United States Patent [19]

Moller

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[54] **RECESSED CROWN CAP**

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[52] **U.S. Cl.**.....**215/337,** 113/121 A, 215/252, 215/341, 264/268

[51] **Int. Cl.**..... **B65d 53/06**

[58] **Field of Search**..... 215/40, 43 R; 113/80 R, 113/80 DA, 121 A; 264/268

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[57] **ABSTRACT**

This disclosure relates to a roll-on closure for bottles wherein an end panel is connected to a depending skirt through a radiused portion and a transition portion with the radiused portion being recessed relative to the skirt. The cap configuration permits a liner molding punch of the necessary diameter to fully mold the liner to be inserted into the closure. It further permits the molding punch to be substantially centered relative to the end panel whereby a portion of the molded liner engaging the radiused portion is of a substantially uniformed thickness and the thickness thereof may be held to a minimum while still capable of producing optimum sealing results. The roll-on closure construction and liner configuration permits the closure to be applied utilizing much less than normal pressure.

7 Claims, 7 Drawing Figures

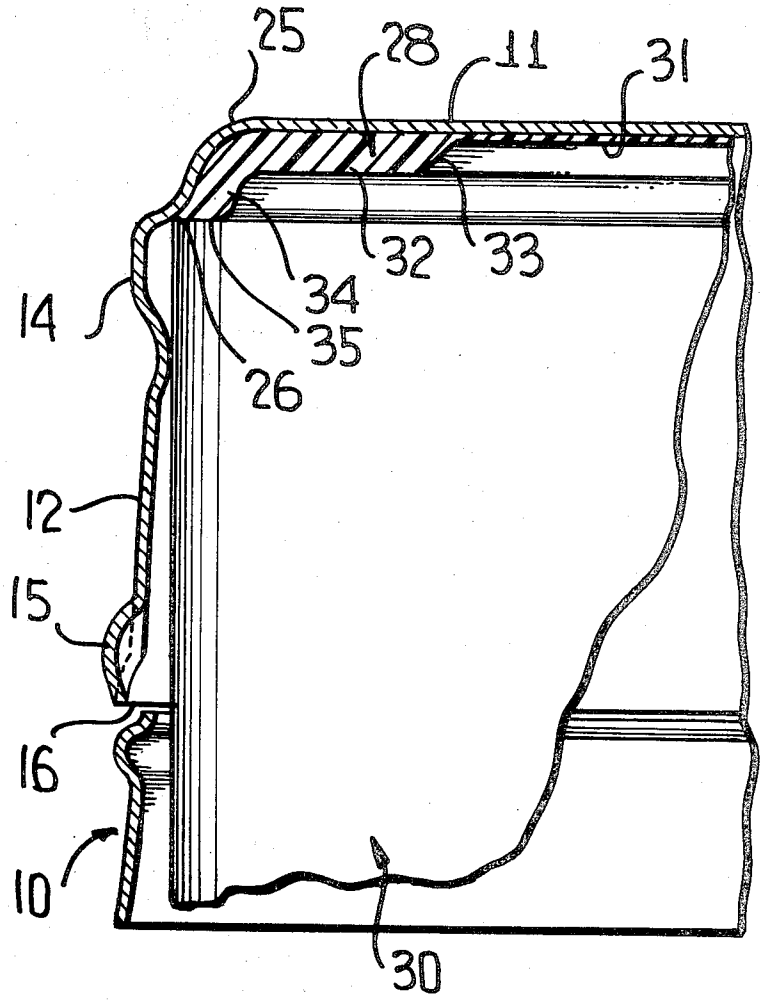


FIG.1

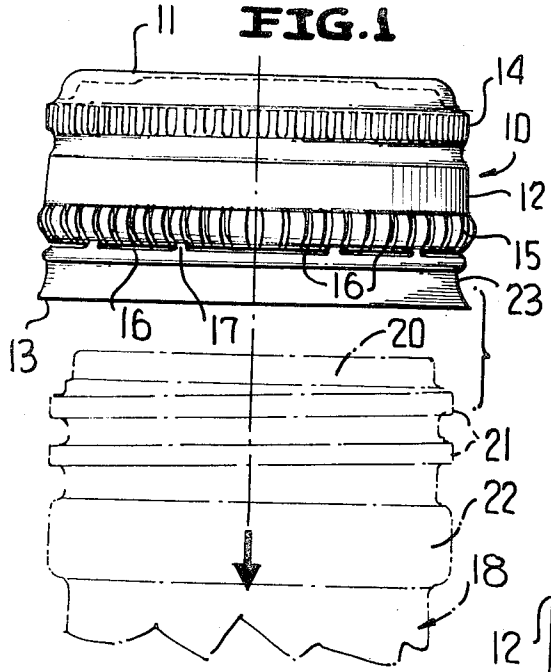
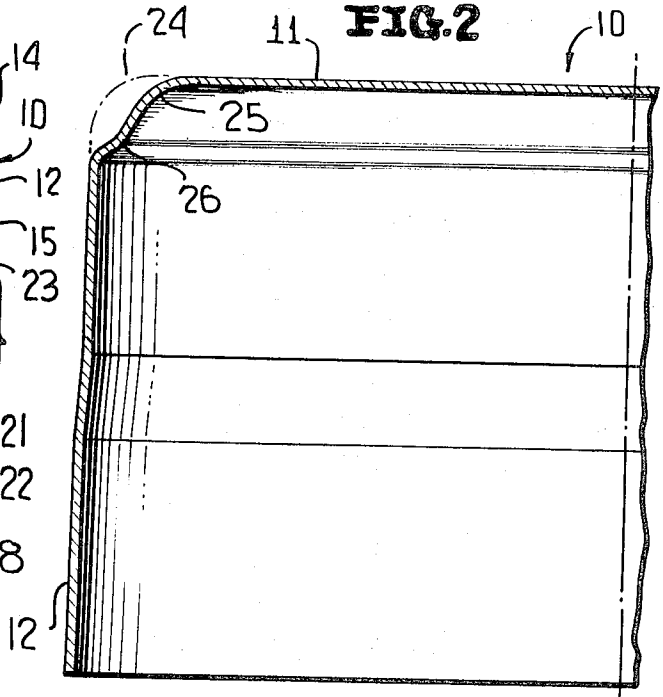


FIG.2



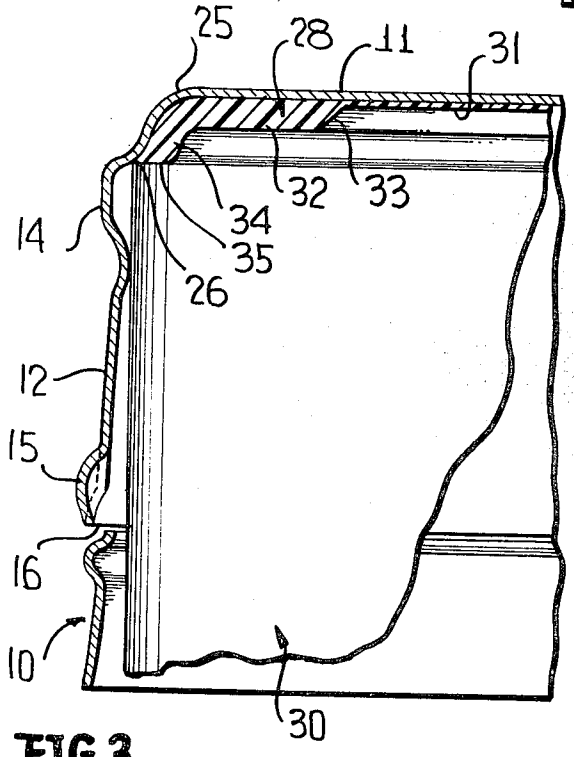


FIG.3

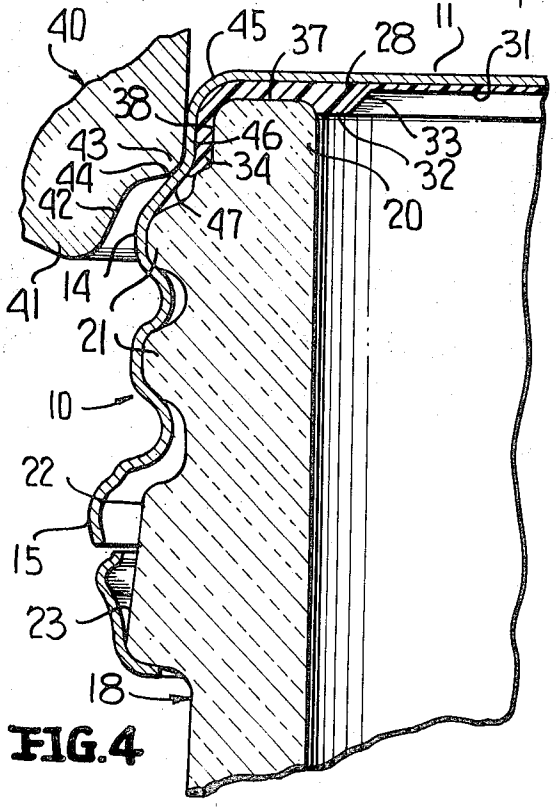


FIG.4

FIG.5

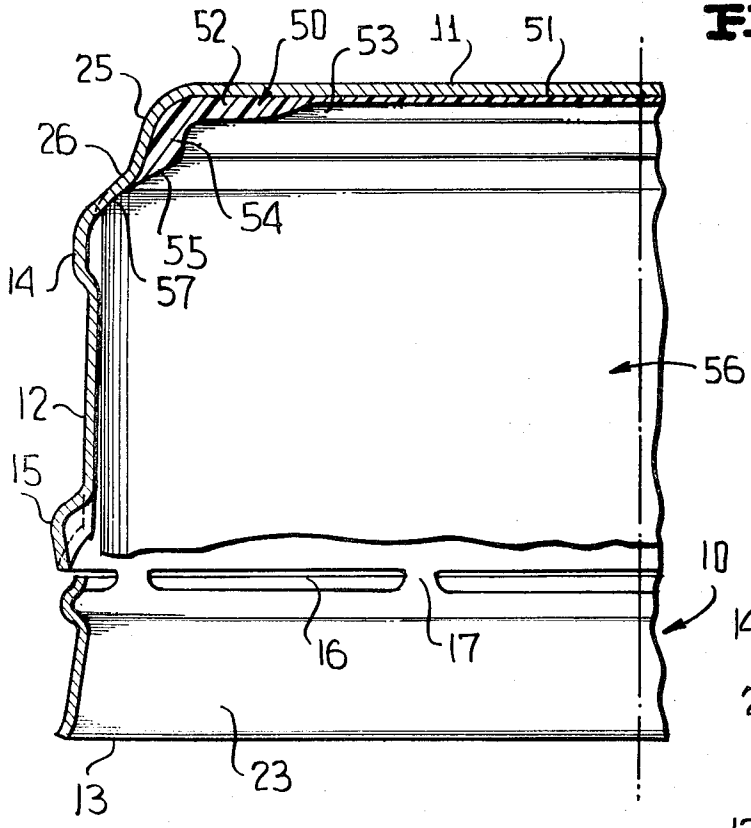


FIG.7

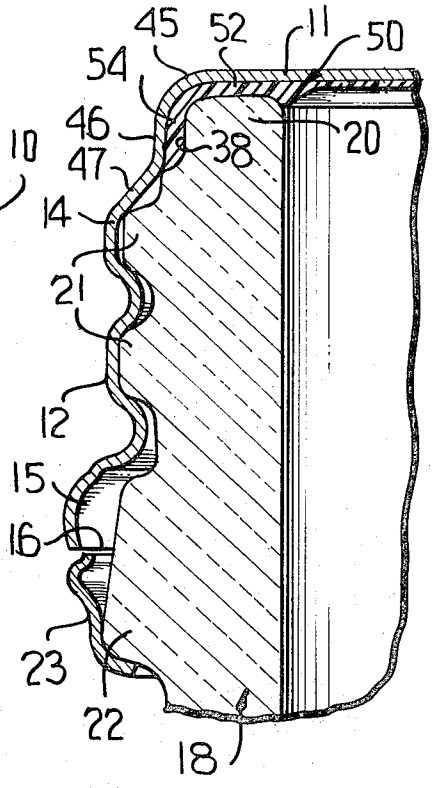
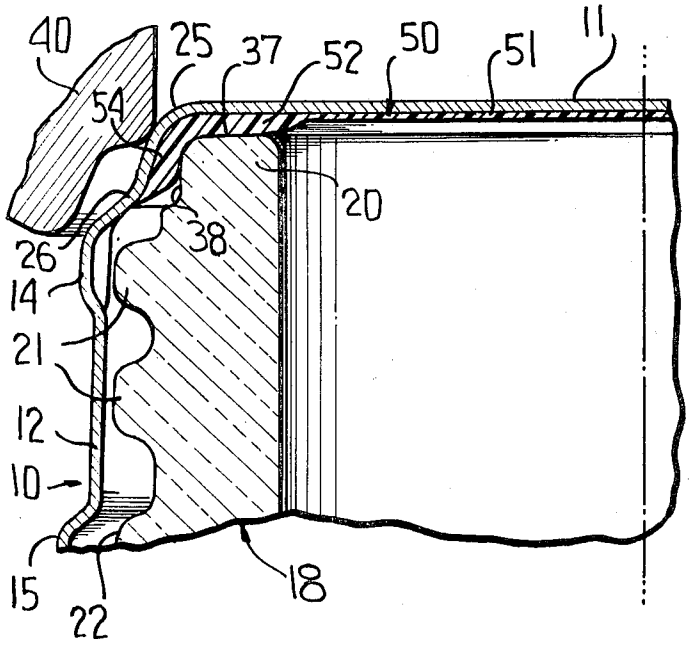


FIG.6



RECESSED CROWN CAP

This invention relates in general to new and useful improvements in closures for containers, and more particularly to a novel roll-on closure construction.

BACKGROUND OF THE INVENTION

Roll-on closures have been generally used for beverage bottle closures. Such closures include a skirt and an end panel with the end panel having formed thereon a liner which is configurated to form a seal with the finish of the bottle with the seal being of a type which is gas tight even under the relatively high pressures which may exist within the bottle.

The liners are molded in place within the closures and in recent years much experimentation has been devoted to the liner configuration so as to assure the desired seal between the liner and the bottle finish.

Certain of the liners have been provided with depending peripheral portions engageable with the external periphery of the bottle finish. This peripheral portion is initially of a diameter well in excess of the diameter of the bottle finish and in the application of the closure, a radiused portion joining the end panel to the skirt of the closure is deformed inwardly with the result that the liner is also deformed inwardly into sealing contact with the periphery of the finish. Considerable deformation of the radiused portion is necessary with the result that loadings on the order of 600 pounds have been required.

Furthermore, in the past since the diameter of the liner has been substantially the same as the internal diameter of the closure skirt, it has been impossible to pass the necessary liner molding punch into the closure with the result that the depending portion of the liner is not always of a uniform configuration nor is it of a uniform thickness. These deficiencies obviously result in improper seals.

SUMMARY OF THE INVENTION

In accordance with this invention, it is proposed to modify the configuration of the roll-on closure in the area of the juncture of the end panel with the skirt so that the radiused portion is recessed and the radiused portion is joined to the skirt by a transition portion. With the radiused portion recessed, the over-all diameter of the liner is reduced to a point wherein the liner molding punch may be of the required size to effectively control the entire molding of the liner. In this manner, the depending portion of the liner which is engageable with the peripheral portion of the bottle finish may be of a uniform thickness and, therefore, a uniform seal between the depending portion of the liner and the periphery of the bottle finish may be assured.

Another advantage of the closure configuration is that the radiused portion being already recessed, a minimum of further deformation is required in the application of the closure to the bottle. The net result is that a good seal may be effected with there being a marked reduction in the necessary application pressure to a pressure on the order of 350 pounds to 400 pounds.

A further feature of the new roll-on closure configuration is that the liner molding punch may engage the transition portion of the closure and substantially form therewith a seal to prevent undesired extrusion of the liner material. This will assure against localized extrusion of the liner material and at the same time assure the existence of sufficient liner material to define the predetermined liner configuration.

A further specific advantage of the closure configuration is that at the time of the final molding of the liner, the closure, through its cooperation with the liner molding punch, is substantially centered with the result that the liner is also centered and the depending portion of the liner which engages the radiused portion is of a substantially uniform thickness.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

IN THE DRAWINGS:

FIG. 1 is a fragmentary exploded elevational view showing a roll-on closure formed in accordance with this invention in position for application to the neck finish of a bottle.

FIG. 2 is an enlarged fragmentary vertical sectional view taken through a partially formed closure after it has been blanked, drawn and trimmed.

FIG. 3 is a view similar to FIG. 1 and shows the same subsequent to a beading and lancing operation with a liner being formed therein by means of a liner molding punch.

FIG. 4 is a sectional view similar to FIG. 2 and shows the closure applied to a bottle, only the upper closing tool being illustrated.

FIG. 5 is a sectional view similar to FIG. 3 but with a different configuration and liner being formed.

FIG. 6 is a sectional view similar to FIG. 5 showing the closure sitting on a glass bottle and the upper closing tool in position for applying the same.

FIG. 7 is a sectional view similar to FIG. 4 and shows the closure of FIG. 5 applied to a bottle.

Referring now to the drawings, it will be seen that there is illustrated in FIG. 1 a closure formed in accordance with this invention, the closure being generally identified by the numeral **10**. The closure **10** includes an end panel **11** and a depending skirt **12**, the skirt **12** being generally cylindrical and terminating downwardly in a circular edge **13**. The skirt **12** is of the double knurled type and includes upper knurling **14** and lower knurling **15**. Below the lower knurling **15**, the skirt **12** is cut so as to have formed therein a plurality of circumferentially extending and circumferentially spaced narrow slots **16** which are separated by bridges **17**.

The closure **10** is particularly configurated for cooperation with a bottle, generally identified by the numeral **18**. The bottle **18** may be formed of any suitable conventional material and includes a neck finish **20** with which the closure **10** will be sealed when placed thereon. The upper neck portion of the bottle **18** is provided with threads **21** with which the roll-on closure **10** will be interlocked after the same is applied. The internal diameter of the skirt **12** is such that the closure **10** may be readily placed thereon, while the skirt **12** is closely spaced from the threads **21**.

Below the threads **21** the neck of the bottle **18** is provided with a shoulder **22** beneath which the lower edge **13** of the closure **10** is intended to be rolled in. At this time it is to be understood that the illustrated closure is of the tamper indicating type and when the closure

10 is removed from the bottle 18, the bridges 17 will rupture and a lower skirt portion 23 below the slots 16 will remain on the bottle.

It is also pointed out at this time that the illustrated closure is intended to be applied to the bottle 18 by a combination seating operation and a thread rolling operation. However, only the details of the seating operation will be described herein, and as far as this invention is concerned, the configuration of the skirt 12 may be modified in any desired manner for cooperation with the threads 21.

In the initial blanking and drawing of the closure 10, the skirt 12 terminates at the upper end thereof in a radiused portion 24. Prior to this invention, no change in the appearance of the radiused portion 24 is made and a suitable liner is applied against the underside of the end panel 11 with the liner extending at least partially around the radiused portion 24. However, as will be readily apparent to one skilled in the art, it is not commercially practical to provide a liner molding punch which can be perfectly centered with respect to the skirt 12 and form a seal therewith in the area of the radiused portion 24. Thus, in the past, when the roll-on closures were applied they were frequently off center and this resulted in sealing difficulties. In accordance with this invention, the skirt 12 and the end panel 11 in the areas of their intersection are deformed further so as to include a radiused portion 25 which is recessed relative to the skirt 12 and which is connected to the skirt 12 by means of a downwardly and outwardly sloping transition portion 26. That portion of the closure 10 in which the necessary liner is to be molded is now of a lesser diameter than the internal diameter of the skirt 12, and a liner molding punch may be readily inserted within the skirt 12 and form a seal with the transition portion 26. At the same time, the liner molding punch may closely fit within the skirt 12 and have an initial centering effect with respect thereto. The closure will be finally centered by the engagement of the liner molding punch with the transition portion 26.

Referring now to FIG. 3, it will be seen that there is illustrated the closure 10 with a liner, generally identified by the numeral 28, applied by means of a liner molding punch 30. The liner 28 is formed from a suitable compound and is molded in the conventional manner by first placing a glob of the compound within the closure 10 on the end panel 11 while the closure 10 is inverted, after which the molding punch 30 enters into the closure and engages the glob of compound and shapes the same to the liner configuration illustrated in FIG. 3.

It will be noted that the liner 28 includes a central portion 31 of a minimum thinness which is integrally connected to an outer portion 32 of a greater thickness, the liner portion 32 being positioned for engagement with the end of the finish of the bottle 18 in a manner illustrated in FIG. 4 and to be described hereinafter. The liner portion 32 is defined in part by an inner edge surface 33 which merges into the central liner portion 31.

The liner 28 also includes a depending portion 34 which extends along and engages the radiused portion 25. The liner portion 34 terminates in a relatively flat surface 35 which is generally planar.

Referring now to FIG. 4, it will be seen that the neck finish 20 of the bottle 18 includes an end surface 37 and a peripheral surface 38. The diameter of the peripheral surface 38 is such that it is freely received in a projecting portion 34 of the liner 28 and the end surface 37 engages the surface of the liner portion 32 outwardly of the side surface 33 thereof. With the closure 10 so positioned on the bottle 18, an upper closing tool 40 is brought down around the upper portion of the closure 10. The closing tool 40 includes a lower portion 41 having a throat 42 which assures the centering of the closure 10 and bottle 18 relative to the closing tool. The closing tool also includes an upper portion 43 which is disposed innermost and which is connected to the throat 42 by means of a radius 44. When the closing tool 40 moves down it will initially engage the radiused portion 25 of the crown cap in the manner illustrated in FIG. 3. Continued downward movement of the closing tool 40 will result in a reforming of the radiused portion so that it now includes a radiused portion 45, which may be decreased in radius, of a 90° extent. The radiused portion 45 terminates in a substantially cylindrical portion 46. The transition portion 26 is also deformed and appears as a substantially conical transition portion 47.

During the seating of the closure 10 on the neck finish 20, the liner portion 32 is deformed so as to tightly fit about the end surface of the neck finish 20. At the same time, the liner portion 34 has been wiped down around the peripheral surface 38 of the neck finish 20 so as to form a complete seal therewith.

It will be readily apparent that the amount of deformation of both the metal of the closure 10 and the material of the lining 28 is held to a minimum in accordance with the invention. At the same time, because the application of the liner portion 34 is more of a wiping action as opposed to a compressing action, a good seal is obtained. The net result is a better seal utilizing a minimum of force in the application of the roll-on closure.

Referring now to FIGS. 5, 6 and 7, it will be seen that there is illustrated a modified form of roll-on closure construction wherein the closure 10 is provided with a liner of a different configuration, the liner being generally identified by the numeral 50. The liner 50 includes a central portion 51 of minimum thickness engaging the end panel 11. The liner 50 also includes a peripheral portion 52 which is of a greater thickness than the portion 51 and which has the inner boundary thereof defined by a sloping side surface 53.

The liner 50 further includes a depending portion 54 which engages the radiused portion 25 of the closure 10. The depending portion 54 terminates in a lower surface 55. It is to be noted that the surfaces 53 and 55 are aligned and form surfaces of a common cone.

The liner 50 is molded by means of a liner molding punch 56. The punch 56 includes a rounded terminal corner 57 which is particularly configurated to internest with the transition portion 56 of the closure. It is also to be noted that the liner molding punch 56 is of a diameter closely approaching the internal diameter of the skirt 12. Thus, when the liner molding punch 56 is inserted into the closure 10 for the purpose of molding a glob of compound positioned on the end panel 11, it will closely interfit within the skirt 12 while being freely movable thereinto so as to substantially center the closure 10 relative to the punch 56. Further movement of the punch 56 into the closure 10 will result in the rounded corner 57 engaging the transition portion 26 and assuring the desired alignment of the punch 56

with the closure **10.** This also assures the centering of the liner **50** as it is being molded within the closure.

Referring now to FIG. **6,** the initial relationship of the liner **50** with respect to the neck finish **20** is illustrated. It is to be noted that the internal diameter of the liner portion **54** is only slightly greater than the diameter extends radially inwardly of the external neck finish surface **38.** It is also to be noted that the liner portion **52** extends radially inwardly of the neck finish so that a complete mating surface is provided between the end surface **37** and the neck finish **20** and the liner portion **52.**

When the closure **10** incorporating the liner **50** is applied to the bottle **18** utilizing the upper closing tool **40,** the upper peripheral portion of the closure **10** is deformed in the same manner described with respect to FIG. **4** wherein the radiused portion **25** and the transition portion **26** have the configurations thereof changed and the end panel **11** becomes connected to the skirt **12** by the radiused portion **45,** the cylindrical portion **46** and the transition portion **47.** It will also be seen that the liner portion **52** is axially compressed and the liner portion **54** is wiped against the peripheral surface **38** of the neck finish **20** to provide for an effective seal.

Although only two preferred embodiments of the invention have been specifically illustrated and described herein, it is to be understood that minor variations may be made in the closure and liner configuration without departing from the spirit and scope of the invention, as defined by the appended claims.

I claim:

1. A roll-on closure prior to being assembled upon an associated bottle comprising an end panel and a depending peripheral skirt, a readily deformable radius portion between said end panel and said peripheral skirt, said radius portion including a first concavely inwardly opening radius most immediately adjacent said end panel and a second concavely outwardly opening radius most immediately adjacent said peripheral skirt, a liner within said roll-on closure having a first liner portion engaging said end panel and a second liner portion engaging said first and second radiuses of said radius portion, said peripheral skirt having an internal surface defining a molding punch centering guide, said first radius being radially inwardly offset from said peripheral skirt and from said molding punch centering guide surface, whereby a liner molding punch will freely pass into said peripheral skirt, the roll-on closure will be substantially centered relative to the molding punch by the molding punch centering guide surface during the molding of the liner, and the molding punch will seat against said second radius thereby assuring a substantially uniform thickness of said second liner portion, and said liner being of a diameter less than that of the interior of said peripheral skirt and being disposed radially inwardly of said second radius of said radius portion.

2. The roll-on closure as defined in claim **1** wherein said second liner portion terminates at a flat surface between said second concavely outwardly opening radius and said molding punch centering guide.

3. The roll-on closure as defined in claim **2** wherein said flat surface is planar.

4. The roll-on closure as defined in claim **2** wherein said first liner portion has a radially inner edge surface aligned with and forming a spaced continuation of said flat surface.

5. The roll-on closure as defined in claim **4** wherein said flat surface and said inner edge surface lie along a common conical surface.

6. The roll-on closure as defined in claim **1** including a downwardly and outwardly sloping transition portion between said second concavely outwardly opening radius and said molding punch centering guide, said transition portion having an intermediate diameter corresponding to the intended liner molding punch external diameter, and said liner second portion terminating at said transition portion.

7. A method of molding a liner in a roll-on closure comprising the steps of forming a roll-on closure having an end panel and a depending peripheral skirt, a readily deformable radius portion between the end panel and the peripheral skirt, the radius portion including a first concavely inwardly opening radius most immediately adjacent the end panel and a second concavely outwardly opening radius most immediately adjacent the peripheral skirt, and the peripheral skirt having an internal surface defining a molding punch centering guide; disposing liner material between the interior of the closure and a molding punch, relatively telescopically moving the molding punch and the closure such that the latter is centered relative to the molding punch by means of the molding punch centering guide, seating the molding punch against the second concavely outwardly opening radius to define an area between the latter, the first concavely inwardly opening radius, the end panel and the terminal end face of the molding punch, and molding the liner material into a liner within the aforementioned area.

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