May 20, 1969 F. A. CILLUFFO 3,445,022

CHILDPROOF SAFETY CONTAINER AND CLOSURE

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FIG. 2

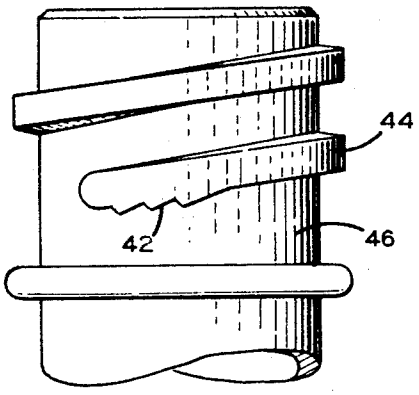


FIG. 3

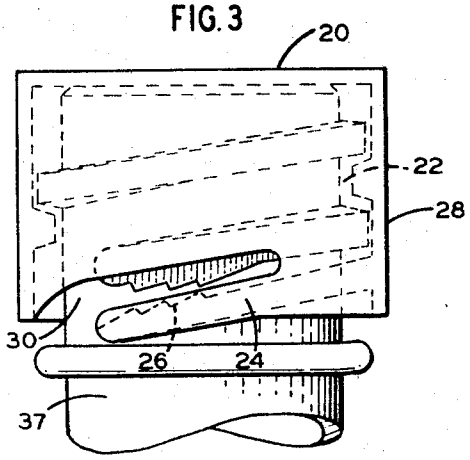


FIG. 1

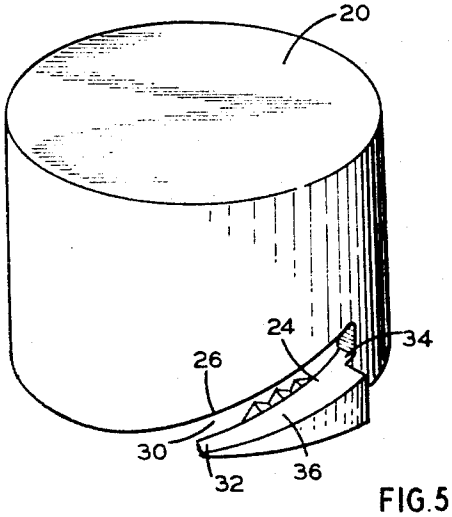


FIG. 4

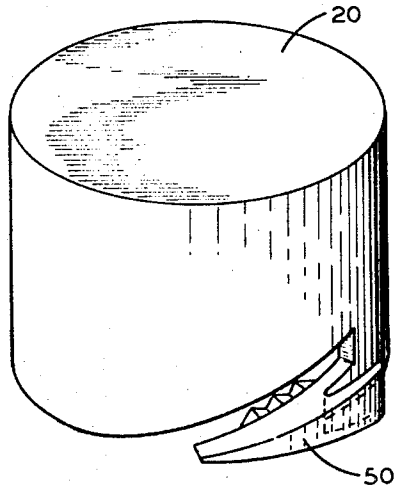
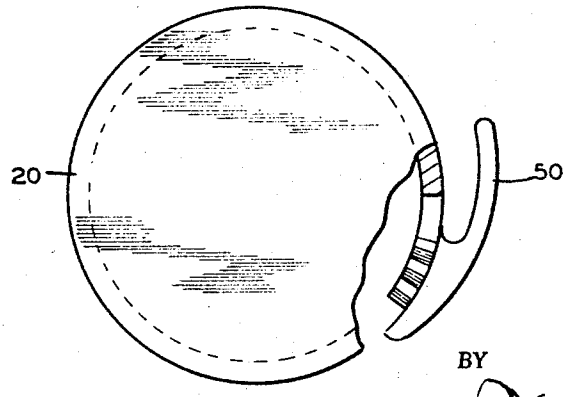


FIG. 5



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FIG. 6

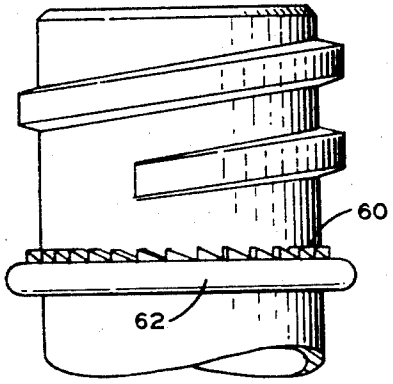


FIG. 7

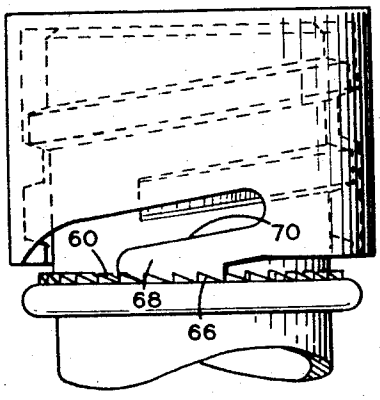


FIG. 8

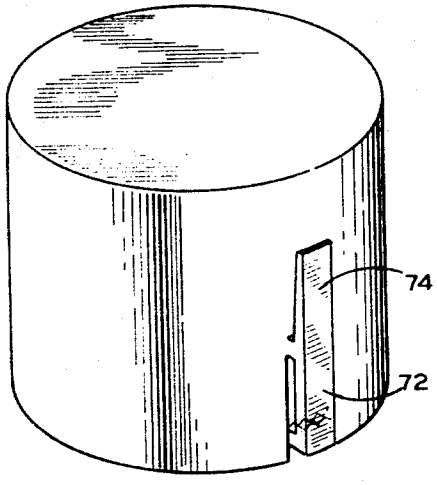
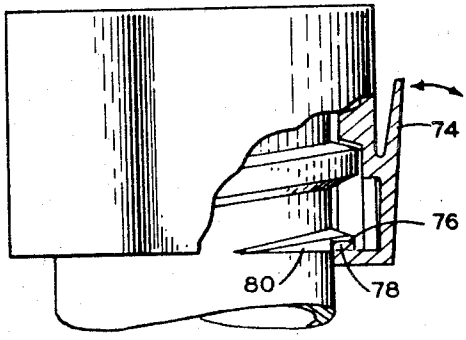


FIG. 9



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CHILDPROOF SAFETY CONTAINER AND CLOSURE

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Int. Cl. B65d 55/02, 41/06
U.S. Cl. 215—9 10 Claims

ABSTRACT OF THE DISCLOSURE

A spiral thread on the neck or spout of the bottle is provided with a ratchet teeth detents on the bottom surface of the lower terminal end of the spiral thread. The closure cap is internally provided with a similar spiral thread, with ratchet teeth appropriately disposed to engage the ratchet teeth on the spiral teeth on the neck, to normally prevent simple casual or undesired disengagement.

A slot in the cap separates the lower end of the cap thread along a predetermined length of its terminal so that portion of the cap thread is supported as a cantilever from the cap body. The cap material is rigid, but the cantilever construction, at the lower end of the thread, provides sufficient flexibility to permit that cantilever to be moved the short distance needed to enable the cantilever teeth to clear the detents on the neck or spout. For the construction shown and covered herein, a clearance shift of 0.020 inch has been found adequate.

This invention relates to a safety bottle and cap combination to provide a safety cap closure that cannot readily be removed by a child. The problem of providing a bottle and cap closure that cannot be readily opened by a child has been a long continuing one. The need has long been recognized of providing some sort of protection to prevent children from opening bottles or containers that normally have contents that are harmful or dangerous to health. Many proposed solutions to that problem have not been adopted, either because of their lack of simplicity or because they have been uneconomical.

The object of this invention is to provide a cap closure that is both simple in construction and economical.

Another object of this invention is to provide a closure cap that is relatively simple in construction, and that may be operated with a slightly sophisticated operation, whose nature would be readily apparent to an adult, but not yet understandable to a child.

In the present invention, the usual spiral thread, on the neck or spout of a container, is provided with a short stretch of ratchet teeth on a short length of the surface of the lower terminal portion of the thread, to serve as detents. Correspondingly, the lowermost terminal portion of the thread on the cap, on the internal surface of the cap, is provided with similar ratchet teeth that will engage those on the neck thread when the cap is in its full closed position. To release the cap for removal, the cap teeth must be moved to clear the detent teeth on the neck of the container. In order to permit the cap thread ratchet teeth to be so raised from the detent teeth on the neck of the container, the lowermost terminal portion of the internal thread of the cap is formed free from the body of the cap by a short slot, which thus renders that lowermost portion of the thread on the cap a cantilever structure. The cap material is preferably such that the body of the cap is relatively rigid. Similarly, then, the cantilever material is also such as to be relatively rigid. However, the cantilever construction provides a small amount of resiliency at the cantilever support region, where the cantilever is joined to the body of the cap. That small amount

of resiliency is sufficient to permit the free end of the cantilever to be moved or raised a short distance from the detent teeth on the neck of the bottle. This distance has been found to be adequate even when as small as 0.020 inch. Several modifications are disclosed herein wherein this feature of construction may be provided on a bottle neck and the related cap, to insure against casual and undesired opening of a bottle by a child.

Another difficulty or problem that is recognized in the art, is the characteristic known as "back-off," which is the tendency of a cap when screwed onto the helical threads of a bottle of glass or plastic, to resist the application slightly, to the extent of storing some of the application energy as internal stress operates in reverse or backwardly, against the application force, to tend to loosen the cap on the thread or glass or the plastic bottle. This is the "Memory" characteristic of the cap material which tends to re-assume an initial undistorted or unstressed condition when the application force is terminated or removed.

In an effort to overcome that tendency, it has been the practice conventionally to resort to threads having a small pitch angle, to diminish the stored stress releasing component.

The present invention, which provides for the detent operation in preventing casual or undesired removal of the cap from the bottle, also takes care of that problem by substantially locking the cap in position against any such loosening tendency of the back-off stress.

A further objective of this invention is to overcome that current difficulty of "back-off" tendency, by essentially locking the cap in closed position, while yet making it possible to unlock the cap by a simple operation for simple easy removal.

The details of construction of the several modifications, and their manner of operation and co-operation, are described in the following specification and are illustrated in the accompanying drawings, in which:

FIGURE 1 is a front view, partially in elevation and partially schematic, to show a cap embodying this invention, with a cantilever element formed at the bottom edge of the cap, and provided with an axial actuator;

FIGURE 2 is a front elevational view of a portion of the neck or spout of a container, to show ratchet detents formed on the bottom surface of the lower terminal end of a spiral thread;

FIGURE 3 is a combination elevational and schematic view, showing the cap of FIGURE 1 applied on the neck of the container shown in FIGURE 2, with the arrow indicating the operation required to slightly depress the outer end of the cantilever for then releasing the cap for rotation and removal;

FIGURE 4 is a front schematic view of a cap in which the cantilever element is provided with an eccentric fulcrumed actuator;

FIGURE 5 is a plan view of the cap in FIGURE 4 and shows the engaged and disengaged positions of the free end of the cantilever, where the detent and ratchet teeth are engaged or disengaged;

FIGURE 6 is a front elevational and schematic view of a neck of a container, showing a spiral thread and a separate transfer bead on the neck for supporting the detent ratchet teeth on the neck, for receiving the ratchet teeth of the cap to be applied to that neck;

FIGURE 7 is an internal view, partially in section and partially in elevation, of the cap to fit on the neck of FIGURE 6, and shows ratchet teeth formed on the bottom edge of the cantilever portion of the cap;

FIGURE 8 is a three-quarter elevational and perspective view of a cap, showing a modified form of cantilever with an external eccentric actuating arm, similar to the

construction in FIGURES 4 and 5, except that the cantilever in FIGURE 8 is vertical instead of horizontal;

FIGURE 9 shows an elevational view, with parts broken away to expose the vertical cantilever, and show the manner in which its teeth engage and disengage the teeth on the lowermost terminal of the spiral thread on the neck of the bottle.

As shown in FIGURES 1, 2 and 3, a cap **20** is provided with the usual cylindrical body, which in some cases may be of truncated conical construction, all of which are provided with a usual internal helical thread **22**, reaching from an upper portion internally of the cap **20** to a lowermost portion **24** representing the terminal portion of the thread **22**. In accordance with this invention, the terminal portion **24** has on its upper surface a series of integrally formed ratchet teeth **26**. In order to impart flexibility to the lowermost or terminal portion of the thread **24**, for purposes to be described below, that portion of the internal thread cap is separated from the body **28** of cap by a slot **30** which serves to set off the terminal thread portion **24** as a cantilever, having a free end **32** and being attached to and supported from the body of the cap **20** at the region **34**, adjacent to the inner end of slot **30**.

In order to utilize the characteristics of a cantilever, and to move the free end **32** slightly pressing the cantilever end downward, for the purpose to be described below, a tab or thumb piece **36** is additionally formed on the outer surface of the cantilever portion **24** of the thread **22**, in order to provide a surface, on the top of the thumb piece **36**, to receive the thumb pressure of an operator who is removing the cap to open the bottle. The pressure on that thumb piece **36** operates in the direction of the arrow **38** shown in FIGURE 3, and serves to move the ratchet teeth **26** on the cantilever **24**, downward, away from a corresponding set of ratchet teeth or detents **42** formed at the lower end and on the lower surface of a conical thread **44**, mounted and generally formed integrally on the neck **46** of the container, such as a bottle, as shown in FIGURE 2.

As shown in FIGURE 1, the ratchet teeth **26** in cap **20** are shown formed on the top edge of the helical thread **22** along the lower terminal end of that thread in the cap, and the ratchet teeth detents **42** on the helical thread **44** of the neck of the bottle are shown formed on the bottom edge, near the terminal end of that thread **44**, as in FIGURE 2.

When the cap **20** is normally screwed onto the bottle neck **46** to close the bottle, the two sets of ratchet teeth engage, and the cap is held against casual displacement, and against casual opening by ordinary rotating force applied to the outside of the cap.

In order to open the cap, a sophisticated operation is required, which involves, first, slightly depressing the thumb tab **36** to disengage two sets of ratchet teeth, and then turning the cap to remove it from the neck of the bottle. The force and distance of the depressing movement of the cantilever that will be required to disengage the teeth, can be controlled by the length of the slot **30**, according to the resiliency available in the material at the root of the cantilever due to the inherent resiliency of the material, and according to the cantilever structure of the element supporting the lower thread **26**.

In FIGURES 4 and 5, another modification is shown, in which a thumb tab **50** is provided to permit the use of a radial pressure in shifting the position of the cantilever to disengage the cantilever teeth from those on the neck of the bottle. In this case, the teeth on the neck of the bottle point radially outward, and the teeth on the cantilever point radially inwardly and are formed on the inner surface, of the lowermost terminal end of the inner thread on the cap, instead of being formed on the upper surface as in FIGURE 3.

In this case, in FIGURE 5, the anchored end of the cantilever serves substantially as a fulcrum about which

the thumb tab **50** may rotate the cantilever, to disengage the teeth on the cap from the detent teeth on the neck of the container.

In FIGURE 6, still another modification is shown, in which the ratchet teeth detents **60** are formed on the top surface of a transfer bead **62** around the bottle neck.

The cap **64** which is to go with this modification is shown in FIGURE 7, and, as there shown, the ratchet teeth **66** on the cap **64** are formed on the lower edge of a cantilever element **68** to engage the ratchet detent teeth **60** on the transfer bead **62** in FIGURE 6. In this case, the thumb tab **70** on the cantilever element **68** is pressed upwardly to disengage the cap teeth **66** from the detent teeth **60** on the bead **62**, shown in FIGURE 6. As soon as the teeth are initially disengaged, the cap **64** may be easily rotated and readily removed from the bottle.

In FIGURES 8 and 9, a further modification is shown in which a cantilever element **72** is arranged vertically with respect to the cap, and is provided with a thumb tab **74** which serves to angularly move the lower end of the cantilever **72** to disengage its ratchet teeth **76** from a corresponding set of detents **78** on the lower end of the helical thread **80** on the bottle neck shown in FIGURE 9.

By means of the several modifications shown, a cantilever structure is formed which may be provided with a set of teeth at its free end to engage a set of teeth detents on the neck or spout of a bottle or container, which is to be closed with a cap on which the cantilever is formed as an element of the cap.

By forming the teeth on the cantilever as an element of the cap, the economy of a single piece plastic construction is obtained, together with the benefits of the invention of protecting against casual and unwanted displacement and removal by a child. In view of the fact that these devices are all throw-aways, the question of economy is always an important factor in determining their use. In this case the economy of a single piece cap is retained and the benefits of the invention had at the same time.

Various modifications may be made in the construction and design on the cap or of the bottle and the cap together, without departing from the spirit and scope of the invention that is defined in the claims.

What is claimed is:

1. A safety container and closure cap combination, to prevent casual removal of the cap by a child, comprising:

a container provided with a neck or spout having an opening, and having a spiral thread on the external surface of said neck to receive an internally threaded cap;

an element on said neck having a series of ratchet teeth detents disposed along its length;

and a cap to fit over said neck or spout, said cap having a spiral thread on its inner surface to engage and ride on the spiral thread on the neck to wedge the cap tightly onto the neck to cover and close said opening;

and an element on said cap having a series of ratchet teeth disposed on said cap element for engaging the detents on said neck, in the fully closed position of said cap, for holding said cap in fully closed position against casual or undesired opening.

2. A container and closure cap combination, as in claim **1**, in which:

said element on said neck is integral with a portion of said spiral thread on said neck.

3. A container and closure cap combination, as in claim **2**, in which:

said integral thread element constitutes the bottom terminal portion of the neck thread, and the detent teeth are integral on said terminal thread portion.

4. A container and closure cap combination, as, in claim **1**, in which:

said element on said cap is supported from the body of said cap as a cantilever, and serves to press and hold in its ratchet teeth in full operative engagement with the detents on the neck in normal full closed position of the cap.

5. A container and closure cap combination as in claim **4**, in which:

said ratchet teeth on said cantilever element of the cap are disposed substantially at the free end of said cantilever and spaced from the anchored end of said cantilever, whereby only a small angular displacement of said cantilever is sufficient to free the cantilever ratchet teeth from the detents on the neck.

6. A container and closure cap combination, as in claim **4**, in which:

said cantilever element has a normal internal bias stress to press its ratchet teeth to a position of operative engagement with the detent teeth on said neck of the container.

7. A container and closure combination, as in claim **6**, in which said cantilever embodies a surface element operative in response to thumb pressure for overcoming said internal bias and for moving the teeth, and the detents to disengaged position to permit free unimpeded rotation and removal of said cap from said container.

8. A container and closure cap combination, as in claim **7**, in which:

said cantilever element is an extension of the cap body and normally follows the extended contour of said cap body from the anchored end of said cantilever, and said cantilever from its anchored end towards its free end is spaced from the body of cap by a slot of sufficient width to permit a transverse pressure force to be applied to the free end of said cantilever to cause disengagement of the cantilever teeth from the detents on said neck.

9. A container and closure cap combination, as in claim **7**, in which:

said surface element consists of a backwardly extending lug which may be depressed to raise the free end of the cantilever about its anchored end as a fulcrum, to disengage the cantilever teeth from the detents on the neck.

10. A safety cap consisting of a hollow cylinder closed at the top and open at the bottom to fit over a threaded neck or spout, and having an internal spiral thread to fit the thread of said neck, with the portion of the cap that supports the lowermost terminal portion of the cap thread slotted away from the body of the cap to provide a cantilever portion;

and a series of ratchet teeth formed on and along a portion of said cantilever.

References Cited

UNITED STATES PATENTS

3,233,769	2/1966	Jessop	215—9
3,311,247	3/1967	Rigor	215—9

GEORGE T. HALL, *Primary Examiner.*

U.S. Cl. X.R.

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