

[54] BOTTLE CAP

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 254,393, May 18, 1972, Pat. No. 3,812,994, which is a continuation-in-part of Ser. No. 215,562, Jan. 5, 1972, abandoned.

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[51] Int. Cl. **B65d 41/34**

[58] Field of Search 215/DIG. 1, 40, 41, 42, 215/43 R, 46 A, 256, 344

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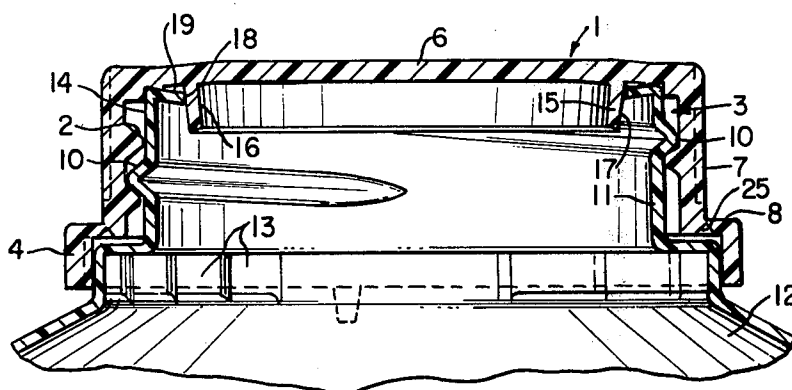
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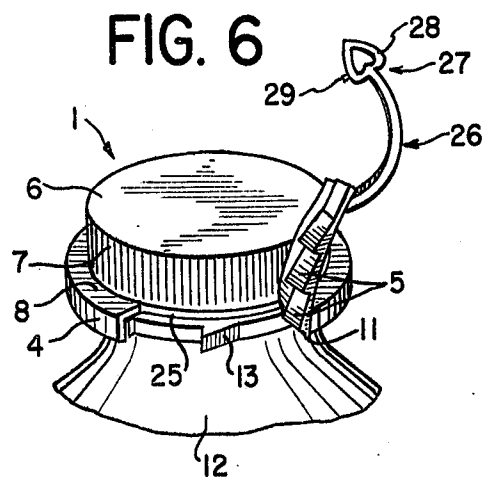
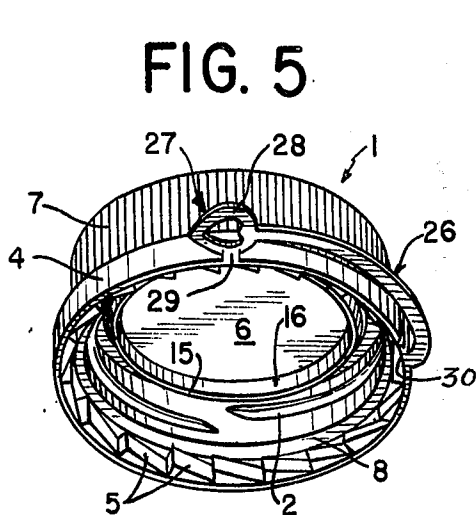
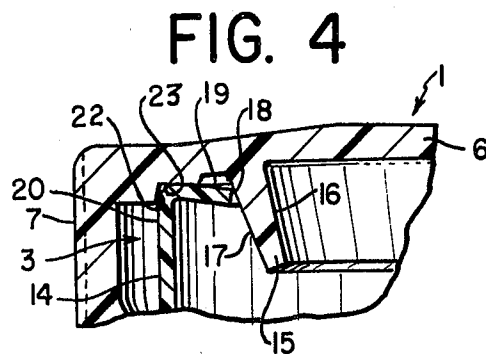
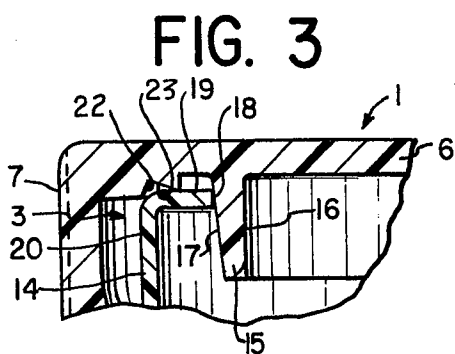
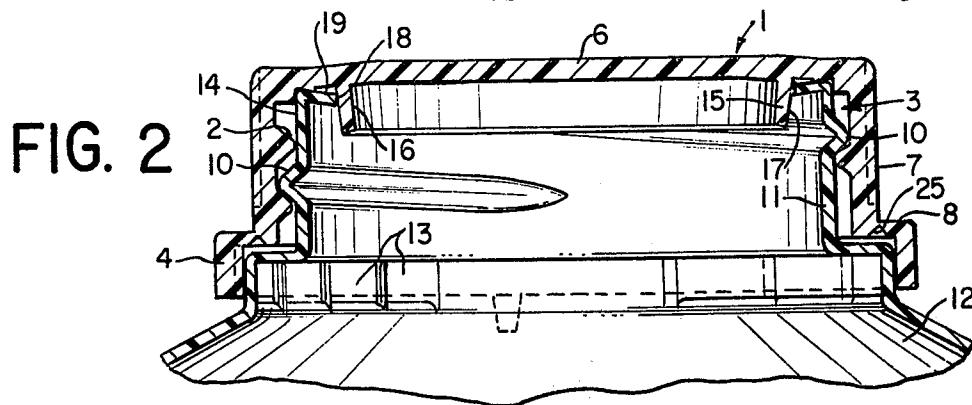
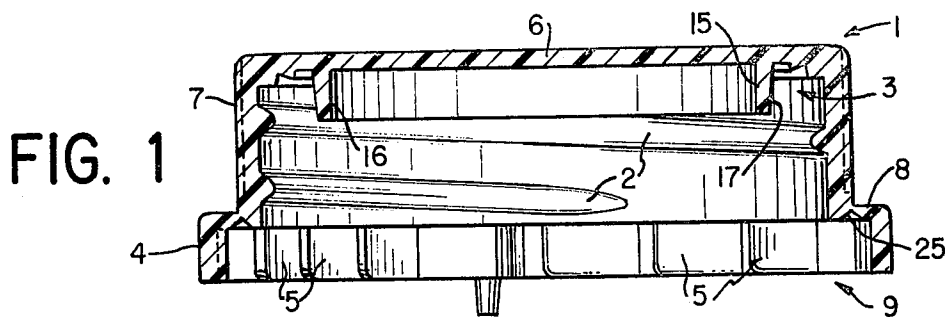
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ABSTRACT

A threaded bottle cap constructed of flexible plastic material and having internal sealing surfaces for sealing against the neck of the bottle on which the cap is secured. The sealing of the cap is effected at separate zones with the cap deforming to increase the sealing engagement. The cap also includes a ratchet ring removably connected at its open end for locking onto the bottle to prevent unthreading and unsealing and to prevent unauthorized removal of the cap.

13 Claims, 6 Drawing Figures





BOTTLE CAP

RELATED APPLICATIONS

This application is a continuation-in-part of applicant's copending application entitled "Tamper-Proof Closure Cap," Ser. No. 254,393, filed May 18, 1972, now U.S. Pat. No. 3,812,994. Application Ser. No. 254,393 is, in turn, a continuation-in-part of applicant's copending application entitled "Closure Cap," Ser. No. 215,562, filed Jan. 5, 1972, and now abandoned.

BACKGROUND OF THE INVENTION

With plastic caps and particularly with tamper-proof caps used for beverage containers, proper sealing of the caps has been a problem. Unlike the conventional metal caps, plastic caps do not employ a sealing liner; but instead rely on the properties of the plastic to effect a seal with the container or bottle to which they are secured. The sealing of the caps produced in this manner has not been altogether acceptable especially during shipping and related handling where the containers are likely to be jostled or the cap accidentally turned in an unthreading direction.

Presently available plastic caps generally provide only one or two surfaces for effecting a seal with the bottle and typically rely on the threads of the cap for sealing. Also, these caps depend on the bottle neck configuration for sealing properties. Some cap constructions have beads and ridges on their internal surfaces and require bottles of specific configuration to accomplish their sealing. These caps are not adaptable to a multiplicity of bottle necks nor do they provide sufficient sealing capabilities.

SUMMARY OF THE INVENTION

The present invention relates to a bottle cap constructed of flexible plastic material having independent sealing surfaces. The surfaces for sealing the cap on the bottle neck are formed in the internal portion of the cap and engage the bottle neck along its inside surface, top surface and outside surface. During tightening of the cap onto the bottle, the cap deforms or flexes to cause the sealing surfaces to move into flush engagement with the bottle neck at both its top surface and outside surface. This deformation and flush contact yields a superior seal. Also, the sealing surfaces are not limited to any particular configuration of bottle neck which makes them usable on practically any type of bottle. A ratchet ring secured at the bottom side wall of the cap cooperates with ratchet teeth on the bottle neck to prevent unthreading and unsealing of the cap.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical cross-sectional view of the bottle cap showing the sealing surfaces;

FIG. 2 is a section view showing the closure in seated, sealed engagement with the bottle neck;

FIG. 3 is an enlarged section of a portion of the cap showing the sealing surfaces of the cap in initial contact with the bottle neck;

FIG. 4 is an enlarged section similar to FIG. 3 showing the sealing surfaces of the cap in their final flush contact with the bottle neck;

FIG. 5 is a perspective view of the cap as viewed from its underside; and

FIG. 6 is a perspective view of the cap in position on a bottle and showing the ratchet ring in the process of being removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the cap structure basically comprises a body portion 1 with an internal thread 2 and sealing surfaces generally designated by reference numeral 3. A tamperproof ratchet ring 4 is removably connected to the body portion and includes a plurality of internal ratchet teeth 5. The body portion is cylindrical in shape having a top wall 6 and cylindrical side wall 7. A shoulder 8 connects the body portion to the removable ring portion; and together with the top wall 6 and side wall 7 defines an opening 9 for receiving a bottle neck. Thread 2 is adapted to engage external thread 10 on the neck 11 of a bottle 12. The bottle also includes ratchet teeth 13 designed to engage the teeth 5 of the ring 4 in such a manner as to prevent the entire cap structure from being unthreaded from the bottle neck.

The upper portion 14 of the bottle neck 11 provides surfaces against which the sealing surfaces 3 of the cap cooperate to seal the bottle from leakage. There are three sealing surfaces on the cap and they are formed as an integral part of the cap. For this purpose, the cap is preferably molded from plastic material such as polyurethane. In the preferred embodiment, the plastic material has a density of 0.940 gm/cc.

One of the sealing surfaces is formed by an annular flange 15 extending downwardly from the top 6 into the opening 9. The flange's internal surface 16 is substantially perpendicular to the top 6, but its external surface 17 is at a slight acute angle to the flange's internal surface 16 and tapers in a direction away from the top 6. This surface faces the side wall of the cap. The upper portion 14 of the bottle neck 11 is defined by three sealing surfaces adjacent the opening into the bottle; an internal edge surface 18, an upper flat surface 19 and an external flat surface 20. The flange 15 of the cap is located a distance from the side wall 7 such that its external surface 17, functioning as a sealing surface, will engage the internal edge surface 18 of the bottle neck 5 and effect a sealing at this point.

Intermediate the flange 17 on the side wall 7, the cap is contoured to define two flat annular sealing surfaces 22 and 23. The surface 22 extends downwardly from the top wall and toward the side wall at an acute angle of about 10° relative to the side wall. The surface 22 is adapted to engage the outside wall surface 20 of the bottle neck. The second sealing surface 23 also extends downwardly from the top wall 6 of the cap. This sealing surface is spaced inwardly of the first sealing surface for engagement with the top surface 19 of the bottle neck. The sealing surface 23 normally extends away from the side wall of the cap and at an acute angle of about 20° relative to the top wall. The sealing surfaces 22 and 23 intersect each other adjacent the top wall of the cap with the angle of intersection being about 80°.

Although the sealing surfaces 22 and 23 of the cap are spaced from the side and top walls, the cap is of solid construction behind these sealing surfaces. Also, the sealing surface 22 is disposed radially inward of the thread 2 on the side wall of the cap while the thread itself terminates at a point spaced from the top wall of the cap and below the sealing surface 22.

As stated above, the cap is made from a flexible plastic such as polyurethane. Also, the top wall has a thickness of between about 0.04 and 0.05 inch. This

construction allows the cap to deform or flex as it is threaded onto the neck of the bottle. This ability to deform or flex permits the sealing surfaces 22 and 23 of the cap to pivot into flush sealing engagement with the sealing surfaces 19 and 20 of the bottle neck.

As the cap is threaded down onto the neck, the sealing surfaces will first move into contact with the cooperating surfaces on the bottle neck. As shown in FIG. 3, the initial contact of the sealing surfaces 22 and 23 with surfaces 20 and 19 will not be a flush engagement. However, as the tightening of the cap is continued, the surface 23 will, upon engagement with the top surface 19 of the bottle neck, act as a stop tending to limit further tightening of the cap. This initial engagement will cause the cap to deform or flex and, in turn, cause the surface 23 to pivot. The pivoting of the surface 23 will be effected due to the solid construction of the cap behind this surface. The flexing of the cap and the solid construction behind the sealing surface 22 will similarly cause this surface to pivot. The pivoting of the surfaces 22 and 23 will continue until flush engagement with the cooperating surfaces of the bottle neck is effected.

As clearly shown in FIG. 4, the sealing of the surfaces 22 and 23 is at spaced zones. These sealing surfaces thus provide independent sealing action. In addition, the sealing effect by the surfaces 22 and 23 is independent of the thread engagement of the cap on the bottle. This is so since the thread 2 of the cap terminates at a point spaced below the sealing surface 22. Also, the sealing surface 22 extends radially inward beyond the thread 2 so that only it engages the outside wall of the bottle neck, the thread 2 limiting its engagement to the threads on the bottle neck.

As the cap is tightened onto the bottle neck, further independent sealing will be effected by the sealing surface 17 against the inside surface 18 of the bottle neck. More specifically, the flange 15 is caused to deform or flex inwardly as the cap is tightened to assure sealing of the surface 17 against the inside surface of the bottle neck. As readily apparent from FIGS. 3 and 4 the sealing effected by the surface 17 is independent of and along a zone spaced from the sealing zone produced with the sealing surface 23. The increased surface contact of all three sealing surfaces of the cap due to the flexing of the surfaces and the independent action of the sealing surfaces assures superior sealing characteristics.

In addition to the sealing effected when the cap is screwed onto the bottle, there is an engagement of the tamperproof ring 4 with the ratchet teeth 13 of the bottle neck. Removal of this ring serves to afford visual evidence that the bottle may have been opened. This ring also prevents back twisting of the cap which would unseat the sealing surfaces.

The ring 4 is severably connected to the cap portion by means of the pivotal shoulder 8. At the junction of the shoulder 8 and cylinder wall 7 a thin membrane zone defines a tear line 25. The specific construction of this tear line and the ring structure is set forth in applicant's copending applications mentioned above. The tear line has sufficient strength to prevent the two portions of the cap structure from severing when normal pressure is applied to threadably remove the cap. A rip cord extension 26 is connected to the ring 4 with a finger grip 27 having a heart-shaped cutout 28 formed therein. The grip 27 is breakably connected by tab 29 to the ring 4 at a point where it has a thin membrane

30 and is used to tear away the shoulder and ring from the rest of the cap structure along the tear line 25 as shown in FIG. 6. When this is done, turning the cap in the unthreading direction permits its removal.

5 With the above construction, the ring 4 pivots outwardly about the tear line 25 as the cap is screwed onto the bottle and the teeth 5 slid over the teeth 13. At the same time this is happening, the sealing surfaces of the cap will engage against the bottle neck to close the bottle against leakage. With the three zone sealing provided by the cap of the present invention working together with the ratchet ring which prevents loosening of the cap, a tight leakproof connection between the cap and the bottle is afforded. Rough handling of the bottles during packing and shipping will not disturb this seal.

I claim:

1. In a bottle cap for use with a bottle having a threaded neck opening into the bottle, said cap being constructed of flexible material and having a top wall, a cylindrical side wall depending from the top wall and a thread on the inner surface of the side wall for cooperating with the thread on the neck of the bottle, the improvement comprising:

- 25 a. a first annular sealing surface extending downwardly from said top wall and toward said side wall at an acute angle relative thereto for engagement with the outside wall surface of the bottle neck adjacent its opening into the bottle, said cap being of solid construction from the first sealing surface radially outward to the side wall;
- 30 b. a second annular sealing surface extending downwardly from said top wall inwardly of said first sealing surface for engagement with the top surface of the bottle neck, said second sealing surface normally extending away from the side wall of the cap at an acute angle relative to the top wall with the cap being of solid construction between second sealing surface and the top wall;
- 35 c. said first and second sealing surfaces being spaced from each other to seal against the cooperating surfaces of the bottle neck at spaced zones; and
- 40 d. said cap being of sufficient flexibility to flex as the second sealing surface engages the top surface of the bottle neck to permit pivoting of said first and second sealing surfaces into flush sealing contact with the top and outside surface of the bottle neck.

2. The improvement in the bottle cap as set forth in claim 1 wherein:

- 45 a. said first sealing surface extends toward said side wall at an angle of about 10° relative thereto.

3. The improvement in the bottle cap as set forth in claim 2 wherein:

- 50 a. said first sealing surface is disposed radially inward of the thread on the side wall of the cap.

4. The improvement in the bottle cap as set forth in claim 3 wherein:

- 55 a. the thread on the side wall of the cap terminates at a point spaced from said top wall and below said first sealing surface.

5. The improvement in the bottle cap as set forth in claim 2 wherein:

- 60 a. said first and second sealing surfaces are flat surfaces which intersect each other adjacent the top wall of the cap.

6. The improvement in the bottle cap as set forth in claim 5 wherein:

a. the angle of intersection of the first and second sealing surfaces is about 80°.

7. In a bottle cap for use with a bottle having a threaded neck opening into the bottle, said cap being constructed of flexible material and having a top wall, a cylindrical side wall depending from the top wall and a thread on the inner surface of the side wall for cooperating with the thread on the neck of the bottle, the improvement comprising:

a a first flat annular sealing surface extending downwardly from said top wall and toward said side wall at an acute angle relative thereto for engagement with the outside wall surface of the bottle neck adjacent its opening into the bottle;

b a second flat annular sealing surface extending downwardly from said top wall inwardly of said first sealing surface for engagement with the top surface of the bottle neck:

1 said second sealing surface normally extending away from the side wall of the cap at an acute angle relative to said top wall,

2 said second sealing surface intersecting the first sealing surface adjacent the top wall of the cap, and

3 said second sealing surface providing a stop for engaging against the top surface of the bottle to limit tightening of the cap on the bottle;

c the cap is of solid construction between the second sealing surface and the top wall; and

d said cap top wall is of sufficient flexibility to flex as the second sealing surface engages the top surface of the bottle neck to permit pivoting of said second sealing surface into flush sealing contact with the top surfaces of the bottle neck.

8. The improvement in the bottle cap as set forth in claim 7 wherein:

a said first and second sealing surfaces are spaced from each other to seal against the cooperating surfaces of the bottle neck at spaced zones.

9. The improvement in the bottle cap as set forth in claim 7 further including:

a. a third annular sealing surface extending downwardly from the top wall radially inward of said second sealing surface and facing said side wall for engagement with the inner surface of the bottle neck at its opening into the bottle.

10. The improvement in the bottle cap as set forth in claim 9 wherein:

a. said third sealing surface is spaced from said second sealing surface to seal against the bottle neck independently of said second sealing surface.

11. The improvement in the bottle cap as set forth in claim 7 further including:

a. an annular ratchet ring removably secured at the bottom of the side wall of the cap for cooperating

with aligned ratchet teeth on the bottle neck to prevent turning of the cap in an unthreading direction prior to removal of said ring.

12. In a bottle cap for use with a bottle having a threaded neck opening into the bottle, said cap being constructed of flexible material and having a top wall, a cylindrical side wall depending from the top wall and a thread on the inner surface of the side wall for cooperating with the thread on the neck of the bottle, the improvement comprising:

a. a first flat annular sealing surface disposed radially inward of the thread on the side wall of the cap and at a point spaced above said thread and extending downwardly from said top wall and toward said side wall at an acute angle relative thereto for engagement with the outside wall surface of the bottle neck adjacent its opening into the bottle, said cap being of solid construction from the first sealing surface radially outward to the side wall;

b. a second flat annular sealing surface extending downwardly from said top wall inwardly of said first sealing surface for engagement with the top surface of the bottle neck, said second sealing surface normally extending away from the side wall of the cap at an acute angle relative to the top wall and intersecting the first sealing surface adjacent the top wall of the cap with the cap being of solid construction between second sealing surface and the top wall; and

c. said cap being of sufficient flexibility to flex as the second sealing surface engages the top surface of the bottle neck to permit pivoting of said first and second sealing surfaces into flush sealing contact with the top and outside surface of the bottle neck, said second sealing surface being spaced from the first sealing surface to seal against the bottle neck at a zone spaced from the zone at which the first sealing zone engages the outside wall surface of the bottle neck.

13. The improvement in the bottle cap as set forth in claim 12 further including:

a. a third annular sealing surface extending downwardly from the top wall radially inward of said second sealing surface and facing said side wall for engagement with the inner surface of the bottle neck at its opening into the bottle, said third sealing surface being spaced from said second sealing surface to seal against the bottle neck independently of said second sealing surface; and

b. an annular ratchet ring removably secured at the bottom of the side wall of the cap for cooperating with aligned ratchet teeth on the bottle neck to prevent turning of the cap in an unthreading direction prior to removal of said ring.

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