer wall, and spacedly entering the top portion of the container,

means causing radial expansion of the lower portion of said depending formation upon forcible flattening of the lid top wall,

inter-engageable formations internally on the top portion of the container and externally on the lower portion of said depending formation, adapted to be inter-engaged by expansion of said lower portion,

and at least one of said inter-engageable formations being of the nature of a helical screw thread,

whereby, with said inter-engageable formations held in inter-engagement, relative rotation of the lid will force the lid up and forcibly pull the internal flange of its outer wall free of its contractive engagement under the container shoulder.

2. The combination defined in claim 1, and in which said depending internal formation is in the nature of a circular vertically slitted wall.

3. The combination defined in claim 2, and in which the means for causing radial expansion of said depending formation embodies a relatively rigid expander lying within said hollow formation under the dome top wall of the lid and having camming engagement with the lower part of said depending formation to expand said lower part on relative downward movement.

4. The combination defined in claim 1, and in which the means for causing radial expansion of said depending formation embodies a relatively rigid expander lying within said hollow formation under the dome top wall of the lid and having camming engagement with the lower part of said depending formation to expand said lower part on relative downward movement.

5. The combination defined in claim 1, and in which the depending internal hollow formation comprises a series of circularly arranged members depending from the lid dome wall,

and the means causing radial expansion on flattening of said dome wall consists in each of said depending members being formed in cross section to reinforcedly stiffen those members against bending in a radial vertical plane.

6. The combination defined in claim 1, and in which the depending internal hollow formation comprises a series of circularly arranged members depending from the lid dome wall,

and the means causing radial expansion on flattening of said dome wall includes an expander member located under the dome wall and having camming engagement with the lower parts of said depending members.

7. The combination defined in claim 1 and in which the inter-engageable formation of the nature of a helical screw thread is located internally on the top portion of the container.

8. The combination defined in claim 7, in which the inter-engageable formation of the nature of a screw thread is composed of a plurality of separate helical and vertically spaced thread elements,

and in which the other inter-engageable formation is of the nature of radially projecting lugs of a number the same as that of said thread elements and equally circularly spaced around said depending formation.

9. The combination defined in claim 2, in which the inter-engageable formation of the nature of a screw thread is composed of a plurality of separate helical and vertically spaced thread elements,

and in which the other inter-engageable formation is of the nature of radially projecting lugs of a number the same as that of said thread elements and equally circularly spaced around said depending formation.

10. The combination defined in claim 1, in which the inter-engageable formation of the nature of a screw thread is composed of a plurality of separate helical and vertically spaced thread elements,

and in which the other inter-engageable formation is of the nature of radially projecting lugs of a number the same as that of said thread elements and equally circularly spaced around said depending formation.

No references cited.