July 18, 1967 N. T. EXTON 3,331,523

CONTAINER CLOSURE MEMBER AND LINER THEREFOR

Filed Feb. 15, 1965 3 Sheets-Sheet 1

Fig. 1.

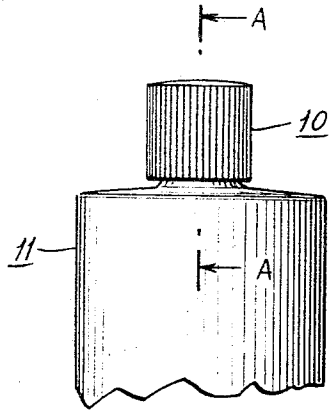


Fig. 4.

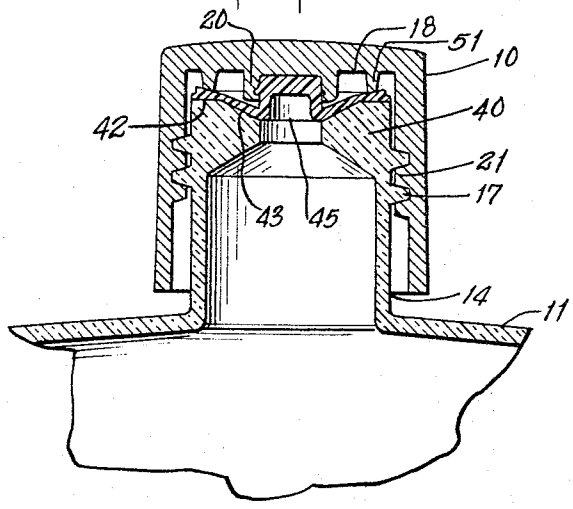


Fig. 6.

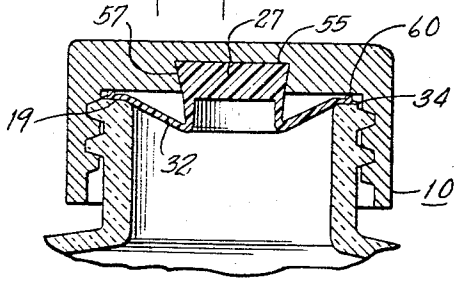


Fig. 5.

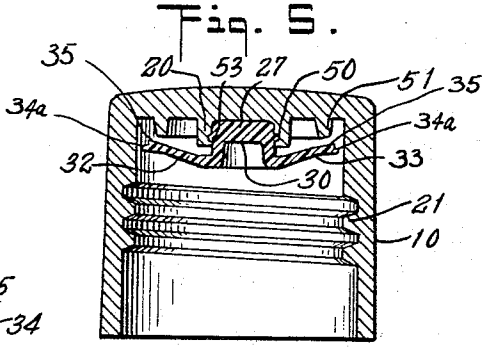


Fig. 3A.

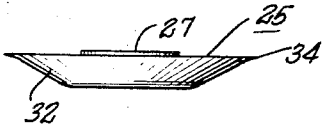


Fig. 2.

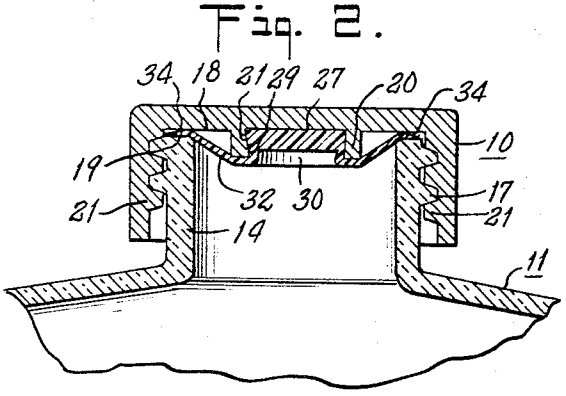
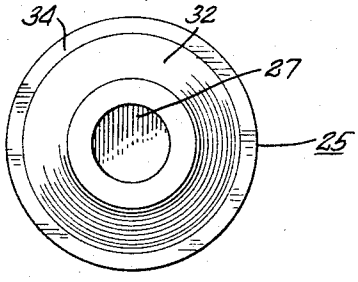


Fig. 3B.



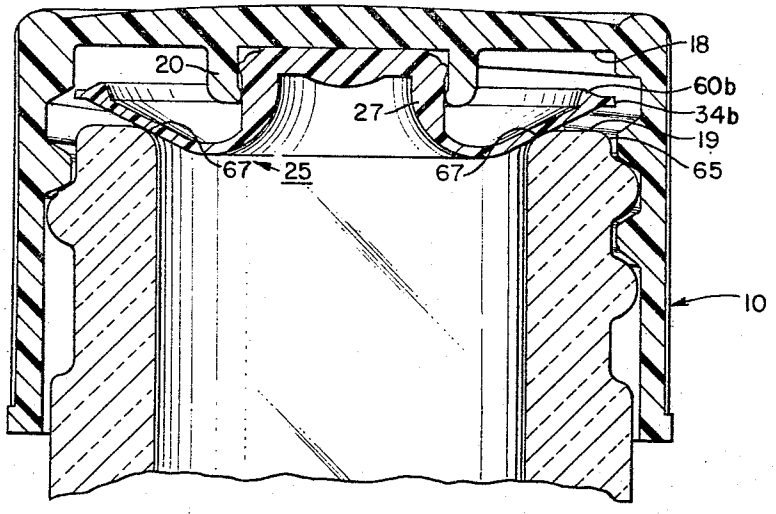
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CONTAINER CLOSURE MEMBER AND LINER THEREFOR

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FIG. 7A



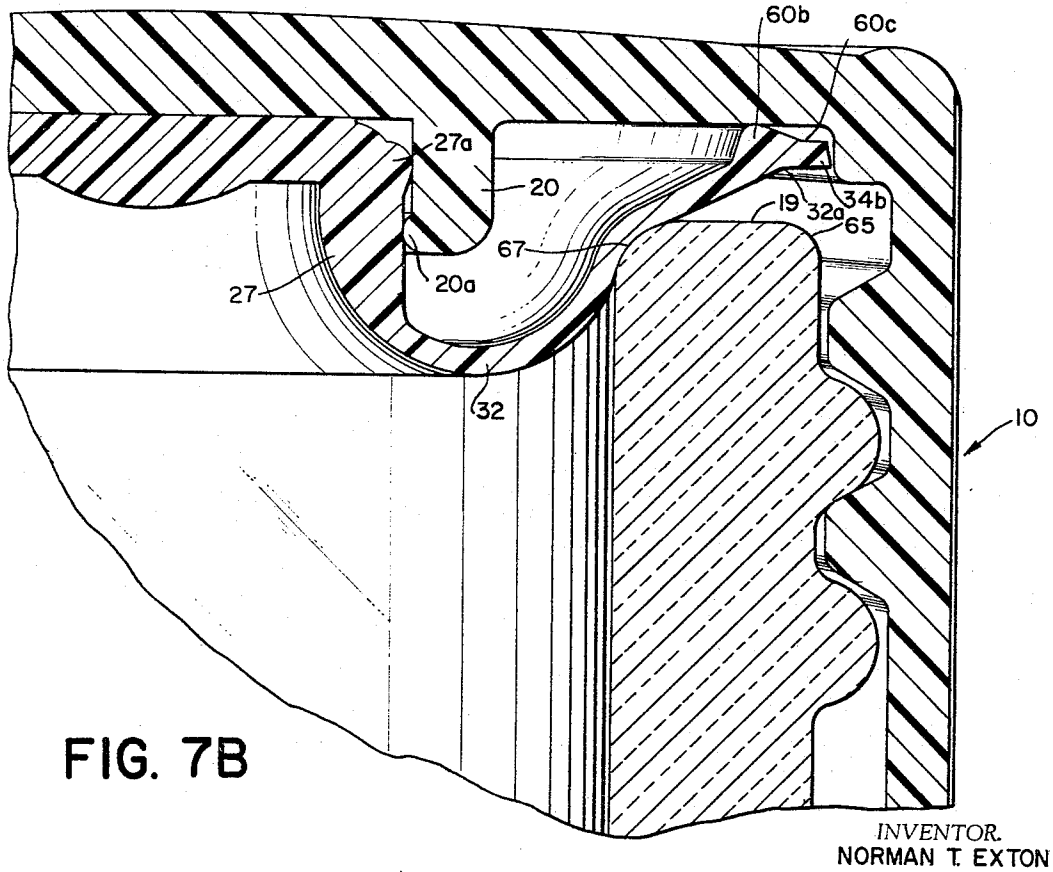


FIG. 7B

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CONTAINER CLOSURE MEMBER AND LINER THEREFOR

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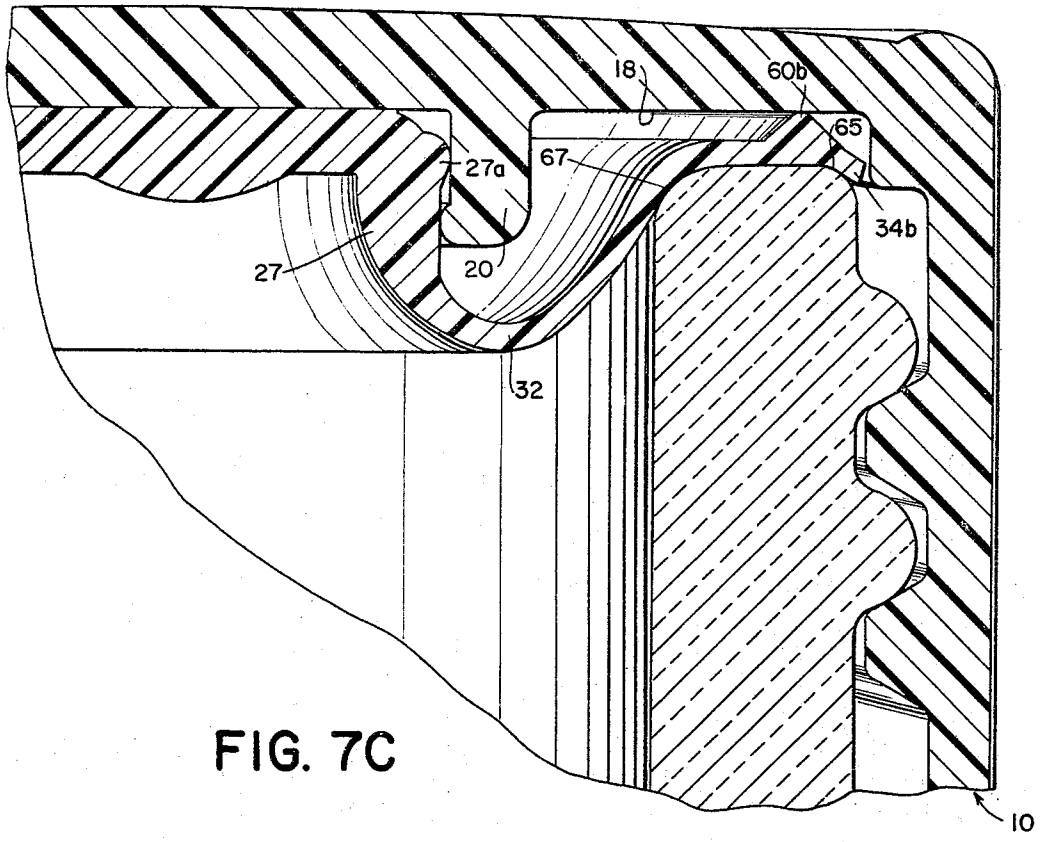


FIG. 7C

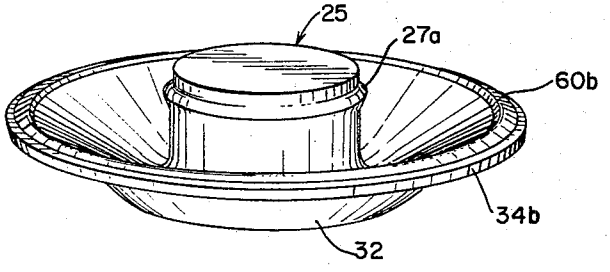


FIG. 8

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3,331,523

CONTAINER CLOSURE MEMBER AND LINER THEREFOR

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Filed Feb. 15, 1965, Ser. No. 432,760
6 Claims. (Cl. 215—40)

This application is a continuation-in-part of my prior copending application S.N. 22,945, filed Apr. 18, 1960, and now abandoned, which is assigned to the same assignee.

This invention relates to closure members for bottles, jars and other similar containers and more particularly to a cap and liner arrangement for sealing a container opening.

When using a bottle, jar or other similar container, it is necessary to provide a closure member to seal the container opening so that the material (solid, liquid or gas) therein cannot leak out of or evaporate from the opening. Such a seal is also necessary to prevent contaminants from getting into the container.

One type of seal which may be used for a container has a cap with a cork or a fibre liner. The liner is usually glued to the inside of the cap. After a time, the glue holding the liner to the inside of the cap is either eaten away by the contents of the container or else it loses its adhesive power and the liner separates from the cap. When this happens, the liner sticks to and covers the container opening each time the cap is removed. It is often difficult and time consuming to remove a sticking liner from the container in order to remove the contents therefrom. In many cases where the liner separates from the cap, it gets lost and the seal is then broken thereby exposing the contents of the container to contamination.

In some cases, the contents of the container dissolve the liner so that small bits or pieces are broken from it. This not only destroys the seal but the bits or pieces often fall into and contaminate the contents of the container.

Other types of seals for containers utilize a cap with a liner made of plastic material. In this type of seal, some arrangement must be provided for fastening the liner to the inside of the cap so that the liner will not separate from the cap. One way to accomplish this is to fuse the liner to the inside of the cap to make it integral therewith. The fusing process becomes difficult and relatively expensive in view of the wide variety of materials which are used for caps, for example, plastics, rubber, Bakelite, metal, glass, etc. It is therefore desirable to provide a relatively inexpensive and easy way of fastening a liner to a cap in a manner so that it will not separate therefrom and to provide a liner having good sealing properties.

The present invention accomplishes the aforesaid objectives by providing a novel cap and liner for use with a container. In accordance with the invention, the cap has a stud on its top inner surface which is shaped to hold a liner in a manner so that the liner cannot move. The liner is made of flexible material with a protruding button portion which is inserted into the cap stud. When the button is snapped into the cap stud the liner becomes attached to the cap. Thus, separation of the liner from the cap is prevented and no glue is used. In order to provide a good seal, the liner is shaped with a flared skirt so that a portion of the liner extends into the container opening. The outer edge of the flared portion of the liner lies over the rim of the container opening and a seal is made as the inside of the cap presses the overlying flared portion of the liner onto the rim when the cap is screwed down. Since the liner is flared, a number of different sizes and shapes of container openings can be sealed by a single liner within its dimensional limitations.

It is therefore an object of this invention to provide a novel cap and liner for sealing containers.

Another object of this invention is to provide a liner for a container cap which can seal a number of sizes and shapes of container openings within the dimensional limits of the liner.

A further object of the invention is to provide a cap and liner for sealing container openings in which the liner is fixedly fastened to the cap.

Still another object of the invention is to provide a cap and liner for sealing a container in which the liner is made of a flexible material and is fastened to the cap so that it will not be separated therefrom.

Other objects and advantages of the present invention will become more apparent upon referring to the following specification and annexed drawings in which:

FIGURE 1 is an elevational perspective view showing a portion of a container and a cap therefor;

FIGURE 2 is a partial section of one embodiment of the invention taken along lines A—A of FIGURE 1;

FIGURE 3A is a side view of the liner used in the embodiment of FIGURE 2;

FIGURE 3B is a bottom plan view of the liner of FIGURE 2A;

FIGURE 4 is a partial section of another embodiment of the invention taken along lines A—A of FIGURE 1 with the cap fastened to the top of the container;

FIGURE 5 is a sectional view of the cap of FIGURE 4 removed from the top of the container;

FIGURE 6 is a partial section of still another embodiment of the invention taken along lines A—A of FIGURE 1;

FIGURES 7A, 7B and 7C are views taken in section, with FIGS. 7B and 7C being a fragment of FIG. 7A, of a closure illustrating the operating principles of the present invention; and

FIGURE 8 is a perspective view of the liner of the closure of FIGURES 7A–7C.

Referring to FIGURE 1, a cap **10** is shown fastened to the top of a container **11**. It should be realized that the container **11** may be any size and/or shape of bottle, jar, jug, etc. The container **11** may be made from any suitable material such as glass or other vitreous material, plastic, metal, etc. It should also be realized that the cap **10** may be made of any suitable material such as plastic, rubber, glass or other vitreous material, Bakelite, etc.

Referring now to FIGURE 2, the container **11** has a neck portion **14** which forms an opening through which the container is filled and the contents in the container extracted.

The outer wall of the neck **14** is formed with a plurality of threads **17** onto which corresponding threads of the cap **10** are screwed. The neck of the container terminates in a lip or rim **19**.

It should be realized that the particular shape of the neck of the container shown and the size and shape of the opening formed thereby are only illustrative and that the invention will operate with other shapes and sizes of container necks and openings.

A stud in the form of an annular ring **20** is formed on the top inner surface **18** of the cap **10**. The formation of the stud **20** may be accomplished by any suitable process, for example, molding it integrally with the cap. The inner wall **21** of the stud **20** is undercut, as shown by the slanted lines so that the diameter of the annular ring is smaller at the side of the ring furthest from the inner surface of the cap **10**. This is done in order that the stud **20** can receive a liner **25** and fixedly fasten it to the cap. The inner

side walls of the cap **10** have threads **21** which mate with the threads **17** on the neck **14**. The cap **10** is screwed down onto the threads **17** in order to fasten it to the neck of the container and to seal the opening therein.

The liner **25**, which is shown in detail in FIGURES 2, 3A and 3B, is formed of any suitable resilient and flexible material which will not react unfavorably with the contents of the container **11**. Some of the materials which can be used for the liner **25** are plastics such as polyethylene, polypropylene, vinyl chloride and copolymers thereof, any elastomer, etc., and other flexible materials such as rubber, nylon, etc.

The liner **25** is formed by any suitable process such as molding, etc., and has a button **27** which may be solid (as shown) or hollow. The height of the button **27** is approximately equal to the depth of the hollow portion of the stud **20**. The wall of the button **27** is undercut at **29** (FIGURE 2) with the top of the button being wider than its bottom so that the button is held by the undercut inner wall **21** of the stud **20**. To fasten the liner **25** to the cap **10**, since the liner is made of a resilient material, it is only necessary to press the button **27** into the recess formed by the stud **20**. Due to the shapes of the stud **20** and the button **27**, the liner is held fast to the cap **10** and cannot move with respect thereto.

The liner **25** has a slight depression **30** at the bottom of the button **27**. The liner flares out from this depression with a skirt **32** which is generally of inverted frustroconical shape. The skirt wall **32** tapers upwardly from the end of the depression in the button **27** in the manner shown. The particular angle of taper is not critical, so long as a good seal can be effected. It has been found that a variety of different angles can produce a good seal. The diameter of the skirt **22** is also not critical. Factors to consider in its selection are the size of the opening which is to be sealed, the internal diameter of the cap **10**, and the width of the sealing lip of the bottle.

The edge of the wall **32** has a thin rim portion **34** around its edge. The thin portion **34** is more easily deformed by the pressure of the cap **10** than is the other portion of the skirt wall **32** which is of slightly greater thickness. However, it should be realized, that the thickness of the skirt wall **32** is not critical as long as it may also be deformed by the pressure of the screwed down cap to form the seal. When the exact sizes of the rim and neck of the container are known, the thin rim **34** may be provided, if desired, in order that the skirt wall **32** may be more easily deformed.

In operation, when the cap **10** is screwed down onto the threads **17**, the skirt wall **32** is forced against the rim **19** by the inner surface **18** of the cap **10**. In the embodiment shown, the thin rim **34** of the sheet **32** is pressed against the rim **19**. This forms a seal around the rim **19** of the container. It should also be noted that, due to the tapering of the skirt wall **32**, the bottom of the skirt **32** makes contact around the entire inner edge of the rim **19**. This provides an additional seal and keeps chips from the rim of the container from falling into the container contents. In general, the angle of taper of the skirt wall **32** is chosen so that the seal around the entire inner edge of the rim **19** is obtained.

It should be noted that the liner **25**, due to its resiliency and tapering shape of the skirt wall **32**, can accommodate a number of different sizes of openings in the neck **14**. For example, consider the case where the neck **14** is thicker than that shown and the liner **25** is the same size and shape. In this instance, as the cap **10** is screwed down, the wall **32** makes the seal around the inner edge of the rim **19** closer to the stud **20** than shown in FIGURE 2 and more of the rim of the skirt **32** is deformed over the top of the rim to form the seal. On the other hand, when the opening in the neck is wider, the seal with the inner edge of rim **19** would be made further away from the stud **20** and less of the skirt **32** would be deformed over the top of the rim.

It should be realized that the flexible materials of the liner acquire a partial positional set, due to their elasticity, once they are deformed to a particular shape. However, when the deforming pressure is removed, such as by unscrewing from the container, there is enough resiliency normally left in the liner to make it spring back almost to its normal unset position. Even when the liner is completely deformed, it will conform to the opening and therefore still provide a good seal. In the embodiment shown in FIGURE 2, when the cap **10** is removed from the container **11** the thin rim **34** and the other portion of the skirt wall **32** which was set against the rim **19**, i.e., that portion of the liner lying outwardly of the point on the skirt wall **32** which contacts the liner edge of the bottle lip, drop down from the inner surface **18** of the cap **10**. This is shown in FIGURE 5, which will be described with respect to another embodiment of the invention.

It should be realized that shapes for the stud **20** other than the annular ring shown in FIGURE 2 can be utilized. For example, the stud **20** may be rectangular, square, triangular, or any general polygonal shape. Also, the stud **20** can be sectionalized to accommodate a button **27** of two or more sections. It should also be realized that ways of fixedly fastening the liner **25** to the cap **10**, other than the corresponding undercuts shown in FIGURE 2 may be utilized. For example, a rim may be formed around the button **27** which is adapted to mate with a corresponding groove on the inner wall of the stud **20**. This particular arrangement is shown in FIGURES 4 and 5. It will be obvious that, due to the resiliency of the material forming the liner **25**, any suitable way of fixedly fastening the liner to the cap can be used.

Referring now to FIGURES 4 and 5, another embodiment of the invention is shown as used with a container having a different size opening and neck shape. The neck **14** of the container shown in FIGURE 4 has a built up upper section **40** which is formed with an inwardly sloping surface **43** and a flat rim **42**. The built up section **40** is shaped to provide a narrow spout or opening **45** for the container so that only a small amount of the container contents can be dispensed therefrom at a given time. Such a container is very popular in after shave lotion, cologne, powder and perfume bottles, etc.

A stud **20** is formed on the top inner surface **18** (FIGURES 4 and 5) of the cap **10** in the same manner as that shown in FIGURE 2. However, instead of the stud **20** being undercut, it is provided with a groove **50** in its inner wall, whose function will be subsequently described. Also, formed on the top inner surface **18** of the cap **10** is an annular ring **51** which extends down into the hollow section of the cap, to engage the liner and force it against the rim **42** of the neck **14**.

The liner for the cap of FIGURES 4 and 5 is of the same general shape as the liner for the cap of FIGURE 2. In addition to having the hollow depression **30** at the bottom of the button **27**, the button is also formed with a ridge **53** which mates with the groove **50** of the stud **20**. This arrangement fastens the liner to the cap so that it cannot be moved under normal conditions of the cap being placed on and removed from the container. The skirt wall **32** of the liner **25** is also tapered, the same as in FIGURES 2–3, in order to effectuate a seal. However, the edge of the skirt **32** is not thinned out in this embodiment of the liner as it is in the embodiment of FIGURES 2–3. The skirt wall **32** of FIGS. 4 and 5 terminates its upper surface in a high point **35** with a portion **34***a* extending therebeyond.

As shown in FIGURE 4, when the cap **10** is screwed down onto the neck of the bottle **14**, the container opening is sealed. Due to the tapering shape of the skirt wall **32**, and the flexibility of the liner **25**, the skirt wall **32** conforms to and lies against the slopping edge **43** of the neck. This in itself provides a seal. Further, when the cap is screwed down, the annular ring **51** forces the lower surface of the liner skirt wall **32**, which it contacts ad-

jacent high point **35** on the upper surface, against the flat rim **42**. The latter provides a tight seal with the neck of the container so that even when the bottle is turned upside down and shaken, its contents cannot escape. It can be seen that a portion of the generally frusto-conical skirt wall is bent over to a substantially flat position on rim **42** with the point **33** of the liner contacting the inner edge of the rim therearound.

FIGURE 5 shows the cap and liner removed from the container **11**. It should be noted, that due to the co-action of the groove **50** in the stud **20** and the rim **53** on the button **27**, that the liner **25** cannot normally be separated from the cap when the cap is removed from the container. This is true even though the contents of the container may be glue or some other similar material which would adhere to the liner. In FIGURE 5, it can be seen that when the cap is off the top of the container, that the edge of the skirt wall **32** outwardly of point **33** which contacted the inner edge of the rim **42** drops down slightly from the annular ring **51**, i.e., it is deformed slightly from its original continuously upward sloping shape. When the cap is again screwed onto the container the ring **51** presses the edge against the rim **42** to remake the seal.

FIGURE 6 shows another embodiment of the invention which utilizes a different way of holding the liner and also a slightly modified type of liner. While this cap and liner assembly is shown and described as used with a container opening of the type shown in FIGURE 2, it should be obvious that it would also apply to a container having an opening of the type shown in FIGURE 4, and containers having other types of openings. The cap **10** is formed with a recessed hollow portion **55** having an undercut inner wall **57**, on its top surface to receive the undercut button **27** of the liner. As described before, this arrangement holds the liner fixedly to the cap. It should be realized that the rim and groove arrangement of FIGURES 4–5, or any other suitable arrangement, may also be utilized to hold the liner to the cap.

The outer edge **34** of the flared skirt wall **32** is made thinner than the rest of the wall as previously described with respect to FIGURES 2 and 3, so that it may easily be deformed over the rim **19** on the neck of the container. The upper surface of the skirt wall **32** is formed with a bead **60** around a circumference near its outer edge. The bead **60** helps to make a good seal since it is pressed against the inner surface of the cap, when the cap is fastened to the container neck, and therefore firmly presses the bent-over portion of the skirt wall against the rim **19**. The bead **60** therefore provides added resiliency for the outer portion of skirt wall lying over the rim **19** when the cap is fastened to the neck.

As discussed above, the point at which contact is made between the inner edge of the bottle lip **19** or **42** and the main portion of the liner skirt wall **32** is determined by the inner diameter of the bottle lip. It also should be clear that the width of the main portion of the skirt wall **32** making contact with and lying on the flat portion of lip **19** is determined by the width of the bottle lip. Therefore, both the width of the bottle lip and the inner diameter of the lip determine the position of the bead **60**, as well as the position of the portion **34** of the liner lying outwardly of the bead, with respect to the bottle lip.

It has been found that an additional advantage is obtained by the bead **60** and portion **34** of the liner lying outwardly of the bead when certain relationships exist between the outer diameter of the bottle lip and the outer diameter of the liner. This is described in greater detail with respect to FIGURES 7A–7C and 8.

As seen in FIGURES 7A–7C the stud **20** on the cap and the button **27** on the liner are of slightly different configuration than previously shown. Here, the stud **20** is formed with a rib **20***a* while the button **27** is formed with an enlarged diameter knob **27***a*. The respective sizes of the rib **20***a* and the main, or smaller diameter, portion of the button are selected so that the rib **20***a* provides a tight engaging fit therewith. Similarly, the size of the knob **27***a* is selected to provide a tight engaging fit with the inner wall of the larger diameter portion of the button **20** as shrown in each of the figures. It should be understood that since the liner and its button **27** are made of resilient material, that it is possible to size the knob **27***a* and the rib **20***a* with respect to the corresponding portions of the stud and button which they contact so that a tight engaging fit is secured between the liner and the cap. This fit can be selected, as desired, so that the liner will not move axially and/or even rotate when the cap is fastened or unfastened to the bottle.

As can be seen in FIGURES 7A–7C and 8, the liner **25** is of generally frusto-conical shape as in the other figures of the drawing. A raised bead **60***b* is provided on the upper surface only of the skirt wall in the same manner as the bead **60** of FIGURE 6. The bead **60***b* is shown as being generally triangular in shape with the apex being slightly rounded. Of course, any other suitable shape may be utilized for the bead, such as the semi-circular form of FIG. 6.

The liner is also formed with a rim portion **34***b* which lies outwardly of the bead **60***b*. As shown more clearly in FIGURE 7B, the upward taper of the lower surface of the skirt wall **32** ends slightly to the right (outside) of the apex of the bead **60***b* at point **32***a*. From there, the bottom portion of rim **34***b* extends outwardly at an angle with respect to the upwardly tapering portion of the main skirt wall. If desired the lower surface of rim **34***b* can be made to start more to the left in FIG. 7B, i.e., to be more directly under the apex of the bead or even inside the apex toward the inner edge of the upwardly sloping surface of the bead. The top surface of the rim **34***b* starts after the downward taper of the bead **60***b* ends at point **60***c*. Rim **34***b* is like the rim portion **34** of FIGURE 6 which extends outwardly of the bead **60**. Although rim **34***b* is shown as being of generally the same thickness as the main portion of the skirt wall **32** it should be understood that it also may be "feathered" as described with respect to FIGURE 6.

FIGURE 7A shows the threads of the cap engaging the threaded neck of the bottle. Here, the closure has been tightened down to a point on the neck where the main portion of the upwardly sloping skirt wall **32** is just contacting the inner edge of **67** of the bottle lip with insufficient pressure being applied to deform the skirt wall in any manner.

FIGURE 7B shows the closure after it has been tightened down slightly onto the neck of the bottle. Due to the fact that the button **25** is initially inserted all the way home into the stud **20**, so that its top abuts the undersurface **18** of the cap, the portion of the upwardly sloping main skirt wall **32** contacting the inner edge **67** of the lip is forced down slightly into the bottle opening to form a first sealing area around edge **67** as the cap is tightened down. As tightening of the closure continues, the apex of the bead **60***b* contacts the under surface of the cap. At this time, continued tightening down of the cap onto the neck of the bottle causes the force exerted by the cap **10** against the bead **60** to bend down that portion of the main skirt wall **32** of the liner shown to the right of the inner edge of the bottle lip **67** in FIGURE 7B around, down and onto the flat portion of lip **19**. Stated another way, the portion of the liner to be bent down onto the lip **19** is pivoted on the bottle lip where the skirt wall contacts the inner edge **67**.

The use of the bead **60***b* to provide this bending down of the main portion of the skirt wall onto the lip of the bottle is advantageous since it provides a positive engagement between the liner and the undersurface of the cap in a manner such that there can be no slipping.

FIGURE 7C shows th closure after it has been fully tightened down. Here, it can be seen that a considerable portion of the skirt wall prior to termination of its up-

wardly extending portion at point 32*a* lies on the flat portion of the bottle lip. This forms the second sealing area. The seal on the flat portion of the bottle lip **19** is enhanced due to the pressure applied from the cap through the bead **60***b* since the bead concentrates the capping torque applied to the closure. The bead **60***b* also serves as a reinforcing member since, if it were not present, then the entire area of the liner skirt wall **32** lying on the flat portion of the bottle lip would be engaged by the cap and would be flattened out, possibly to a degree where it no longer had an resiliency. The bead **60***b* is made of sufficient thickness to prevent this so that engagement is made only between the undersurface of the cap and the liner at the upper portion of the bead.

In situations where the outer diameter of the bottle lip is less than the overall outer diameter of the liner **32**, the rim portion **34***b* of the liner performs another function in cooperation with the bead **60***b*. Due to the pressure exerted on the bead **60***b*, when the diameter relationship referred to above exists, the portion **34***b* is spun down over and around the outer edge **65** of the bottle lip, as shown in FIG. 7C. This provides what in some cases may be a third sealing area around the outer edge **65** of the lip. This is highly advantageous since, in addition to forming what is effectively the third sealing area, it is also useful in preventing the outer edge of the rim **34***b* from bunching up against the cap thread to keep the cap from being fully torqued down.

To enhance the action of the rim **34***b* being placed around the outer edge **65** of the lip, the liner portion **34***b* may originally be formed with a slight downwardly extending angle and the dimensions of the liner and bottle lip selected so that at least the apex of the bead **60***b* lies over the lip **19** when the closure is in the substantially fully tightened down position. This ensures that the portion **34***b* will be extended downwardly around the outer edge **65**. The other functions previously ascribed to the bead **60***b* are still achieved.

It should be understood that the placement of the rim portion **34** around the outer edge **65** of the bottle neck occurs even when the portion **34** is feathered, as in FIG. 6, or of different thickness from that of the rest of the skirt wall, so long as it is not made too thick, for example of the combined height of the skirt wall and bead. The portion **34** preferably should be thinner than the combined thickness of the liner skirt wall and the bead.

It should be realized that the various types of caps and liners shown in FIGURES 2–3, 4–5, and 6, may have their features interchanged. For example, the caps of FIGURES 2 and 6 may be provided with the annular ring **51** of the cap of FIGURE 4. As another example, the liner of FIGURE 6 can be used with the caps of FIGURES 2 and 4–5. In any case, the outer edge of the flared skirt wall **32** may be made thinner than the rest of the wall, as desired. Also, instead of the cap and liner assembly of FIGURES 4–5 having the groove **50** and the ridge **53**, the button **27** and the stud **20** may be undercut, as shown in FIGURES 2 and 6, so that the liner **25** may be attached to the cap. It should also be obvious that the cap and liner assembly shown in FIGURES 4–5 could be used with a container of the type shown in FIGURES 2 and 6 and that the cap and liner assembly shown in FIGURES 2 and 6 could be used with a container having an opening of the type shown in FIGURE 4. Other interchanging of the features of the various caps and liners disclosed may be carried out in order to meet a specific closure requirement and/or to meet the tooling requirements for forming the caps and liners.

It should also be realized that while the cap and liner assemblies are shown with a hollow stud and the liner button fits into the hollow portion; that the reverse arrangement may be used wherein a center post (stud) is formed on the cap and the button is made hollow to snap around it. In this embodiment the same ridge and groove and undercut arrangements may be used. The embodiment of FIGURE 6 may also be reversed so that the recess is in the form of an annular ring with a center post, around which the hollow button is snapped.

Therefore, it can be seen that a novel cap and liner arrangement has been provided for use in sealing the openings of containers. The liners are made of flexible material and are fixedly attached to the cap. The liner also has a tapering surface so that a seal is effected with the inner edge of the rim of the container, due to the tapering surface of the liner, and with the top of the rim of the container when the cap presses the liner against it.

Although a particular structure has been described, it should be understood that the scope of the invention should not be considered to be limited by the particular embodiment of the invention shown by way of illustration, but rather that the scope of the invention be limited solely by the appended claims.

What is claimed is:

1. A closure for use on the tubular neck of a container having an external diameter and an internal bore that may vary in diameter between a predetermined maximum and a predetermined minimum value defining a sealing lip therebetween, comprising: a cap having a circular top from which a cylindrical side wall depends, said side wall having means for engaging the exterior of said neck, and a surrounding wall on the lower surface of said cap forming a recess, a liner of a formed circular sheet of resilient material defining a central area from which a continuous wall extends downwardly to develop into a web having a generally conical lower surface, the outer edge of which web develops into a raised bead on the upper surface thereof and a ring-shaped rim having a portion located on the outside of said bead which is disposed at an angle of less than 180° with respect to said generally conical lower web surface, the high point of said bead lying outside of the center of said sealing lip when said closure is fully sealed, said continuous side wall being removably disposable within the recess to engage the surrounding wall thereof to hold said liner at a fixed position relative to said cap when said liner is disposed within the confines of said cap side wall, said liner effecting a first seal when a circumferentially extending segment of said lower web surface contacts an upper interior surface of said neck surrounding said bore as said cap is screwed downwardly on said neck, a second seal being formed as said cap continues to be screwed downwardly on said neck when the high point of said bead is engaged by the lower surface of said cap to bend down a circumferentially extending segment of said lower web surface and to press it into sealing contact against the sealing lip, and a part of the rim portion extending outwardly of said bead overlying the outer edge of the neck when the external diameter thereof is less than the external diameter of the rim of the liner when the cap is fully screwed down onto the container.

2. A closure for use on the tubular neck of a container having an external diameter and an internal bore that may vary in diameter between a predetermined maximum and a predetermined minimum value defining a sealing lip, comprising: a cap having a circular top from which a cylindrical side wall depends, said side wall means for engaging the exterior of said discharge member, a surrounding wall on the lower surface of said cap forming a recess, a liner of a formed circular sheet of resilient material defining a central area from which a continuous wall extends downwardly to develop into a web having a generally conical lower surface, the outer edge of which web developing into a ring-shaped rim which is disposed at an angle of less than 180° with respect to said generally conical lower surface, the internal diameter of said rim being greater than said predetermined maximum diameter of said bore, said continuous side wall being removably disposable within the recess to engage the surrounding wall thereof to hold said liner at a fixed position relative to said cap when said liner is disposed within the

confines of said side wall, a raised bead formed on the upper surface of said web located with respect to said rim so that a portion of the rim lies outwardly of the bead and located so that the bead high point lies outside of the center line of the sealing lip, said liner effecting a first seal when a circumferentially extending segment of said lower web surface contacts an upper interior surface of said neck surrounding said bore as said cap is screwed downwardly on said neck, and a second seal continuous with said first seal being formed as said cap continues to be screwed downwardly on said neck when said bead is engaged by the lower surface of said cap to bend down a circumferentially extending segment of said lower web surface and to press it into sealing contact against said sealing lip, at least a portion of the lower surface of said rim also being in sealing contact against the top surface of the neck when the diameter of said bore is less than said predetermined maximum.

3. A closure for use on the tubular neck of a container having an external diameter and an internal bore that may vary in diameter between a predetermined maximum and a predetermined minimum value defining a sealing lip therebetween, comprising: a cap having a circular top from which a cylindrical side wall depends, said side wall having means for engaging the exterior of said discharge member, a surrounding wall on the lower surface of said cap forming a recess, a liner of a formed circular sheet of resilient material defining a central area from which a continuous wall extends downwardly to develop into a web having a generally conical lower surface, the outer edge of which web develops into a raised bead on the upper surface thereof and a ring-shaped rim located on the outside of said bead and which is disposed at an angle of less than 180° with respect to said generally conical lower surface, the high point of said bead lying outside of the center of said sealing lip when said closure is fully sealed, said continuous wall being removably disposable within the recess to engage the surrounding wall thereof to hold said liner at a fixed position relative to said cap when said liner is disposed within the confines of said side wall, said liner effecting a first seal when a circumferentially extending segment of said lower web surface contacts an upper interior surface of said neck surrounding said bore as said cap is screwed downwardly on said neck, a second seal being formed as said cap continues to be screwed downwardly on said neck when said bead is engaged by the lower surface of said cap to bend down a circumferentially extending segment of said lower web surface and to press it into sealing contact against the sealing lip, at least a portion of the lower surface of said rim also being in sealing contact against said lip when the diameter of said bore is less than said predetermined maximum, and a part of the rim extending outwardly of said bead overlying the outer edge of the neck when the external diameter thereof is less than the external diameter of the rim of the liner when the cap is fully screwed down onto the container.

4. A closure assembly for use on the discharge member of a container, which discharge member has an internal bore that varies in diameter, said assembly including: a cap having means for mounting on and enveloping the end of the discharge member, a liner formed of a circular sheet of resilient material that defines a central area from which a continuous wall extends downwardly to develop into an annulus-shaped web having a generally conical lower surface, the outer edge of said web developing into a raised bead on the upper surface thereof whose apex lies outside of the center line of the neck sealing area when said closure is fully tightened down and a ring-shaped rim having at least a portion which lies outside of said bead and which portion lies at an angle of less than 180° with respect to said generally conical lower surface, and means on said cap including a side wall for rigidly holding said central area at a fixed position relative to the interior surface of said cap, which cap and liner when moved downwardly on said discharge member effect a first seal at the time a circumferentially extending segment of said lower conical surface of said web contacts an upper interior surface of said bore, with a second seal being formed on the top surface of the threaded discharge member by further downward movement of said cap and liner as the interior surface of said cap engages said bead to bend down and press a circumferentially extending segment of the generally conical lower surface of the web and a portion of said rim into sealing contact with the top surface of the threaded discharge member surrounding the bore.

5. A closure assembly for use on the discharge member of a container, which discharge member has an internal bore that varies in diameter, said assembly including: a cap having means for mounting on and enveloping the end of the discharge member, a liner formed of a circular sheet of resilient material that defines a central area from which a continuous wall extends downwardly to develop into an annulus-shaped web having a generally conical lower surface, the outer edge of said web developing into a raised bead on the upper surface thereof and a ring-shaped rim having at least a portion which lies outside of said bead and at an angle of less than 180° with respect to said generally conical lower surface, and means on said cap including side walls for rigidly holding said central area at a fixed position relative to the interior surface of said cap, which cap and liner when moved downwardly on said discharge member effect a first seal at the time a circumferentially extending segment of said lower conical surface of said web contacts an upper interior surface of said bore with a second seal being formed on the top surface of the threaded discharge member by further downward movement of said cap and liner as the interior surface of said cap engages said bead to bend down and press a circumferentially extending segment of the generally conical lower surface of the web into sealing contact with the top surface of the discharge member surrounding the bore, and the portion of the rim extending outwardly of said bead overlying the outer edge of the discharge member when the external diameter of said discharge member is less than the external diameter of the rim of the liner when the cap is fully screwed down onto the container.

6. The combination of a cap and liner for sealing the opening in the neck of a container comprising a cap, said cap having a surrounding wall formed on its inner surface, a one-piece integrally formed liner of flexible material, said liner having a protruding portion fitting within the recess defined by the surrounding wall and engaging said surrounding wall to provide an engaging fit to hold the liner to the cap, the protruding portion of said liner developing first downwardly and then upwardly toward the inner surface of said cap to form a skirt wall which is generally conical in shape and terminating in a circumferential rim which is disposed at an angle of less than 180° with respect to the upwardly extending generally conical portion of the skirt wall, a raised surface portion formed around the face of the skirt wall opposite the inner surface of the cap with a portion of the rim lying outwardly of the raised surface portion, the inner surface of said cap engaging said raised surface portion and pressing the other face of the conical skirt wall opposite said raised surface portion and the rim against the portion of the container surrounding the container opening to form a seal therewith when the cap is fastened to the container, the portion of the rim lying outside of said raised surface portion overlying the outer edge of the neck due to pressure exerted on said raised surface portion by the inner surface of the cap when the external diameter of the top of the neck surrounding the container opening is less than the outer diameter of the liner rim.

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