

[54] CHILD-RESISTANT CLOSURE  
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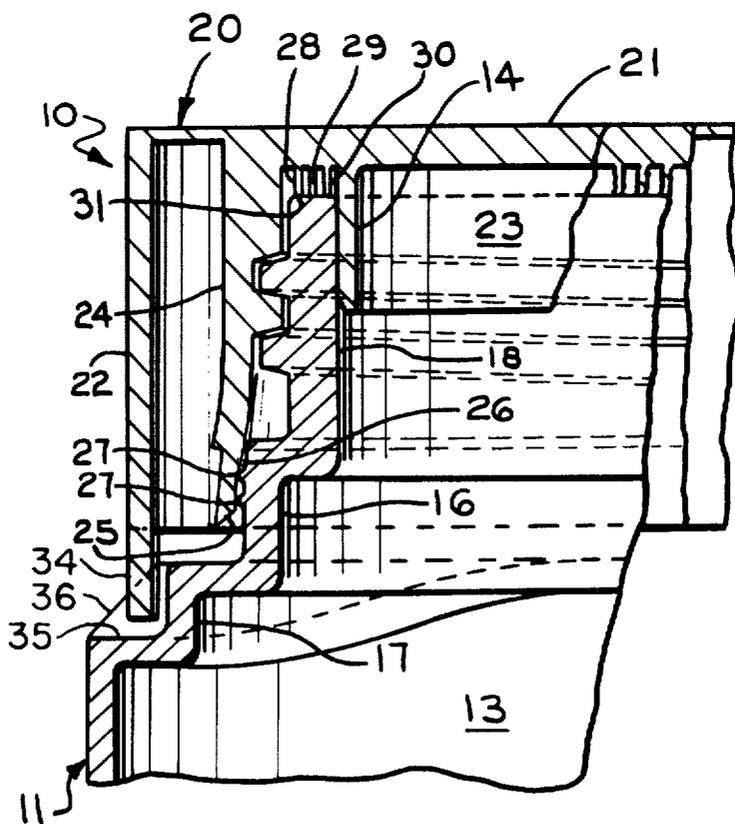
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[57] **ABSTRACT**  
 The invention is a closure for retaining liquids. The closure cap includes an outer skirt and inner skirt and an intermediate skirt. The inner skirt is engaged within the container neck to form a first seal. A plurality of concentric members depend from the container cap and engage the top of the container neck to form a second seal. An integral annular sealing ring is positioned between the intermediate skirt and the container to form a third seal.

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2 Claims, 4 Drawing Figures





## CHILD-RESISTANT CLOSURE

### BACKGROUND OF THE INVENTION

Closures which are utilized for liquids have been a problem in the art. These closures generally comprise a container and a cap wherein, for example, the cap is threaded onto the container neck. When plastic caps are utilized, there is a tendency for the cap to take a "set" after being initially placed on the container. When this occurs, leakage often results unless the cap is mounted on the container with ever-increasing torque. Various methods have been used in the past to eliminate leakage. The most common prior art structure is to place a cork or another type insert in the upper part of the cap. When the cap is placed on the container, the cork engaged the neck and tended to prevent leakage.

Another problem with many prior art caps is that, particularly with plastic caps, there is a tendency for the cap to "back off" after its initial placement on the container. Again, this often results in leakage.

### SUMMARY OF THE INVENTION

The present invention relates to a closure which is particularly adapted for holding liquids. The closure includes a container having a bottom, a sidewall, a neck and an annular shoulder extending between the neck and the sidewall. A cap having a top and an outer skirt is threadably engaged on the container neck. The cap also includes an inner skirt which extends downwardly into the neck forming a first liquid seal when the cap is positioned on the container. An intermediate skirt is positioned between the outer skirt and the inner skirt. A sealing ring is positioned between a lower surface of the intermediate skirt and a portion of the container. The annular ring serves as an "O-ring" and functions as a second sealing means. Additional means, for example a plurality of concentric rings, depend downwardly between the inner skirt and the intermediate skirt. When the cap is in closed position on the container, the depending rings engage the upper surface of the container neck and serve as a third sealing means.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, side elevational view, showing a closure according to the present invention. The cap is shown elevated from the container;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 1; and

FIG. 4 is a fragmentary, sectional view, similar to FIG. 1, showing the cap in closed and sealing relationship with the container.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

A closure according to the present invention is generally indicated in the drawings by the reference number 10. The closure 10 includes a container 11 having a bottom 12, a sidewall 13, a threaded neck 14 and an annular shoulder 15 extending between the neck 14 and the sidewall 13. In the present embodiment, the shoulder 15 is stepped and includes an upper portion 16 and a lower portion 17 (see FIG. 4). The neck 14 includes an inner face 18.

The closure 10 also includes a cap 20 having a top 21 and an outer skirt 22. Spaced concentrically with respect to the outer skirt 22 is an inner skirt 23 of a shorter length than the outer skirt 22. The inner skirt 23 fits within the neck 14 of the closure 10 and engages the inner face 18, when the cap is in its closed position. The engaging relationship between the inner skirt 23 and the face 18 of the neck 14 provides a first sealing means which tends to prevent leakage of material from within the container 11.

An intermediate skirt 24 depends from the top 21 and is concentrically located between the outer skirt 22 and the inner skirt 23. The intermediate skirt 24 includes a lower end 25 having an interior surface 26. One or more interference rings or annular sealing rings 27 are positioned between the interior surface 26 of the intermediate skirt 24 and the upper portion 16 of the annular shoulder 15. In the present embodiment, the annular sealing rings 27 are integral with the container 11 and act as O-rings. The annular sealing rings 27 both seal the escape of material from within the container 11 and also provide friction forces which tend to prevent the cap 20 from backing off the container 11.

Referring to FIG. 4, a plurality of concentric rings 28, 29 and 30 depend from the top 21 of the cap 20 and are located between the intermediate skirt 24 and the inner skirt 23 of the cap 20. The concentric rings 28—30 are semi-flexible in nature and are of a length such that when the cap 20 is in its closed position on the container 11, lower edges 31 of the rings 28—30 engage and are compressed by a top surface 33 of the container neck 14. This functions as a sealing means to prevent leakage from the container 11.

In the present embodiment, the cap 20 has a pair of opposed downwardly extending lugs 34 formed on the bottom edge of the outer skirt 22. Complementary lug recesses 35 are provided in the shoulder 15 of the container 11. Camming surfaces 36 are provided adjacent the lug recesses 35. To assemble the cap 21 on the container 11, the cap is applied to the upper end of the container 11 and rotated in a clockwise direction. Continued rotation causes the lugs 34 to engage the camming surfaces 36 which spreads the lugs 34 and leads them to the lug recesses 35. When this occurs, the lugs 34 snap into the lug recesses 35 and the cap 20 is retained on the container 11 until the lugs 34 are removed from the lug recesses 35. To remove the cap 20, the sides of the cap 90° opposed from the lugs 34 are squeezed. The cap 20 is constructed of a semi-flexible material and the squeezing deforms the cap to an oval configuration so that the lugs 34 are moved out of the lug recesses 35. The cap 20 then can be rotated in a counterclockwise direction to remove the cap 20 from the threaded neck 14 in the normal manner.

Various other modifications of the above-described preferred embodiments will be apparent to those skilled in the art and may be made without departing from the spirit and scope of the appended claims.

What we claim is:

1. A child-resistant closure for containing liquid, said closure consisting of a container having a tubular neck, a body and a shoulder portion adjacent the base of said neck, and a cap for said container,

a. said container neck having a flat annular lip and a smooth cylindrical inner surface,

b. said cap having a disc-like top and three radially spaced concentric skirts depending from said top,

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the top of said cap having a central area overlying said container neck and an annular area circumjacent thereto and connecting said outermost skirt to said intermediate skirt.

- c. the outer surface of the innermost one of said skirts 5 being substantially cylindrical and having an interference fit with the inner surface of said neck,
- d. at least one annular, downwardly extending, flexible, first sealing element in the space between said innermost one of said skirts and the intermediate 10 one of said skirts, said first element being engaged in sealing contact with said container lip when said cap is in closed position on said container,
- e. cooperating mating threads on the exterior of said container neck and the interior of said intermedi- 15 ate skirt,
- f. that portion of said cap top overlying said container neck and that portion of said intermediate skirt where said threads are located being substantially thicker in cross section than said innermost skirt, 20 said outermost skirt and said annular area of said cap top,
- g. the inner surface of said intermediate skirt and the outer surface of said neck having cooperating circumjacent areas that are opposed to each other 25 when said cap is near to and in closed position on

said container.

- h. the first of said areas being the inner cylindrical surface of a portion of said intermediate skirt at a level spaced below said threads, said portion having an inner diameter greater than the outside diameter of the threads on said neck and a cross sectional thickness less than the thickness of that portion of said intermediate skirt where said cap threads are located,
- i. the second of said areas being on said container neck and having integral, circumferentially extending, axially spaced and radially protruding sealing ribs thereon, said ribs having a diameter greater than the outside diameter of said threads and an interference fit interiorly with the first said area,
- j. said first cylindrical surface having a greater axial extent than said ribs for effecting a seal therewith when said cap approaches closed position and when said cap is at closed position and for maintaining a seal when said cap shifts axially due to thread manufacturing tolerances.

2. A closure according to claim 1 and cooperating child-resistant locking means on the outermost one of the skirts on the cap and the shoulder portion of the container.

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