BOTTLE SEALING CAP

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ABSTRACT
The aluminum cup, which secures a thick pierceable rubber stopper on the necks of small pharmaceutical bottles or vials to seal them, is smoothly contoured to facilitate handling by folding the lower edge of its cylindrical skirt under within itself and imbedded into the stopper and by concavely indenting its top face to withdraw the tear-off tab. The shoulder formed by the inwardly folded edge retains the stopper within the cup, and the stopper seals the edge imbedded in it. When the skirt is crimped about the neck of the bottle, the compressed rubber stopper bulges the indented tear-off tab out above the cap to expose it for convenient removal.

10 Claims, 11 Drawing Figures
BACKGROUND OF THE INVENTION

The aluminum cups used to secure pierceable rubber stoppers on pharmaceutical vials have an indented stopper-retaining groove, a raw edge and various projections which snag against and scrape each other during transport prior to assembly with the bottle. These are liable to shed contaminating particles of metal, to hinder efficient transportation and to damage the finish on the caps. An object of this invention is therefore to provide a cup for a bottle sealing cap having a minimum of snagging projections or contours and which prevents contaminating metal particles from being shed during fabrication, assembly and use.

SUMMARY

In accordance with this invention the outer cup of a bottle sealing cap for retaining a pierceable elastomeric stopper has the lower edge of its cylindrical skirt folded upwardly with itself and imbedded into the stopper. This provides a smooth lower edge, a shoulder for securing the stopper within the cap and seals the edge to prevent it from shedding contaminating particles. The tear-off tab is withdrawn within the face of the cup by concavely indenting it. When the cup is cramped about the neck of the bottle, the compressed rubber stopper bulges the tab outwardly to relieve its cut edges above the reversely indented periphery to facilitate removal. The thickness of the cup material is also minimized by the double folded skirt, which conserves material and facilitates clamping flexure of the face.

BRIEF DESCRIPTION OF THE DRAWING

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a cross-sectional view in elevation of one embodiment of this invention cramped upon the top of a bottle;

FIG. 2 is a top plan view of the embodiment shown in FIG. 1 before it is attached to a bottle;

FIG. 3 is a cross-sectional view taken through FIG. 2 along the line 3—3;

FIG. 4 is a cross-sectional view taken through FIG. 2 along the line 4—4;

FIG. 5 is a partial cross-sectional view in elevation of another embodiment of this invention cramped upon the top of a bottle; and

FIGS. 6-11 are partial cross-sectional views of sequential configurations of the skirt of the cup of this invention shown in FIGS. 2-4 as it is being formed and assembled with a stopper.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 is shown a bottle sealing cap 10 cramped upon the top 12 of a bottle 14, for example, containing a pharmaceutical liquid 16 such as a parenteral product. Cap 10 is cramped upon the flanged neck 18 of bottle 14 by inwardly bent edge 20 of skirt 22 about neck 18.

FIGS. 2-4 show outer cup 24 of cap 10 which includes circular face 26 and skirt 22. Cup 24 is made of a thin flexible material such as aluminum 0.004 inch thick formed, for example, by a stamping or deep drawing process. Cup 24 includes removable tab 28 substantially in the center of face 26 and substantially separated from face 26 by cut edges 30 of concavely indented flange 32 surrounding domed center 34. Central notch 36 separates dome 34 into two halves. FIG. 3 shows narrow webs 38 connecting cut edges 30 of tab 28 with surrounding cutout edges 40 of periphery or annular 42 of face 26.

FIGS. 3 and 4 show how tab 28 and its cut edges 30 are withdrawn into or behind the contours of face 26 by concave indentation of the center of face 26 and of peripheral annulus 42 of face 26. This prevents tabs 28 and cut edges 30 from snagging and scraping, which might shed contaminating particles of metal, hinder efficient transportation or damage a finish, such as lacquer, on the caps. FIGS. 2 and 4 show small bulges 29 in flange 32 in line with notch 36.

FIGS. 2-4 also show smooth bottom edge 44 formed by folding a flap 46 of skirt 22 within and against itself. Exposed edge 48 of skirt flap 46 provides a shoulder for holding stopper 50 within cap 10 instead of the former circular indentation which was found to be a source of contaminating metal particles. The imbedment of raw edge 48 in stopper 50 also seals it and prevents contaminating metal particles from being shed during fabrication, assembly and use of the cap. Inwardly folded flap 46 also reinforces skirt 22 to the previous 0.008 inch thickness. This conserves metal for the other portions of cap 10 and facilitates flexure of face 26 as later discussed.

FIGS. 6-11 show the various stages in the sequence of folding the extremity of skirt 22 up within flat 46 and against itself. In FIG. 7 flap 46 is half obliquely bent inwardly. FIG. 8 shows a right angle bend on flap 46, and FIG. 9 shows an inwardly-directly half oblique bend on flap 46. FIG. 10 shows flap 46 completely bent against the inner surface of skirt 22 to form shoulder 48 imbedded into stopper 50 to support it and to seal it before and after crimping on the flanged neck 18 of a bottle 14.

FIGS. 1 and 5 show caps 10 and 10A crimped upon bottles 14 and 14A by compression thereon and inward deformation of bent edges 20 and 20A of skirts 22 and 22A. Caps 10 and 10A are similar except for central plug 52A of stopper 50A extending downwardly within neck 18A of bottle 14A. Further discussion is therefore limited to cap 10 but applies to cap 10A as well.

Downward pressure of cap 10 on bottle 14 bulges tab 28 outwardly to pop it out or relieve it above the contours of face 26 and to particularly relieve cut edges 30 of tab 28 above and away from the remaining concave indentation of periphery 42 of cap 10. This facilitates engagement and removal of tab 28 by grasping cut edges 30 or by inserting a blade between them and surrounding cut edges 40 of peripheral portion 42 of face 26. The reverse flexure of tab 28 out away from concavely indented peripheral or annular section 42 of face 26 is facilitated by the minimal thickness of face 26 afforded by the ability to make it one-half the thickness of skirt 22, which has the primary strength requirement of the cap—necessitated by its crimping function. Tab 28 is thus even more easily removed than the prior unindented cap structure.

Stoppers 50 and 50A are a pierceable elastomer, such as rubber, which reseals itself after being pierced.
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by a needle used to withdraw the contents of bottles 14 and 14A. Shoulder 48 firmly secures stopper 50 within cap 10 in a more positive manner than the former indentation in skirt 20, which was a source of contaminating particles. The imbedment of raw edge 48 in stopper 50 prevents it from shedding contaminating particles. The protection of edge or shoulder 48 within cap 10 also prevents scraping of raw or unfinished edges which formerly was a source of contaminating metal particles, particularly of soft aluminum.

1 claim:

1. A bottle sealing cap comprising an outer cup of thin flexible material having a circular face and a cylindrical skirt attached to it, a removable tab in the central portion of said face leaving an annular outer portion in said face about said tab, said tab having cut edges substantially separating it from the annular outer portion of said face to facilitate removal of said tab from said face, and said outer annular and central portions of said face being concavely indented to withdraw said cut edges behind the contours of said face whereby snagging of said outer edges of different caps disposed adjacent each other is prevented and to permit said face to be flattened outwardly when said cap is cramped upon the top of the bottle whereby removal of said tab is then facilitated.

2. A bottle sealing cap as set forth in claim 1 wherein said cap before it is secured on said bottle to seal said bottle and to bulge said top outwardly.

3. A bottle sealing cap as set forth in claim 1 wherein said material is a thin ductile metal.

4. A bottle sealing cap as set forth in claim 3 wherein said metal is thin aluminum.

5. A bottle sealing cap as set forth in claim 1 wherein said tab has a concave flange about it whereby said upward flattening of said face exposes said cut edges of said flange above the flattened concavely indented periphery of said face to facilitate removal of said tab.

6. A bottle sealing cap as set forth in claim 1 wherein the edge of said skirt is folded within and against said skirt for providing a smooth edge on said skirt and an exposed edge within said skirt to comprise a shoulder for holding a resilient stopper within said cap and said exposed edge being imbedded within said stopper whereby it is sealed to prevent it from shedding contaminating particles.

7. A bottle sealing cap as set forth in claim 6 in combination with an elastomeric stopper within said cup engaged upon said shoulder, and said exposed edge being imbedded within said stopper whereby it is sealed to prevent it from shedding contaminating particles.

8. A bottle sealing cap comprising an outer cup of thin flexible ductile metal having a circular face with a cylindrical edge attached to it, and the edge of said skirt being folded within and flat against itself to provide a smooth outer edge, to strengthen said skirt and to provide an exposed edge within said cup which comprises a shoulder for retaining a stopper.

9. A bottle sealing cap as set forth in claim 7 wherein said cup is thin aluminum.

10. A bottle sealing cap as set forth in claim 8 in combination with an elastomeric stopper within said cap engaged upon said shoulder, and said exposed edge being imbedded within said stopper whereby it is sealed to prevent it from shedding contaminating particles.

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