United States Patent [19]

Landen

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[54] **BOTTLE SAFETY CLOSURE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 313,801, Dec. 11, 1972, abandoned.

[52] **U.S. Cl.** **215/221;** 215/216

[51] **Int. Cl.** **B65d 55/02;** B65d 85/56; A61j 1/00

[58] **Field of Search** 215/9, 216, 221

[56] **References Cited**

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[57] **ABSTRACT**

The invention contemplates a child-resistant safety cap and bottle-neck combination wherein the cap has a threaded engagement to the neck but wherein a ratcheting one-way engagement relation develops between the bottle and the neck in approach to the closed relation of the parts. An axially resilient locking projection on the neck, located axially between the threads and base of the neck, has an escaping relation with teeth on the skirt of the neck for the cap thread-on direction, and a locking relation for the thread-off direction. Finger-actuated axial depression of the projection is necessary, in order to release the locked engagement and thus to permit the cap to be unthreaded.

3 Claims, 5 Drawing Figures

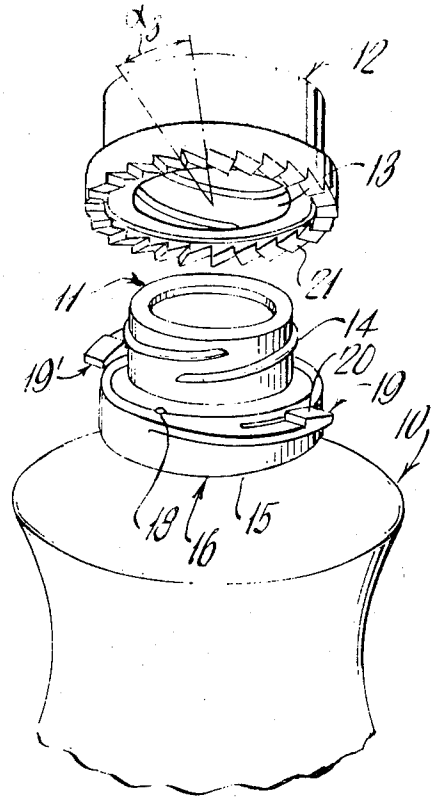


Fig.1.

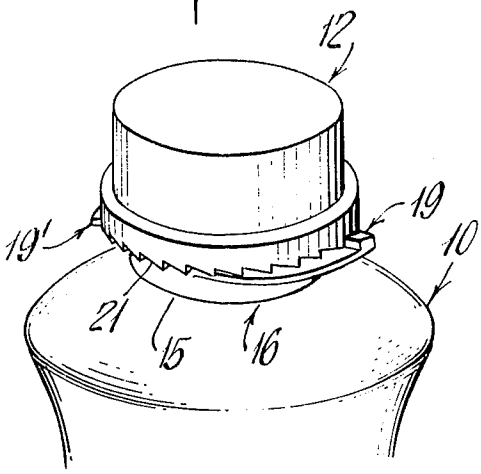


Fig.2.

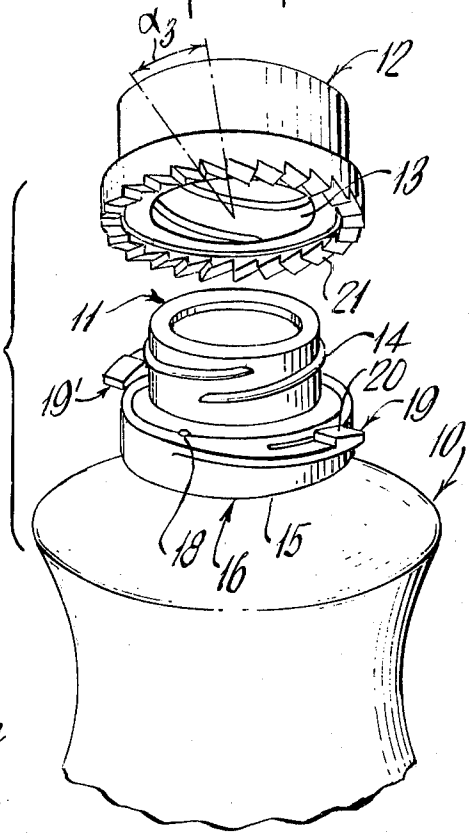


Fig.5.

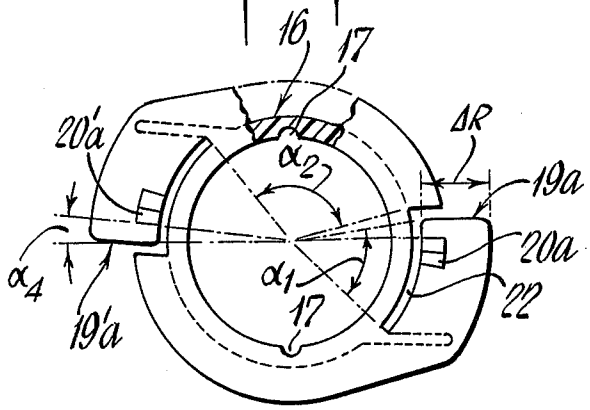


Fig.3.

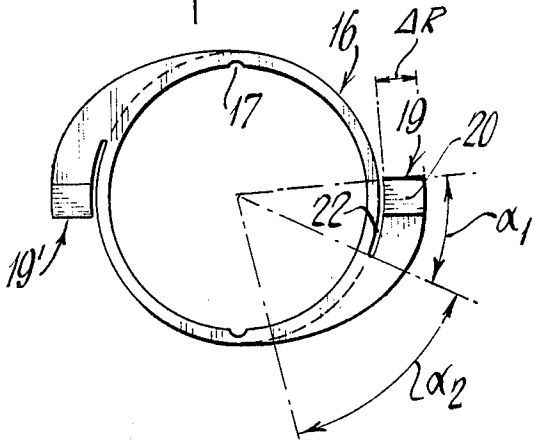
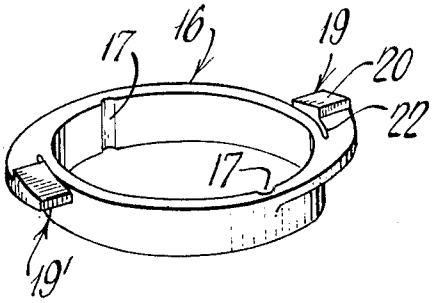


Fig.4.



BOTTLE SAFETY CLOSURE

This application is a continuation-in-part of my co-pending application, Ser. No. 313,801, filed Dec. 11, 1972, now abandoned.

This invention relates to bottles adapted to contain hazardous substances, and more particularly relates to safety closures for such bottles which render them child-resistant, i.e., resistant to tampering by children.

It is an object of this invention to provide a new and improved safety cap for a bottle, particularly of the variety having rotary engagement, as by threads.

Another object of the invention is to provide a new and improved safety cap for a bottle which is economical to manufacture and readily lends itself to automatic production line facilities for filling and capping a bottle.

A further object of the invention is to provide a new and improved safety cap and bottle combination in which the cap is readily locked onto the bottle but may be unlocked therefrom by a very simple manipulation of a locking member.

A still further object is to meet the above objects with a construction of inherent low cost, involving minimum alteration of present constructions.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, a preferred form of the invention:

FIG. 1 is a perspective view of a closed bottle-and-cap engagement of the invention;

FIG. 2 is an exploded perspective view of the parts of FIG. 1, the cap being tilted up for a better showing of detail;

FIG. 3 is a top plan view of the locking member of FIG. 1;

FIG. 4 is a view in perspective of the part of FIG. 3; and

FIG. 5 is a view similar to FIG. 3 to illustrate a modification.

The invention is shown in application to a container bottle **10** having an integral threaded neck **11** and selectively opened and closed by a cap **12** having a threaded bore **13.** The bottle may be of any suitable material such as glass, metal or plastic, but is shown in the style of a blow-molded plastic bottle. Cap **12** may be of any suitable construction, being typically an injection-molded plastic part, for the case of a plastic bottle **10.**

In accordance with the invention, the bottle neck non-rotatably carries axially resilient locking-projection means in the region between the threads **14** and the base end **15** of the neck. In the case of a plastic bottle **11,** such projection means may be formed integrally with the bottle **11,** but in the form shown the locking-projection means is a separate ring-shaped part **16,** which may be injection-molded of suitable plastic.

Ring **16** is intended to be a permanently assembled non-rotatable part of the neck **11** beneath the threaded region thereof. It thus may be force-fitted, bonded, or merely keyed to neck **11.** As shown, key grooves **17** in the bore of ring **16** have non-rotatable engagement with a nib or ribs **18** formed integrally with neck **11,** ring **16** being axially retained upon seating abutment with the base end **15** of the neck. One or more resilient

locking devices **19—19′** project radially from the body of ring **16** and are each provided with a ramp tooth **20,** for ratcheting engagement with a series of teeth **21** at the lower (open) end of the skirt of cap **12**; projections **19—19′** must be axially downwardly deflectable from the at-rest positions shown in FIGS. **2** and **4,** and so they are axially spaced from the neck base **15,** as shown. Preferably, the radial projections **19—19′** also extend over an arc α_1 about the neck axis, the same being provided by a slit **22** of extent α_1 between projections **19—19′** and the adjacent body of ring **16.** As shown, the effective angular extent α_2 over which projections **19—19′** are integrally united to the body of ring **16** is at least substantially the angular extent α_1, and the radial width ΔR of projections **19—19′** is substantially less than the length of the slits **22.** Also, the outer radial limit of projections **19—19′** exceeds that of the open end of the cap skirt, to an extent enabling finger-actuation. The ramp directions at **20** and **21** are selected to provide ratcheting escape for thread-on advance of cap and neck engagement, upon approach to the full threaded relation; in the thread-off direction of rotation, the teeth **20–21** are locked by engaged flat surfaces each of which extends radially in a plane through the neck axis. Preferably, tooth height (i.e., axial extent) in relation to the pitch or threaded advance of threads **14** is such that ratcheting action occurs only after considerable threaded engagement and in close approach to the home or fully closed position of the cap on the neck; at the fully closed position, the resilient action of the axially deflected teeth **20** is sufficient to assure a fully locked engagement of teeth **20–21,** as will be understood.

In use, the cap **12** is set in place and "threaded-on" to neck **11,** as for one or more turns, prior to any escaping engagement of teeth **20–21.** At the fully closed position, one tooth period (α_3, FIG. **2**) is the most that cap **12** can be unthreaded before encountering the locked condition at **20–21.** To remove the cap, the one or more projections **19** (**19′**) must be axially depressed to effect disengagement at **20–21,** whereupon the cap may be "threaded-off" in the usual manner.

In the modification of FIG. **5,** parts corresponding to those in FIG. **3** are given the same reference numbers; the plural projections and their ramp teeth are different and are therefore identified **19*a*—19*a*′,** and **20*a*—20*a*′,** respectively. The primary point of difference is that the angular locations or spacings between these projections and their teeth (**20*a*—20*a*′**) are so selected in reference to the number of ratchet teeth **21** in the skirt of cap **12** that ratchet action interlaces, as between the several individual teeth (**20*a*—20*a*′**) in the course of achieving a secured position of cap **12** on the bottle **10.** Thus, for the interlaced two-tooth arrangement of FIG. **5,** the effective angular position of tooth **20*a*** with respect to tooth **20*a*′** should be such that a locked engagement of tooth **20*a*** with one of the teeth **21** will mean an offset, or less-than-locked, engagement of tooth **20*a*′** with its next-adjacent one of teeth **21**; stated in other words, for a two-tooth arrangement, the effective separation of teeth **20*a*—20*a*′** is preferably an odd-integer multiple of one half of the effective pitch spacing of teeth **21.** Stated more generically, for a ring **16** having N teeth (as at **20*a*, 20*a*′**, etc.), coacting with a cap **12** having *n* equally spaced teeth **21,** the tooth spacing of adjacent teeth on ring **16** is preferably a multiple X of the pitch angle ($\alpha_3 = 2\pi/n$), divided by N,

where X is an integer other than N (or a multiple of N). Thus, for a 24-tooth series at **21**, an effective angular offset α_4 exists between tooth **20***a*′ and an adjacent one of the teeth **21**, for the condition that the other tooth **20***a* is fully engaged to a tooth **21**, the said offset being preferably 7.5° [$(2\pi/24\times2\pi$ radian) in the case of FIG. **5**. In such a relation, the incremental advance between successive ratchet-held positions of the cap and bottle neck is one half that obtainable for FIG. **3**, wherein both teeth **20** were positioned for simultaneous engagement with spaced teeth in the cap series **21**; thus, the arrangement of FIG. **5** provides the advantage of more reliably securing a liquid-sealing closure by cap **12**, by more finely dividing the number of available ratcheting positions, for a given number of teeth **21**.

The invention will be seen to provide a construction which meets all stated objects, and it will be understood that modifications may be made without departure from the scope of the invention.

What is claimed is:

1. In combination, a bottle including an externally threaded neck, an internally threaded cap having a skirt removably engageable to the threaded neck, a plurality of axially resilient locking projections non-rotatably carried on the outside of said neck beneath the threaded region and spaced from the base of said neck, said projections being in radial overlap with said skirt and being at angularly spaced locations about the axis of said neck, the open end of said skirt having a circumferentially extending downwardly directed series of teeth in one-way engageable relation with said locking projections near the closed relation of said cap and neck, the direction of one-way co-action being that of escapement in the thread-on direction and engagement in the thread-off direction, and said projections extending sufficiently radially outward of said cap in the closed position to enable finger-actuated disengagement of said locking projections from said teeth, whereby the cap may then be unthreaded, the effective separation of said locking projections being substantially a multiple χ of the pitch angle characterizing said series of teeth, divided by the number of said projections, where χ is an integer other than said number or a multiple thereof.

2. In combination, a bottle including an externally threaded neck, an internally threaded cap having a skirt removably engageable to the threaded neck, a locking ring non-rotatably carried by the outside of said neck and beneath the threaded region thereof, said ring including two like integral angularly spaced and axially resilient locking projections in radial overlap with said skirt and spaced from the base of said neck, the open end of said skirt having a circumferentially extending downwardly directed series of teeth in one-way engageable relation with said locking projections near the closed relation of said cap and neck, the direction of one-way co-action being that of escapement in the thread-on direction and engagement in the thread-off direction, the effective separation of said locking projections being substantially an odd integer multiple of one half the pitch angle characterizing said series of teeth, and said projections extending sufficiently radially outward of said cap in the closed position to enable finger-actuated disengagement of said locking projection from said teeth, whereby the cap may then be unthreaded.

3. The combination of claim **2**, wherein the number of skirt teeth is even, and said projections are angularly offset from diametric opposition, to the extent of one half said pitch angle.

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