

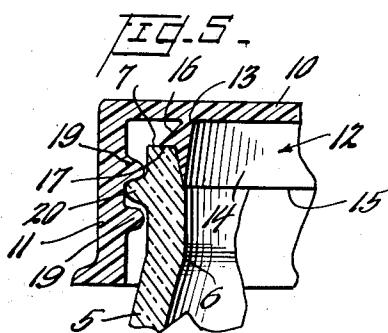
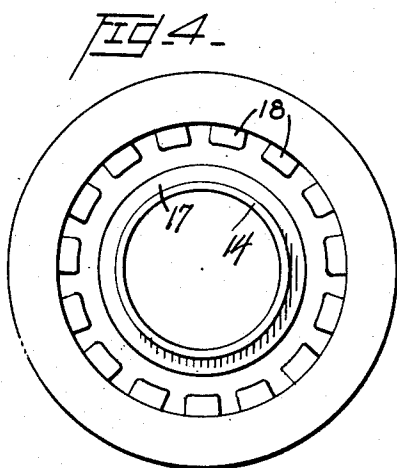
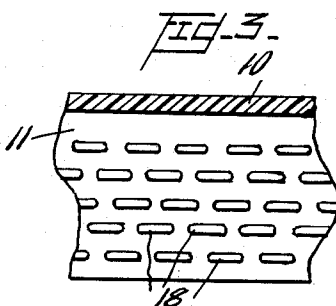
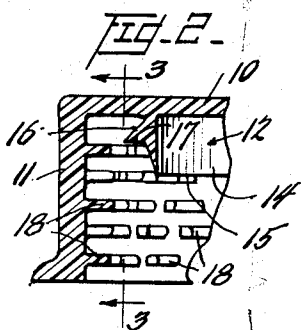
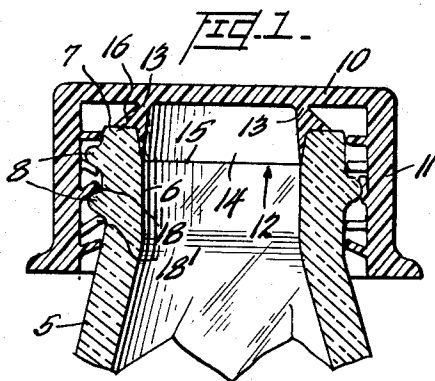
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CONTAINER CLOSURE

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3,069,040

**CONTAINER CLOSURE**

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This invention relates to improvements in a container closure.

It is a primary object of the invention to provide in a container closure an improved seal including a primary sealing rib or element adapted for reception in and radial expansion into sealing engagement within the dispensing opening of the container, incident to endwise or axial abutment of an expander element or portion of the seal with the container.

It is a further object to so form and dispose the said expander element that it may function as a secondary seal in engagement with the end of the container.

A still further and important object is to provide the closure with an improved and novel retainer means capable of coaxing with various types of external radial projections on the container outlet portion, as for instance threads, lugs, annular ribs or beads, in order to resist axial displacement or removal of the closure and to maintain such a seal as aforesaid in operative engagement with the container.

In addition, it is an important object of the invention to provide an improved expansible seal such as aforementioned in combination with said retainer means in a unitary cap structure, whereby to adapt the cap for efficient use with containers of varying types and sizes and in which both the seal and the retainer means are rendered effective merely by axially pressing the cap onto the container.

It is a further object to provide such a cap which is capable of economical mass production as an integral unit by conventional plastic molding and forming methods.

Further incidental objects and advantages of the invention will be apparent from the appended detailed description of the invention in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a sectional view in an axial plane through the upper end portion of a bottle having applied thereto a cap incorporating the novel features of the invention in their preferred form;

FIGURE 2 is a fragmentary sectional view in the same plane as FIGURE 1 showing the cap per se prior to its application to the container;

FIGURE 3 is a detailed fragmentary view, partly in section on the line 3-3 of FIGURE 2 and partly in elevation, showing certain details of the internal cap structure;

FIGURE 4 is a bottom plan view of the cap shown in the preceding figures; and

FIGURE 5 is a view similar to FIGURE 1 but showing a modified form of cap.

Referring now in detail to the drawings, there is shown in FIGURE 1 an outlet portion of a container, exemplified in this instance by the neck 5 of a bottle defining an endwise opening 6 surrounded by the axial end portion 7 of the bottle neck. The elements 8 may represent suitable radial projections such as are customarily defined either by external threads or annular ribs or lugs around the container outlet portion 5 adjacent its end 7.

The cap itself may advantageously be formed as an integral unit in which case it will be normally molded in its entirety from a suitable flexible and stretchable material such as rubber, vinyl plastic, polyethylene or the like, though it is not absolutely essential that the several parts

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of the cap hereinafter described be thus formed as a unit.

In the illustrated form of cap the same comprises a circular top wall 10 adapted to extend across the outlet opening 6 in the container end, together with a generally cylindrical skirt 11 which depends axially from the top wall for reception of and disposition around the bottle neck 5. The cap is provided with means hereinafter described for securing it against axial displacement from the bottle neck.

Disposed within the cap concentrically to and spaced inwardly from the skirt 11 is an annular depending seal 12 which is integrally formed of resiliently flexible and stretchable material having a flexible connection 13 to the top wall 10, thereby permitting radial outward deflection of the seal from the broken line position of FIGURE 1 outwardly into radially expanded sealing position as indicated in full lines in that figure.

The seal 12 includes an axially depending annular sealing rib 14 normally proportioned for reception within the container opening 6 and having a free depending end edge 15 which, together with the radially outer surface of the rib 14, is adapted for radial expansion into sealing engagement with the internal wall of the container incident to such outward radial deflection.

The flexible connection 13 in the present instance is defined simply by a portion of material of reduced radial thickness integrally interconnecting the upper end of the seal 14 to the underside of the top wall 10 and thus, in effect, defining a fulcrum for expansion movement of the seal. Obviously it is not essential that the connection 13 be a positive one as distinguished from one in which the fulcrum 13 merely axially abuts against the underside of the top wall 10, as will be readily apparent.

In order to produce the radial expansion of the seal 14 into operative sealing engagement within the opening 6 as the cap is applied to the container, there is provided an expander element 16 concentrically encircling and substantially rigidly connected to the sealing rib 14 at an axial location adjacent its base, or in other words, spaced substantially from the depending free end edge 15 and adjacent the connection or fulcrum point 13. Expander element 16 projects radially outwardly from the sealing rib 14 for axial abutting engagement with the container end wall 7 around the opening 6 at points spaced radially outwardly from the flexible connection or fulcrum 13. Thus as the cap is applied and urged downwardly onto the bottle expander element 16 by its abutting axial engagement with the container end 7, it acts in the manner of a lever arm to flex the entire sealing element 12 including the sealing rib 14 radially outwardly about the connection 13. In doing so it will obviously radially expand the sealing rib 14 to an extent which, of course, progressively increases toward the depending free end edge 15 of the sealing rib to thereby bring the outer surface of the rib and its edge 15 into sealing engagement with the wall which defines the opening 6.

By reference to the cross sectional views of the seal 12 in FIGURES 1 and 2, it will be apparent that the cross sectional shape of said seal and also its mode of operation is generally analogous to that of a bell crank lever in which the connection 13 corresponds to the lever fulcrum and the elements 14 and 16 correspond to the two arms of the lever. For the purpose of securing a sufficiently rigid interconnection between the expander element 16 and the sealing rib 14 while at the same time forming these parts together with the rest of the cap structure of the generally resiliently flexible and stretchable material, it is desirable to form said parts 14 and 16 of maximum bulk or thickness at their interconnected portions as shown. It is desirable to taper the expander element 16 somewhat toward its radially outer edge as shown

in order to provide ample clearance between it and the top wall 10 to permit the desired degree of axial movement of element 16 without interference.

In order to provide for the progressively increasing expansion of the sealing rib 14 toward its depending edge 15 incident to its radial outward deflection, the said rib is tapered downwardly substantially to a feather edge at its leading or free edge portion 15.

The expander 16 of the present preferred embodiment not only is capable of functioning in the manner above described to actuate the sealing rib 14, but in addition, by virtue of being provided with a continuous axially directed annular sealing face 17 in engagement with the bottle end 7, it also may function as a secondary seal by virtue of its thrusting engagement with the bottle end.

It will be readily apparent that by virtue of the generally flexible construction of the seal 12 and its mode of operation as above described, the same is capable of efficient use in bottle openings of varying sizes within a reasonable range.

It is, of course, necessary to provide suitable means associated with the cap structure above described for resisting axial removal of the cap from the container and for maintaining the necessary abutting engagement between the expander 16 and the container end 7. In order that the cap may be more or less universally adapted for use with bottle necks or container discharge portions or spouts having different types of retaining means thereon as well as different sizes thereof, the present invention in its preferred form provides, in conjunction with the above described seal, a particularly novel form of retaining means adapted for coaction with various types of conventional radial projections on the container as, for instance, threads, annular ribs or lugs.

Thus, referring to FIGURES 1, 2 and 3, it will be seen that such means comprises a multiplicity of resiliently axially flexible lugs 18, 18' carried by the skirt 11, and normally projecting radially inwardly thereof for upward axial deflection incident to movement of the lugs past the radial projections 8 on the container outlet portion 5. The radial length of the various lugs is substantially uniform and normally such that their inner peripheries are disposed about circles of approximately the same diameter as the container discharge portion 5 whereby they will be deflected to a substantial degree in passing over the projections 8. The internal diameter of the cap is sufficiently larger than the diameter of the respective annular ribs, threads or other projections 8 as to permit the lugs 8 to deflect sufficiently to be received between these inner walls and the projections 8 and thus to pass downwardly beyond the projections 8.

It will be seen, however, that the lugs extend completely around the circumference of the cap, preferably though not necessarily in a number of annular rows extending for substantially the full axial extent of the skirt 8. In addition, the lugs 18 in each row are angularly staggered or rotated with respect to the lugs in immediately adjoining rows. With this arrangement, even though the projections 8 on the container are merely in the form of spaced outward protrusions or nipples, at least some of the lugs 18' will be deflected in passing over them and will be so positioned that when the cap is fully seated on the bottle the said lug or lugs 18' will be disposed in axially diagonally deflected positions with their deflected upper ends in substantial axial abutment with the undersurfaces of certain of the radial projections 8. Thus, these deflected lugs 18' are disposed to provide substantial resistance to removal or axial displacement of the cap and to retain it in the fully applied position shown in FIGURE 1.

Despite the more or less universal adaptability of the cap to different types and sizes of bottles when the seal 12 and the retaining lugs 18 are employed in combination with each other as in FIGURES 1-4 inclusive, it will be readily apparent that either the lugs 18, 18' or the seal

12 may be advantageously employed without the other. Obviously the retainer lugs 18, 18' may be employed with caps having other types of seals or omitting the seal altogether and the seal 12 may be employed with other caps having conventional retaining or fastening means.

For instance, a particularly advantageous employment of the seal 12 is as illustrated in the modified form of the invention shown in FIGURE 5. In this view the construction and operation of seal 12 is identical with that shown in FIGURES 1-4 inclusive. However, in this view the cap employs conventional internal threads 19 for cooperation with an external thread 20 around the bottle neck, this being in lieu of the specific retainer means 18 of the earlier described figures. In this arrangement it will be seen that, as the cap is rotated to thread it onto the container, the coacting threads 19 and 20 will urge the sealing rib 14 axially into the opening 6 and will ultimately draw the expander element 16 into abutting actuating engagement with the bottle end 7. After such engagement has occurred, continued threading and tightening of the cap and the resulting increasing axial deflection of the expander 16 will radially expand the sealing rib 14 into tight sealing engagement with the inner wall of the container.

It is believed that from the foregoing detailed description, the operation of either form of the invention will be readily apparent, viz., axial movement of the cap onto the container outlet portion will guide the sealing rib 14 into the outlet opening 6 of the container until such time as the expander 16 abuts against the container end 7 and then causes expansion of the sealing rib 14 into tight sealing engagement in the opening 6 as the cap is pressed firmly onto the container, whether by axial pressure alone, as in FIGURES 1-4 or by combined axial pressure and rotation as in the embodiment of FIGURE 5.

In this application I have shown and described only the preferred embodiment of the invention together with a single modification of one of the features thereof. However, it will be understood that the invention is capable of modification in various respects, all without departing from the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. In a container cap of the class including a sleeve-like depending skirt for reception of the externally threaded outlet portion of a container, the improvement comprising a multiplicity of resilient axially deflectable lugs carried by the skirt internally of the cap and normally projecting inwardly from said skirt for upward deflection of the lugs incident to movement thereof past the external threads on the container outlet portion during application of the cap to the container, and for disposition of at least some of said lugs in axially diagonal positions of deflection with their radially inner ends in axial abutment with said projections to thereby resist withdrawal of the cap from the container, said lugs being arranged in a plurality of annular rows with the lugs in each row relatively rotationally staggered with respect to those in adjoining rows.

2. A container cap comprising a circular top wall for application over the open end of a generally tubular container outlet portion; an annular depending seal concentric with and spaced inwardly from the periphery of said top wall, said seal and said cap being integrally formed of resiliently flexible and stretchable material and said seal having a flexible connection to said top wall permitting radial outward deflection of said seal, said seal including an axially depending annular sealing rib normally proportioned for reception within the said opening and having a depending free end edge portion for radial expansion into sealing engagement with the container incident to said radial deflection; and an expander element concentrically encircling and substantially rigidly connected to said sealing rib at an axial location spaced from said depending free end edge portion and adjacent said

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connection, said expander element projecting radially outwardly from said sealing rib for axial abutting engagement with said container outlet portion around said opening at points spaced radially outwardly from said flexible connection, thus to flex said sealing rib radially outwardly and thereby radially expand it into sealing engagement with the container outlet portion as the cap is pressed axially onto said outlet portion; and means associated with said cap for resisting axial removal thereof from the said container portion.

3. A container cap adapted to extend across an opening in a generally tubular container outlet portion; comprising an annular seal depending from said cap, said seal being integrally formed of resiliently flexible and stretchable material having a flexible connection to said cap permitting radial outward deflection of said seal, said seal including an axially depending annular sealing rib normally proportioned for reception within the said opening and for radial expansion into sealing engagement with the container incident to said radial deflection; and an expander element concentrically encircling and substantially rigidly connected to said sealing rib adjacent said connection, said expander element projecting radially outwardly from said sealing rib for axial abutting engagement with said container outlet portion around said opening at points spaced radially outwardly from said flexible connection, thus to flex said sealing rib radially outwardly and thereby radially expand it into sealing engagement with the container outlet portion as the cap is pressed axially onto said portion; and means associated with said cap for resisting axial removal thereof from the said container portion.

4. The combination defined in claim 3, in which said expander element has a continuous annular sealing face for abutting sealing engagement with said container around and radially outwardly of said opening.

5. A container cap comprising a circular top wall adapted to extend across an opening in a generally tubular container outlet portion; an annular depending seal concentric with and spaced inwardly from said top wall, said seal being integrally formed of resiliently flexible and stretchable material having a flexible connection to said top wall permitting radial outward deflection of said seal, said seal including an axially depending annular sealing rib normally proportioned for reception within the said opening and for radial expansion into sealing engagement with the container incident to said radial deflection; and an expander element concentrically encircling and substantially rigidly connected to said sealing rib at an axial location spaced above the lower extremity of said sealing rib and adjacent said connection, said expander element projecting radially outwardly from said sealing rib for axial abutting engagement with said container outlet portion around said opening at points spaced radially outwardly from said flexible connection, thus to flex said

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sealing rib radially outwardly and thereby radially expand its said free end edge into sealing engagement with the container outlet portion as the cap is pressed axially onto said portion.

6. A container cap comprising an annular depending seal having an upper extremity in axial engagement with said cap and defining a fulcrum, said seal being integrally formed of resiliently flexible and stretchable material permitting radial outward deflection of said seal relative to the cap about said fulcrum, said seal including an axially depending annular sealing rib normally proportioned for reception within a container opening and having a depending free end portion for radial expansion into sealing engagement with the container incident to said radial deflection; and an expander element concentrically encircling and substantially rigidly connected to said sealing rib at an axial location spaced above the free end portion of said sealing rib and adjacent said fulcrum, said expander element projecting radially outwardly from said sealing rib for axial abutting engagement with said container around said opening at points spaced radially outwardly from said fulcrum, thus to flex said sealing rib radially outwardly and thereby radially expand it into sealing engagement with the container outlet portion as the cap is pressed axially onto the container.

7. A container cap as defined in claim 6, in which said expander element has a continuous sealing face for abutting engagement with said container.

8. A seal for use with a container closure, comprising an annular sealing rib of resiliently flexible and stretchable material of substantial axial extent having opposite axial extremities in parallel planes, one of said extremities being adapted for axial reception in an opening and radial expansion into sealing engagement therein, the other said extremity being adapted for axial sealing engagement with a container closure and for defining a fulcrum about which said rib is radially deflectable with respect to the closure and container, and an expander element encircling and substantially rigidly connected to said rib and projecting radially outwardly therefrom for axial abutting engagement with said container to expand said rib by outward deflection thereof about said fulcrum.

9. A seal as defined in claim 8 in which said expander element has a continuous annular face presented axially toward said one extremity for sealing engagement with the container.

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