May 13, 1941. E. M. ENKUR 2,241,588

CAP

Filed Jan. 28, 1941 3 Sheets-Sheet 1

Fig. 1.

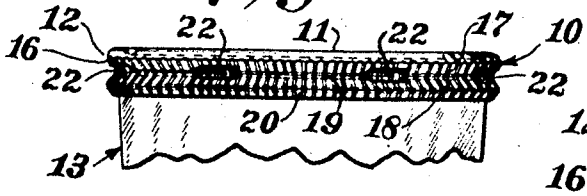


Fig. 2.

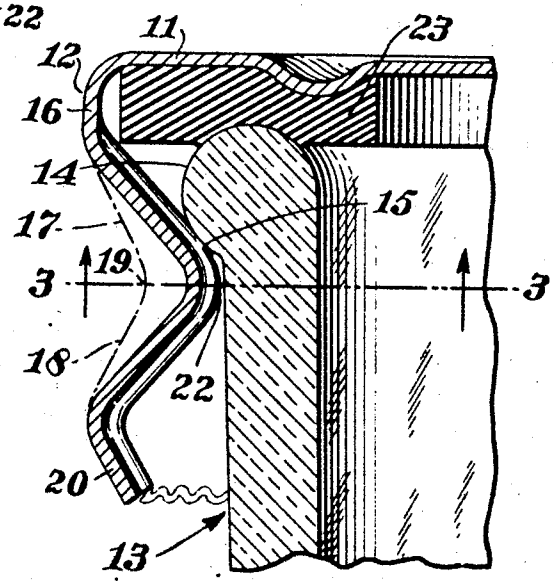


Fig. 5.

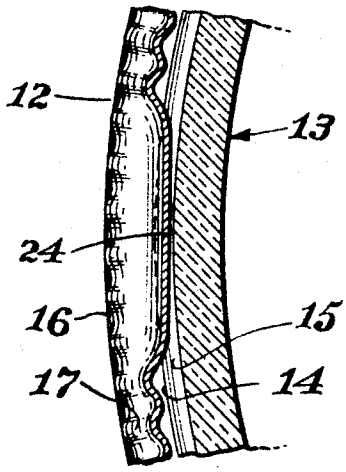


Fig. 3.

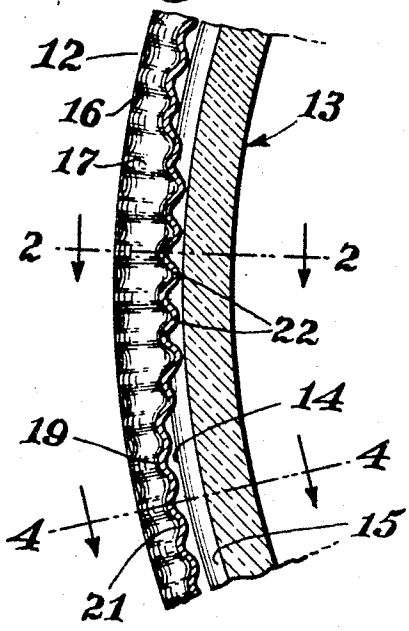
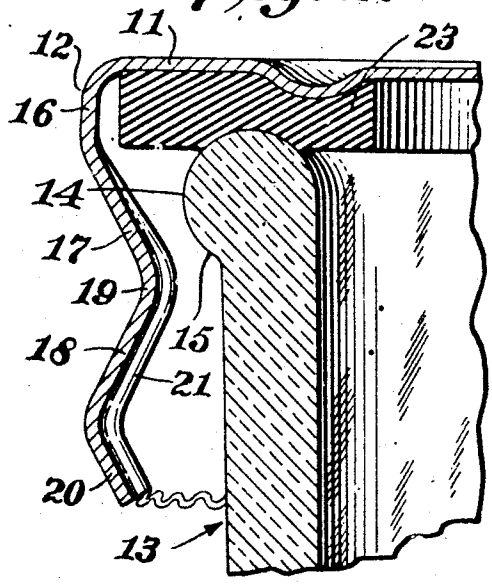


Fig. 4.



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May 13, 1941. E. M. ENKUR 2,241,588

CAP

Filed Jan. 28, 1941 3 Sheets-Sheet 2

Fig. 6.

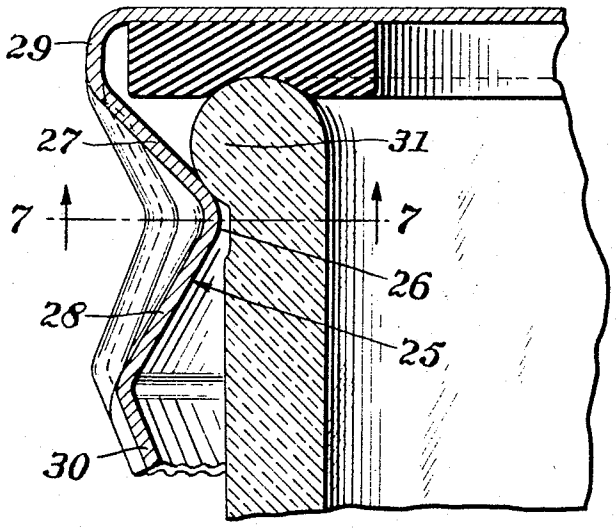


Fig. 7.

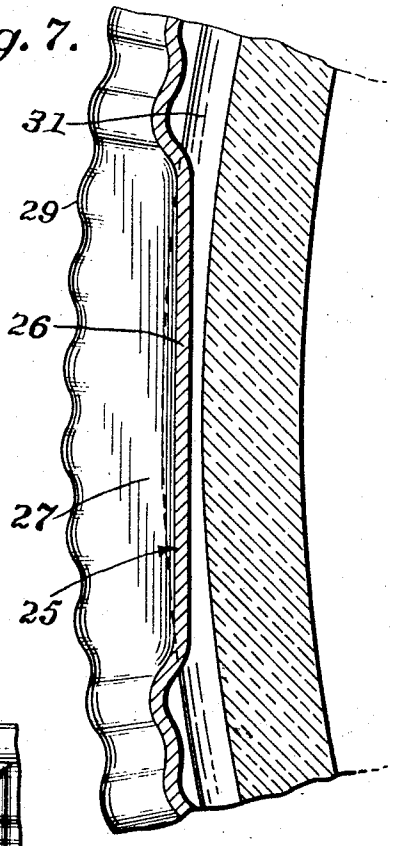


Fig. 8.

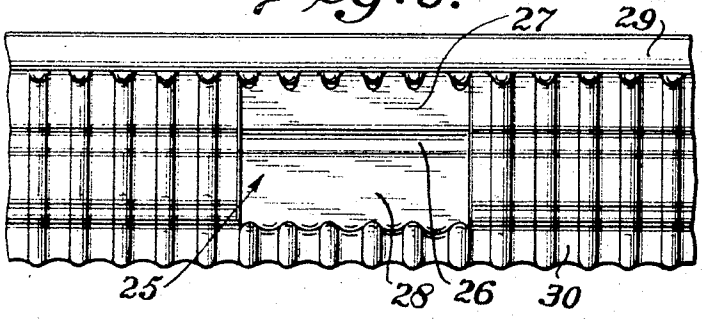


Fig. 9.

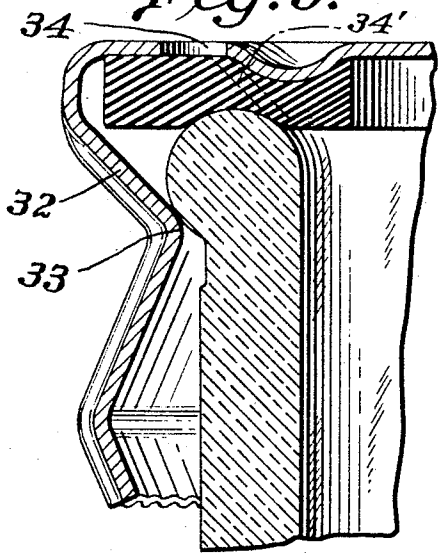
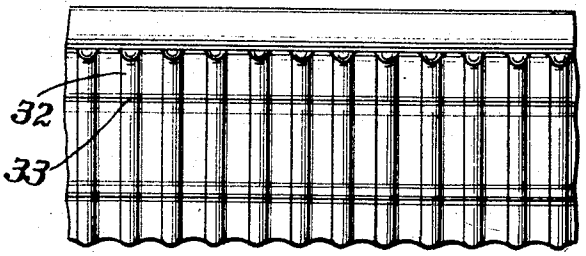


Fig. 10.



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May 13, 1941. E. M. ENKUR 2,241,588

CAP

Filed Jan. 28, 1941 3 Sheets-Sheet 3

Fig. 11.

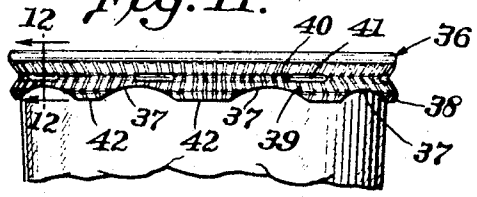


Fig. 12.

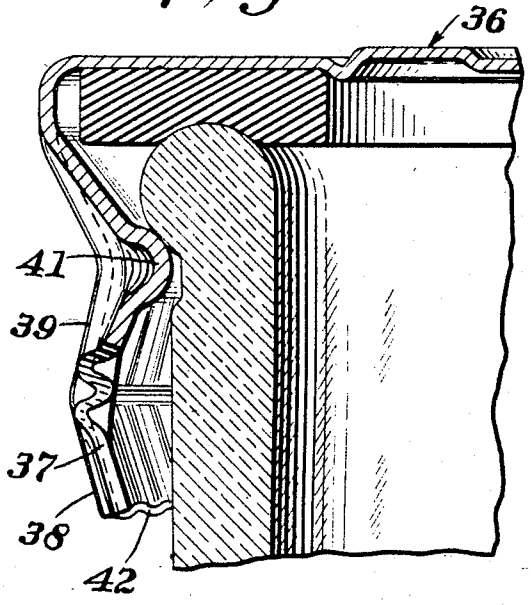


Fig. 14.

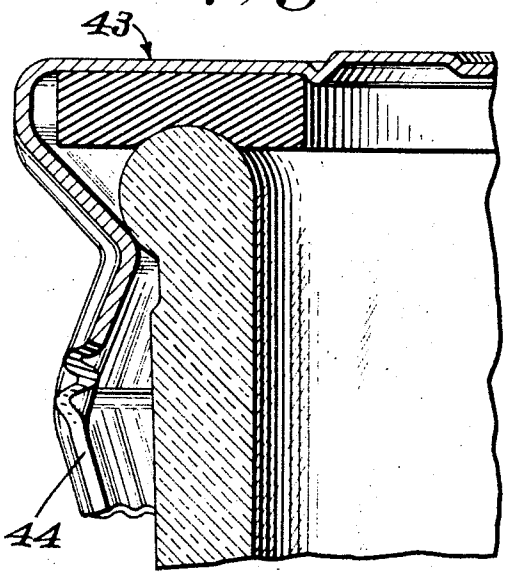


Fig. 15.

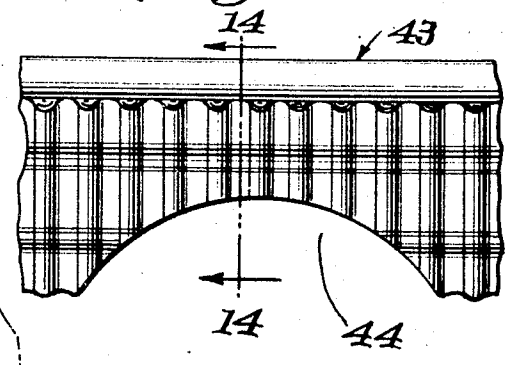
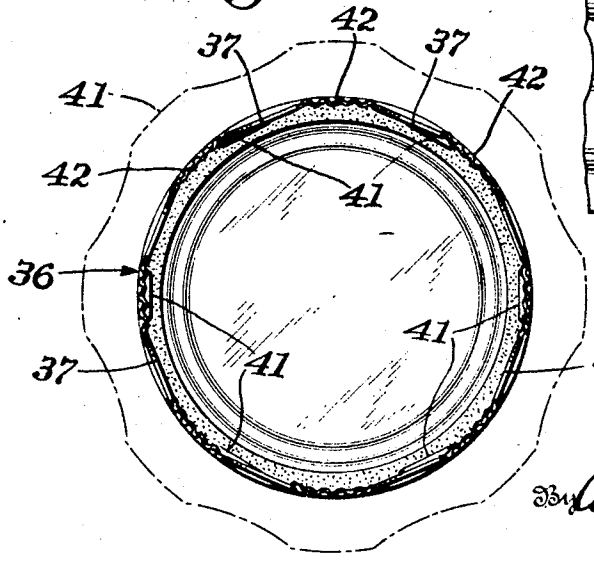


Fig. 13.



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UNITED STATES PATENT OFFICE

2,241,588

CAP

Edward M. Enkur, Baltimore, Md., assignor to Crown Cork & Seal Company, Inc., Baltimore, Md., a corporation of New York

Application January 28, 1941, Serial No. 376,389

5 Claims. (Cl. 215—38)

This invention relates to closure caps of the snap-on type applicable to the mouths of containers to provide a seal for the same, the application being a continuation-in-part of Serial No. 276,478 filed May 29, 1939. While not limited to such use, the new closure is particularly effective as applied to containers, such as tumblers, with a mouth surrounded by a small external bead. In the case of tumblers, the manufacturing tolerances are extreme, and it is the main purpose of the invention to provide a closure which will accommodate itself to the maximum and minimum tolerances encountered in such containers.

In order that the invention may be clearly understood, I shall describe it with reference to the specific showing of the accompanying drawings in which:

Figure 1 is an elevation of a cap according to the present invention and shows the upper portion of the tumbler to which the cap is applied;

Figure 2 is a partial axial section of the cap and container of Figure 1 enlarged about ten times, assumed to be taken on a line substantially as at 2—2, Figure 3;

Figure 3 is a section substantially on line 3—3 of Figure 2 enlarged about five times as compared to Figure 1;

Figure 4 is a partial axial section of the cap and container of Figure 1 on the scale of Figure 2 and assumed to be taken on a line substantially as at 4—4, Figure 3;

Figure 5 is a section similar to that of Figure 3 showing a modification;

Figure 6 is a section like that of Figure 2 showing a further modification;

Figure 7 is a partial section substantially on line 7—7 of Figure 6;

Figure 8 is a partial elevation of the cap of Figures 6 and 7;

Figure 9 is a section like that of Figure 2 showing a still further form of cap;

Figure 10 is a partial elevation of the cap of Figure 9;

Figure 11 is a view like that of Figure 1 showing a further modification;

Figure 12 is a section, enlarged, on line 12—12 of Figure 11;

Figure 13 is a bottom plan view of the cap of Figure 11, the blank being shown in outline.

Figure 14 is a section, enlarged, on line 14—14 of Figure 15, and

Figure 15 is a partial elevation of a cap modified in detail over the cap of Figure 11.

Referring first to Figures 1 to 4, the new cap, which may be readily formed by the rolling method, for example, is generally designated by the reference numeral 10. It comprises a circular top 11 and a depending skirt 12 of resilient cap metal.

A container, for example, a tumbler, generally designated by the reference numeral 13, has a rounded beaded upper edge 14 presenting a downwardly faced locking shoulder 15.

The top 11 of the cap has a diameter substantially greater than the maximum diameter of the beaded edge 14. The skirt has a substantially cylindrical portion 16 and therebelow is bent inwardly to provide an upwardly flaring portion 17 and then outwardly to form a downwardly flaring portion 18, the portions 17 and 18 merging in an intermediate blunt edge 19. Portion 18 is continued downwardly in an inwardly and downwardly directed annular flange 20. Below portion 16 the skirt is provided throughout with corrugations 21 which, as here shown, are in axial planes. The minimum inner diameter of edge 19 between the lug formation is somewhat greater than the maximum diameter of the beaded container edge when the latter is of maximum tolerance.

At spaced points around its circumference the edge corrugations are inset to provide lug formations 22 whose inner ends lie in a circle of less diameter than that of the maximum circle of the beaded container edge whether the beaded edge be of maximum or minimum tolerance or anywhere between the two. The minimum circle of the lug formations is of less diameter than the circle of the lower inner edge of flange 20.

A compressible gasket 23 is retained in the cylindrical portion 16 of the cap by means of the underlying inwardly bent portion 17.

In the application of the cap, the same is placed over the beaded edge 14, flange 20 passing the beaded edge without interference. The cap is supported on the bead by the lugs, the flange cooperating with the bead to maintain the cap against jarring off before sealing pressure is applied. As pressure is exerted on the top of the cap, the lug formations 22 ride downwardly on the beaded edge and are forced outwardly. Their outward movement is facilitated by the resilient corrugations, by a slight straightening of the angle between skirt portions 17 and 18, and by a slight straightening of the circumferential skirt portions between the lug formations 22 as permitted by the clearance between edge 19 and the beaded edge, these features uniting to prevent deformation of the lug formations during ap-

plication. Eventually, the lug formations spring under the shoulder in locking engagement therewith. The gasket **23** is suitably compressed, and a continuing axial tension is exerted on the skirt. Since deformation of the lug formations is prevented, due to the mentioned features, during application, it follows that deformation is likewise prevented during removal. Consequently, the cap may be applied and removed repeatedly without injury.

In Figure 2 it is assumed that the finish has a minimum or nearly minimum tolerance, and, consequently, the inner ends of the lug formations are only slightly spaced away from the container walls beneath the shoulder. With a maximum tolerance, this spacing would of course, be greater. In any event, a continuing skirt tension is maintained, so that the gasket is suitably compressed.

Flange **20** strengthens the lower edge of skirt portion **18** but without impairing the free bellows effect of the skirt, since the corrugations are continued through the flange. The flange also acts as a guard, its lower edge lying fairly close to the outer container wall.

In use, the cap has been found to give a very excellent seal, the lug formations securely gripping under the container shoulder throughout the range of tolerances of the latter.

In Figure 1, the parts are shown in what may be an actual size, and six lug formations, equidistantly spaced apart, are contemplated. There may be a smaller or greater number of these formations, according to requirements.

In Figure 5, the lug formation **24** is formed by blanking out a number of edge corrugations and offsetting the blanked out zone inwardly so as to provide a formation whose inner edge extends substantially as a chord with respect to the skirt. The action of the cap is substantially the same as in the first described form.

In Figures 6 to 8 the cap skirt is provided with a number of lugs **25** whose inner portions **26** are disposed substantially as chords relative to the skirt, the lugs having upper and lower plane surfaces **27** and **28** of which the former terminate upwardly in the lower part of the cylindrical skirt portion **29**, the lower portions **28** terminating downwardly in the upper portion of the bottom flange **30**. Outside of the lug formations the cap structure is identical with that of Figures 1 to 4.

As the cap is applied there is substantially line contact axially between the lugs and the bead **31** of the container, portions **27** eventually snapping under the bead. The cap is somewhat more easily applied than that of Figures 1 to 4 due to the reduced contact area and the more gradual slope of lug portions **28**, and if a mold seam is present on the bead it will not be chipped. In a cap having a diameter of two and three-quarter inches and a skirt with a depth of five-sixteenths inch, the lugs may each have a circumferential dimension of five-sixteenths inch, for example. In such a cap six lugs are desirably provided although the number may be varied. The lugs are ordinarily formed by blanking out the skirt corrugations, but the skirt may be formed with corrugations except where the lugs are formed.

In Figures 9 and 10 the skirt **32** is the same as in the previously described embodiment with the exception that the skirt is brought in a little further circumferentially at the point **33** and lug formations are omitted. A substantially continuous circumferential lock is secured. Reference numeral **34** designates a small opening in the cap top to the outside of the crest of the bead and through which a pointed instrumentality, such as a pin, can be inserted slantwise to puncture the gasket as at **34'** for vacuum relief when the cap is to be removed. Due to its disposition to the outside of the crest of the lip the opening **34** does not impair the seal between the bead and gasket. The use of the opening is, of course, not confined to the species of cap shown in Figures 9 and 10.

The cap **36** shown in Figures 11 to 13 is exactly like the cap of Figure 1, except that the lower portion of the skirt is provided with reentrant scallops **37** which interrupt the lower inturned flange **38** and extend into the lower outwardly flared portion **39** short of the intermediate portion **40**, the latter being provided with in-pressed lugs **41**. The blank from which the cap is formed is shown in dot and dash lines at **41**, Figure 13. As shown, the skirt has eight equidistantly spaced scallops **37** which are separated by straight (i. e. in the same plane) edges **42**. Six lugs are shown, these being equidistantly spaced and related at random to the scallops. However, the lugs may be vertically registered with the scallops or with the edge portions **42**, with the number of lugs equal to the number of scallops. Of course, the number of scallops and lugs may be varied as required.

Due to the provision of the scalloped edge, the skirt is more readily expansible than in the previously described embodiments, and the cap may in particular be used where the glass is light in relation to the gauge of the cap metal. Being more readily expansible the cap can, of course, be more readily applied and removed and, as a consequence, the likelihood of damage to the container through constrictive force is reduced. The depth of the scallops of course affects the strength of the locking zone **40** and consequently is chosen to meet the requirements of the situation.

The cap **43** of Figures 14 and 15, is exactly like that of Figures 9 and 10, except that it is provided with scallops, as at **44**, as in Figures 11 to 13.

Of course, variations in detail from the specific disclosure herein may be made without departing from the invention as defined in the following claims.

I claim:

1. A sheet metal snap-on cap adapted to be applied to a container having a mouth surrounded by a bead, said cap comprising a circular top having a diameter substantially greater than the maximum diameter of said bead, a resilient circumferential skirt depending from said top and provided with corrugations extending in axial planes and completely throughout the length of the skirt, said skirt being bent inwardly below the top and then outwardly to provide oppositely flared upper and lower annular surfaces merging in an abrupt bend at an intermediate portion which has a minimum diameter somewhat less than said maximum diameter so that when the cap is placed on the container said portion will directly support the cap on the container bead, the lower edge of the lower flared surface of the skirt being continued in an inwardly and downwardly directed annular flange which cooperates with said bead to retain the cap on said bead in position to receive sealing pressure whereby said portion is forced past said bead and then springs into direct locking engagement thereunder, and a gasket fixed against the inner surface of said top

in position to engage the bead to provide a top seal.

2. A sheet metal snap-on cap adapted to be applied to a container having a mouth surrounded by a bead, said cap comprising a circular top having a diameter substantially greater than the maximum diameter of said bead, a resilient circumferential skirt depending from said top and provided with corrugations extending in axial planes and completely throughout the length of the skirt, said skirt being bent inwardly below the top and then outwardly to provide oppositely flared upper and lower annular surfaces merging in an abrupt bend at an intermediate portion which has a minimum diameter somewhat less than said maximum diameter so that when the cap is placed on the container said portion will directly support the cap on the container bead, said intermediate portion including circumferentially spaced inwardly projecting lugs, the lower edge of the lower flared surface of the skirt being continued in an inwardly and downwardly directed annular flange which cooperates with said bead to retain the cap on said bead in position to receive sealing pressure whereby said portion is forced past said bead and then springs into direct locking engagement thereunder, and a gasket fixed against the inner surface of said top in position to engage the bead to provide a top seal.

3. A cap according to claim 2 wherein the inner extremities of the lugs are disposed substantially as chords relative to the skirt, the lugs having flat upper and lower portions of which the latter terminate downwardly in the upper portion of said flange.

4. A sheet metal snap-on cap adapted to be applied to a container having a mouth surrounded by a bead, said cap comprising a circular top having a diameter substantially greater than the maximum diameter of said bead, a resilient circumferential skirt depending from said top and provided with corrugations extending in axial planes and completely throughout the length of the skirt, said skirt being bent inwardly below the top and then outwardly to provide oppositely flared upper and lower annular surfaces merging in an abrupt bend at an intermediate portion which has a minimum diameter somewhat less than said maximum diameter so that when the cap is placed on the container said portion will directly support the cap on the container bead, the lower edge of the lower flared surface of the skirt being continued in an inwardly and downwardly directed annular flange, the lower portion of said skirt being provided with scallops or recesses which interrupt said flange and extend into said lower surface short of said intermediate portion, said flange cooperating with said bead to retain the cap on said bead in position to receive sealing pressure whereby said intermediate portion is forced past said bead and then springs into direct locking engagement thereunder, and a gasket fixed against the inner surface of said top in position to engage the bead to provide a top seal.

5. A sheet metal snap-on cap adapted to be applied to a container having a mouth surrounded by a bead, said cap comprising a circular top having a diameter substantially greater than the maximum diameter of said bead, a resilient circumferential skirt depending from said top and provided with corrugations extending in axial planes and completely throughout the length of the skirt, said skirt being bent inwardly below the top and then outwardly to provide oppositely flared upper and lower annular surfaces merging in an abrupt bend at an intermediate portion which has a minimum diameter somewhat less than said maximum diameter so that when the cap is placed on the container said portion will directly support the cap on the container bead, said intermediate portion including circumferentially spaced inwardly projecting lugs, the lower edge of the lower flared surface of the skirt being continued in an inwardly and downwardly directed annular flange, the lower portion of said skirt being provided with scallops or recesses which interrupt said flange and extend into said lower surface short of said intermediate portion, said flange cooperating with said bead to retain the cap on said bead in position to receive sealing pressure whereby said intermediate portion is forced past said bead and then springs into direct locking engagement thereunder, and a gasket fixed against the inner surface of said top in position to engage the bead to provide a top seal.

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