United States Patent [19]

Montgomery

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[54] **CHILD-RESISTANT CLOSURE**

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[52] **U.S. Cl.** **215/9**; 215/221; 116/72

[51] **Int. Cl.** **B65d 55/02**

[58] **Field of Search** 215/9, 221; 116/72

[56] **References Cited**

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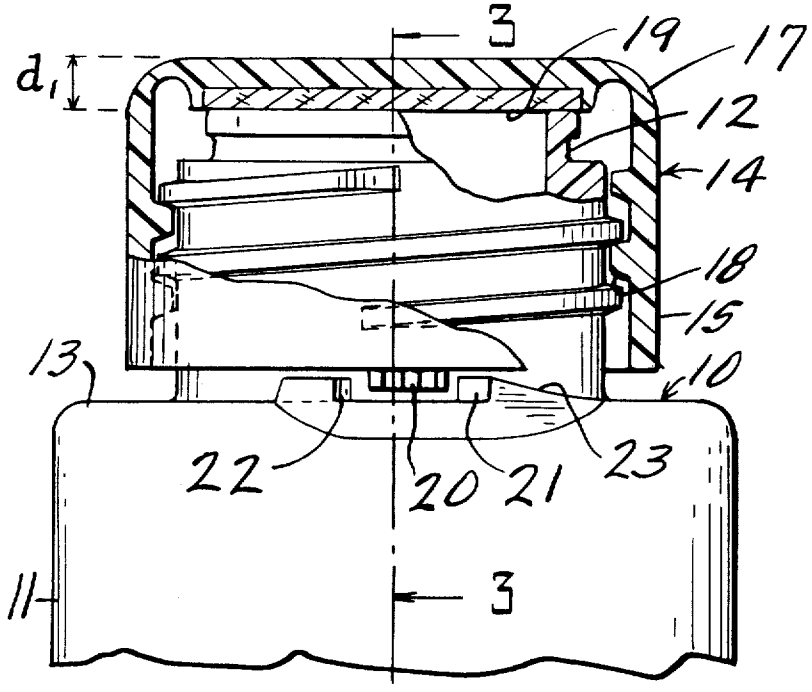
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Assistant Examiner—Ro E. Hart
Attorney, Agent, or Firm—Henry K. Leonard

[57] **ABSTRACT**

A substantially leak-proof and child-resistant combination closure comprising a container and a cap. The container has a threaded neck and the cap has a tubular skirt with mating threads on its inner surface, a disc-like top and resilient annular shoulder portion. There is a sealing liner beneath the top of the cap which engages and seals the open end of the container neck. The cap skirt and the container have cooperating locking means which are engaged when the cap is turned down to normal closed position. The locking means function both to render the closure child-resistant and to stop the relative rotation of the cap onto the container at a predetermined angular position where the locking means is effective. The resilient shoulder of the cap flexes to compensate for tolerance variations in the threads of the cap and container neck in order to insure that the cap liner seals the neck of the container.

2 Claims, 5 Drawing Figures



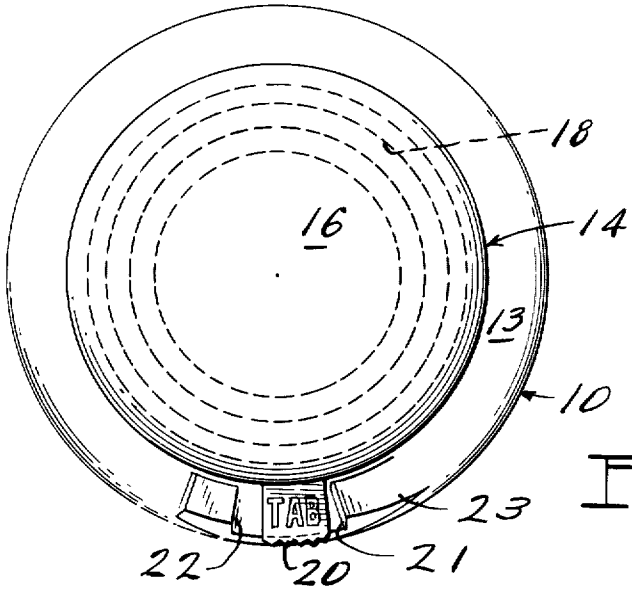


FIG-1-

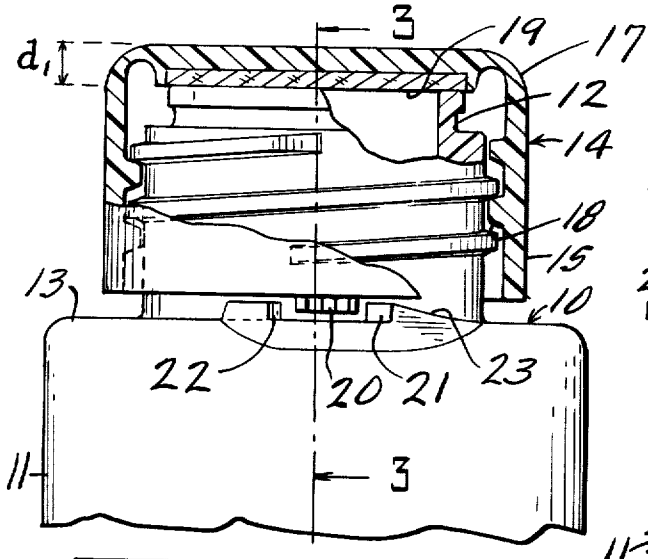


FIG-2-

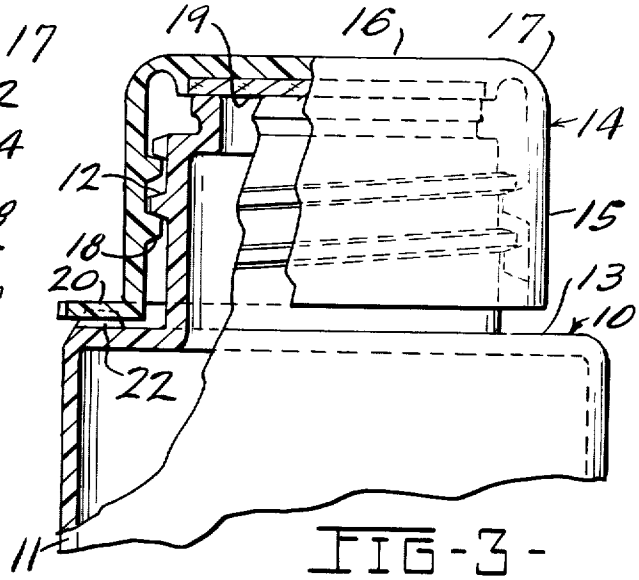


FIG-3-

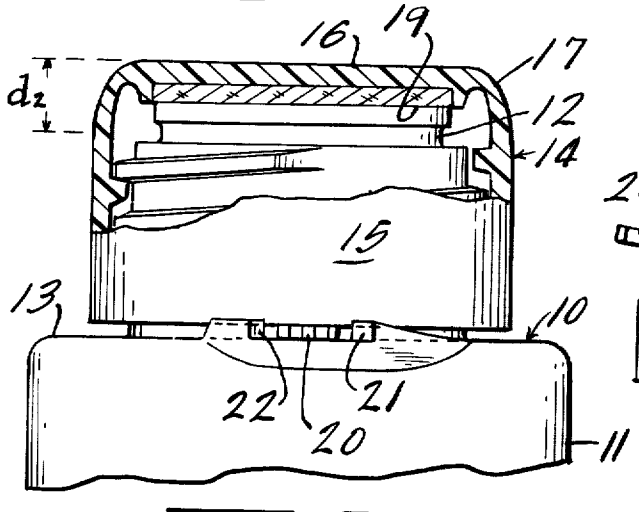


FIG-5-

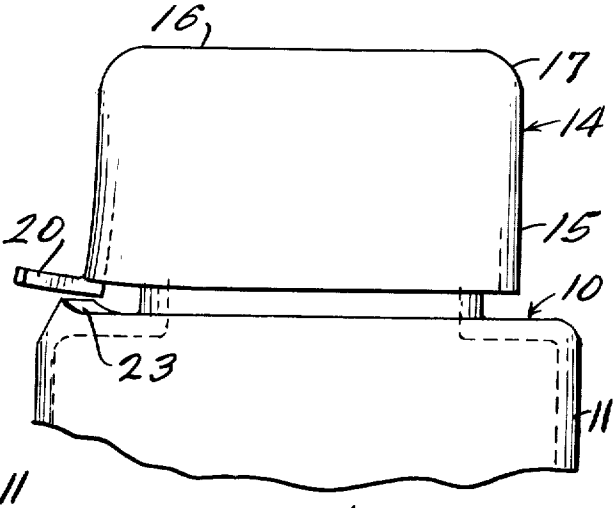


FIG-4-

CHILD-RESISTANT CLOSURE

BACKGROUND OF THE INVENTION

With the current emphasis that has been placed upon protection of children of tender ages from harm due to their being able to open containers of medicines, acids, soaps, etc., development of so called "child-proof" or, more correctly, "child-resistant" containers and closures, has been very rapid.

Many of these child-resistant combinations have employed threaded caps and containers with threaded necks, the caps and containers being provided with cooperating means which function to prevent the child of tender years from removing the cap from the container after it has been seated thereon.

Devices of this type which are practical also must be so designed as to provide for capping the containers by the use of conventional capping equipment. Since may products to be so packaged have previously been packaged in vials or glass bottles with threaded necks and simple screw-on caps most packaging organizations already possess capping equipment which is capable of placing such caps onto bottle necks with a fixed torque so that the caps will be securely seated on the bottle necks by the capping machines.

However, the tolerances of manufacturing of both the bottles or vials and the caps or closures are such that even when the caps are put on by automatic, constant torque capping machines, they do not all reach the same angular position relative to the containers on which they are set by the capping machines.

If the caps or closures have internal sealing liners, which function to render the necks of the containers leak proof, variations in the degree of tightening of the caps onto the necks of the bottles may be important as a result of cumulations in the tolerances. When cork was inexpensive, because it is highly resilient and does not take a "set" if it is squeezed too tightly, it frequently was utilized as the main body of the sealing liners so that it would compensate easily for these variations and would maintain all of the containers in liquid tight condition even if the caps or closures were put on various containers with different torque and thus squeezed the liners to differing degrees.

When the cap of the child-resistant closure is designed, however, it is necessary that the cap be rotated onto the container to a distance sufficient to insure that the cooperating means will engage and thus prevent the cap from being unscrewed by a small child. However, because of the variations in the tolerances such caps may be turned onto the containers by the capping machine or by an adult to positions beyond the positions where the locking means engage. If this occurs, the liner may be squeezed too tightly and take a "set." Upon a subsequent replacement of the cap, if it is not turned on as far, the liner will not expand to maintain the seal.

In order to avoid the foregoing common problem, it has been suggested that the cap and container comprise means for stopping the rotation of the cap onto the container at the precise position where the child-resistant locking means engage. Again, however, because of the cumulation of tolerances problem, when the rotation of the cap is stopped at a fixed position, the liner may not be in sealing contact with the neck of the container.

It is the object of the instant invention, therefore, to provide a child-resistant closure for a container in which the cap and container have cooperating child-resistant locking means engaged at a certain relative angular position of the cap on the container and in which the locking means also prevent the cap from being turned beyond locking position and the cap has a resilient shoulder which compensates for variations in cumulated tolerances to insure that the liner seals the container neck when the cap reaches the fixed or predetermined locking position on the container at which the child-resistant locking means are engaged.

These and other more specific objects and advantages of a closure embodying the invention will be better understood from the specification and from the drawings which follow.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a closure embodying the invention;

FIG. 2 is a fragmentary view in vertical elevation, with parts broken away of the closure shown in FIG. 1;

FIG. 3 is a fragmentary, vertical sectional view with parts broken away taken along the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary side view in elevation showing how the child-resistant locking means is disengaged to permit removal of the cap from the container;

FIG. 5 is a view similar to FIG. 2 and illustrating how the closure of the combination of the invention may be distorted to insure sealing engagement of its liner against the open neck of the container.

DESCRIPTION OF PREFERRED EMBODIMENT

A substantially leak-proof and child-resistant closure combination according to the invention comprises a container **10** which has a generally cylindrical body portion **11**, a threaded neck **12** and an annular shoulder **13** joining the wall of the body **11** to the base of the neck **12**.

An inverted cup-shaped cap **14** has a tubular skirt **15**, a disc-like top **16** and a resilient annular shoulder portion **17** connecting the disc-like top **16** and the skirt **15**. The cap **14** also has threads **18** formed on the inner surface of its skirt **15** to mate with the threads on the neck **12** of the container **10**.

A disc-like liner **19** is positioned against the inner side of the cap top **16** and is of such size as to close and seal the open center of the container neck **12**.

The cap **14** and the container **10** have cooperating child-resistant locking means which consist of a radially outwardly directed tab **20** at the lower edge of the cap skirt **15** and a pair of stops **21** and **22** formed on the shoulder **13** of the container to be engaged by the tab **20**. When the cap **14** is turned onto the container **10**, either in its initial capping or after use, the cap **14** must be rotated a sufficient distance for the tab **20** to ride up an incline **23** on the shoulder **13** of the container **10** and then to snap by its own resiliency downwardly behind the stop **21**. This is the closed position of the closure **14** relative to the container neck **12**. The second stop **22** is angularly spaced beyond the first stop **21** only a distance sufficient that the tab **20** will drop down between the stops **21** and **22** and thus prevent the cap **14** from being turned angularly beyond this normal closed position.

If it were possible to manufacture the cap **14** and the container **10** and its threaded neck **12** without any tol-

erances in the dimensions, the cap **10** and the neck **12** could be maintained at proper sizes so that when the cap **10** is turned to the normal closed position, the liner **19** is pressed against the open neck **11** with just sufficient force so as to seal the container. Of course all manufactures on a production basis must be made with a definite manufacturing tolerance, say plus or minus 0.005 inch or the like, so that when these tolerances cumulate if the cap **10** is turned to its normal closed position, the liner **19** may or may not be in its proper sealing adjacency to the end of the container neck **12.** If the tolerances cumulate in one direction, the container may not be sealed at all. If the tolerances cumulate in another direction, it may not be possible to turn the cap **14** far enough down onto the neck **12** for the child-resistant locking means comprising the tab **20** and the stop **21** to engage.

If it were economically feasible to utilize natural cork for the liner **19,** it would have sufficient resiliency and compressability so that it could be made thick enough to engage the end of the container neck **12** in sealing relationship at both extremes of the tolerance variations. However, as mentioned above, the cost of cork has become prohibitive for its use as a liner in large volume containers such as aspirin bottles, and the like.

In order to compensate for the tolerance variations, the cap **14** of the invention has the annular shoulder portion **17** so that the liner **19** is brought into sealing engagement with the end of the threaded neck **12** of the container **10** whether the tolerances result in the locking tab **21** reaching the normal position as illustrated in FIG. **2** or as illustrated in FIG. **5.** It will be observed by comparing the indicated distances d_1 and d_2, that the extremes of the tolerance variations are illustrated and that in both conditions, the tab **20** is positioned between the stops **21** and **22** and the liner **19** is pressed against the end of the neck **12.** The annular shoulder **17** is illustrated as being stretched downwardly in FIG. **5** to compensate for the tolerance variations presumed to exist between the cap **14** and neck **12** of FIGS. **2** and **5,** respectively.

Having described my invention, I claim:

1. A substantially leak-proof and child-resistant closure combination, said combination comprising

a. a container having a tubular neck, a hollow body and a generally inwardly extending shoulder between the upper portion of said body and the base of said neck,

b. a one-piece cap for said container, said cap having a tubular skirt, a disc-like top and a resilient annular shoulder portion means connecting said skirt and said top,

c. a disc-like liner beneath said cap top and engageable with the end of said container neck for sealing said neck,

d. means comprising mating threads on said neck and said cap skirt for retaining said cap on said neck,

e. and cooperating locking means on said cap skirt and said container shoulder engageable when said cap is rotated to normal closed position relative to said neck and for preventing rotation beyond normal closed position

f. said shoulder portion means being stretchable for downward movement of said tubular skirt for compensating for tolerance variations in said threads, and between said threads and said locking means.

2. A combination according to claim **1** in which the cooperating child-resistant locking means comprise a tab on the lower edge of the cap skirt and a pair of angularly spaced stops on the shoulder of the container engageable by said tab.

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