

[54] SAFETY CLOSURE

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[58] Field of Search.....215/9, 43, 31; 220/39, 44

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UNITED STATES PATENTS

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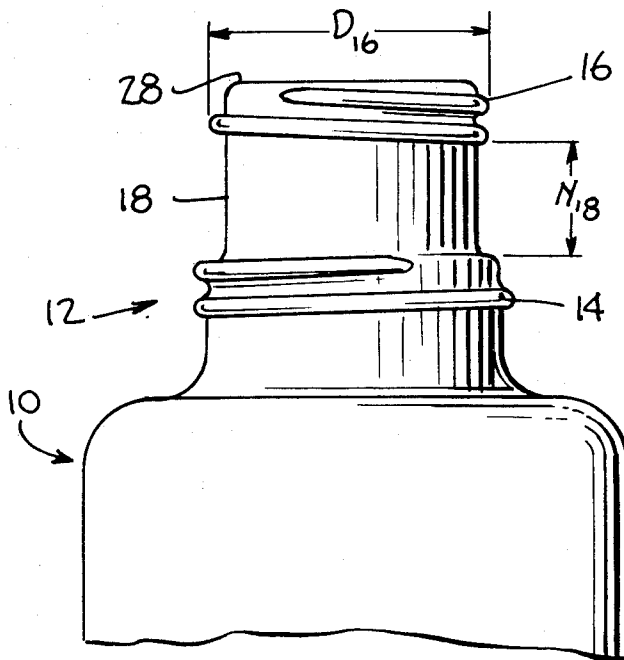
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[57] ABSTRACT

A dual thread neck and cap safety closure for a container to prevent opening of the container by children yet facilitate opening the container by adults. The neck has at least two spaced apart threads, one clockwise and one counterclockwise. The cap has a corresponding clockwise thread and a corresponding counterclockwise thread.

6 Claims, 4 Drawing Figures



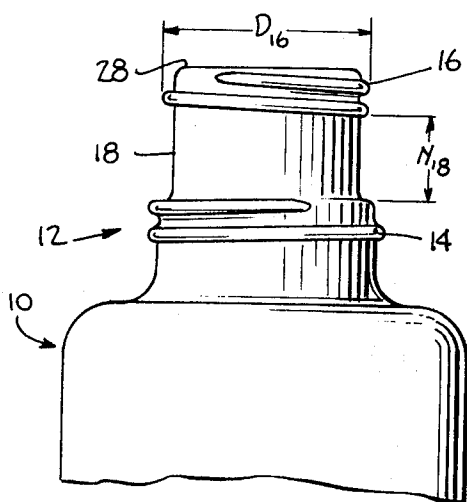
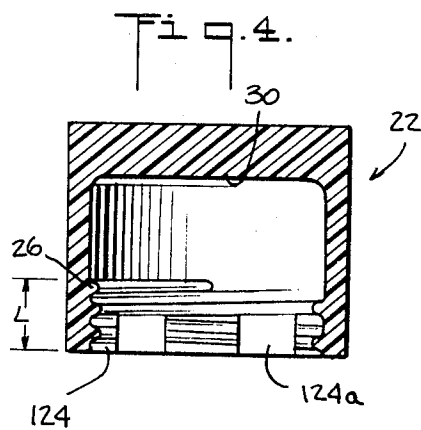
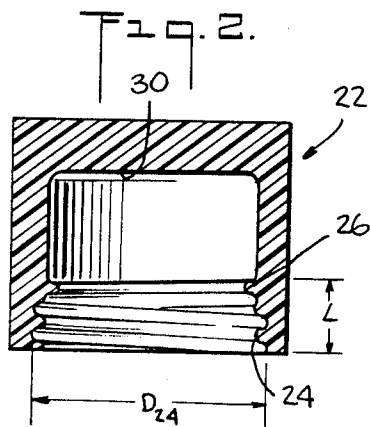


Fig. 1.

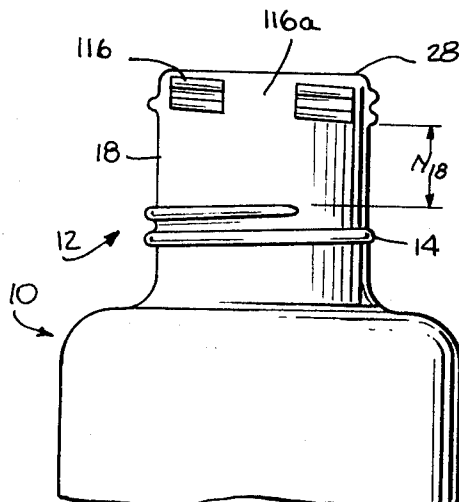


Fig. 3.

SAFETY CLOSURE

BACKGROUND OF THE INVENTION

This invention relates in general to safety closures and more particularly to a closure which is adapted to be used on medicine bottles and other containers where it is desired to keep children, particularly children under 6 or 7 years of age, from opening the container while making it relatively convenient for adults to open the container.

There has long been a need for container closures that can be readily opened and closed repeatedly by an adult but cannot be opened by small children. It is not merely containers for medicine, but also containers for such other household items as bleach, cleaning fluids and pest poison which require such closures.

Many safety closures have been proposed and some have been used. One group of such closures relies on friction to make it impossible or unlikely for a child to have the strength necessary to open the closure. However, such closures had the disadvantage that elderly people and other sick adults frequently do not have the strength necessary to open and properly close the containers involved. A person with arthritic fingers has great difficulty opening some of the aspirin bottle safety closures that have been employed. Furthermore, some of the known and proposed closures place such force on the friction creating elements that there is a real risk that the closure will break after a number of uses.

Accordingly, it is an important purpose of this invention to achieve this child-proof safety closure in a design which will permit elderly persons and ill adults, whose strength may be no greater than that of the children to which the design is directed, to open the bottle readily and to close it again.

It is another purpose of this invention to devise a safety closure that will not break after repeated use.

Another group of known safety closures are so complex that many adults have difficulty opening them. Such complex closures require expensive and complex special machinery for forming the closure and/or for capping the container in production. Such complexities tend to prevent the use of these safety closures in the wide range of applications for which it is desired to have such a closure.

Accordingly, it is another purpose of this invention to provide a relatively simple and relatively inexpensive childproof safety closure.

More particularly, it is a purpose of this invention to provide a safety closure which is relatively inexpensive to manufacture and which is relatively inexpensive to incorporate into an automatic container filling and capping assembly line.

Because of the nature of the contents that are contained in those containers where safety closures are required, it is an important purpose of this invention to provide a safety closure that meets the above criteria but which also can be made as airtight as required.

To facilitate widespread adoption of a child-proof safety cap, it is a further object of this invention to provide a design which will avoid obsoleting presently installed filling and capping machinery.

It is yet another object of this invention to provide a child-proof safety closure that can be used on squeeze tubes without requiring that the squeeze tube be held so tightly when being uncapped as to deform the tube.

BRIEF DESCRIPTION OF THE INVENTION

In brief, this invention involves the use of a first clockwise screw thread around the lower portion of the neck of a container and a second counterclockwise screw thread around the upper portion of the neck of the container. These two threads are spaced apart on the neck by an amount and for a reason that relates to the cap structure. The cap which fits over the neck of the container has a clockwise thread close to the cap rim that mates with the lower clockwise thread on the neck. Further into the cap is a counterclockwise thread that mates with the upper thread on the neck.

The peak diameter of the upper counterclockwise thread on the neck is sufficiently less than the diameter across the peaks of the lower clockwise thread on the cap so that the latter can readily pass over the former without engagement when the cap is placed over the neck.

The two cap threads are substantially axially adjacent to one another. The spacing between the two neck threads is at least equal to the total axial length of both cap threads taken as a unit.

In operation, the cap is fitted onto the neck by placing the cap over the neck until the upper counterclockwise thread in the cap contacts the upper counterclockwise thread on the neck. By turning the cap counterclockwise, these threads engage and the counterclockwise movement is continued until the upper thread on the cap passes entirely through the upper thread on the neck. At that point, both threads in the cap are in the space areas between the two threads on the neck. The cap is then continued to be brought down over the neck by changing the direction of rotation of the cap from counterclockwise to clockwise, so that the lower thread on the cap engages the lower thread on the neck. To remove the cap requires reverse movement, first rotating counterclockwise to unscrew the lower neck and cap threads from one another, and then clockwise to unscrew the upper neck and cap threads from one another.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the neck of a container incorporating this invention.

FIG. 2 is a cross-section through a cap designed to fit over and close off the neck shown in FIG. 1.

FIG. 3 is a perspective view of the neck of an alternate embodiment of this invention.

FIG. 4 is a cross-section through a cap designed to fit over and close off the neck shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate the same embodiment. As shown therein, a container 10 (not completely shown) has a neck portion 12. On the outside circumference of the neck 12 there is a lower screw thread 14 having a first rotational direction and an upper screw thread 16 having the opposite rotational direction. Between the two threads 14 and 16 there is an appreciable blank space 18. Just as an example, in one embodiment the lower thread 14 has three turns in a clockwise direction and the upper thread 16 has three turns in a counterclockwise direction.

In order to permit proper cooperation with the cap shown in FIG. 2, the upper thread 16 peak diameter D_{16}

is less than the root diameter of the lower thread 14. The axial length of the space 18 depends upon the axial length of the threads in the cap but in most embodiments, this length will be approximately at least equal to the sum of the axial length of the neck lower thread 14 and neck upper thread 16.

On the inside circumferential surface of the cap 22, there is a lower screw thread 24 and an upper screw thread 26. The cap lower thread 24 has a rotational direction such that it can be mated with the neck lower thread 14. The cap upper thread 26 has a rotational direction such that it can be mated with the neck upper thread 16. Thus, the rotational directions of the cap lower thread 24 and cap upper thread 26 are opposite to one another. The cap lower thread 24 and upper thread 26 need be no more spaced from one another axially than is convenient and necessary in order to fabricate two threads having opposite rotational directions.

In order for this dual screw thread safety cap to operate, it is essential that the cap lower screw thread 24 pass axially over the neck upper screw thread 16. Accordingly, the peak diameter D_{24} of the lower screw thread 24 in the cap 22 must be greater than the peak diameter D_{16} of the cap upper screw thread 16.

A further dimensional relationship, in order to permit operation of this invention, is that the axial length of the two cap screw threads 24 and 26 taken as a unit must be equal to or less than the axial distance N_{18} of the space 18 on the neck 12 between the two neck screw threads 14 and 16. This dimensional relationship is necessary so that after the cap upper thread 26 has completely threaded through the neck upper thread 16, both cap screw threads 24 and 26 will fit within the space 18. This fit in turn is required so that the cap lower thread 24 can then be threaded onto the neck lower thread 14 in order to effect closure.

The axial dimensions of the neck 12 and cap 22 may be such that the neck 12 upper rim 28 abuts against the back inner surface 30 of the cap 22, when the cap lower thread 24 is threaded onto the neck lower screw thread 14, so as to effect a substantially air-tight type of seal.

OPERATION

In operation, the cap 22 is mated to the neck 12 by first rotating the cap 22 on the neck 12 in one rotational direction (for example, counterclockwise) and then rotating the cap 22 on the neck 12 in an opposite rotational direction (clockwise in the example hypothesized).

More specifically, the cap 22 is brought down over the neck 12 and the cap lower screw thread 24 passes over the neck upper screw thread 16 until the cap upper screw thread 26 contacts the neck upper screw thread 16. Next, the rotation counterclockwise (as one example) causes the cap upper screw thread 26 to thread through the neck upper screw thread 16 until both cap screw threads 24 and 26 are positioned within the blank neck space 18. Obviously the neck space 18 must have a diameter less than the peak diameter of either cap screw thread 24, 26. Next, the cap is rotated clockwise to cause the cap lower screw thread 24 to thread onto the neck lower screw thread 14.

In order to remove the cap, the user must know to first rotate the cap counterclockwise (thereby unscrewing the thread 24 from the thread 14) and then, pulling

the cap axially up, rotate the cap clockwise (thereby threading the screw thread 26 through the screw thread 16).

ALTERNATE EMBODIMENT

FIGS. 3 and 4 show an alternate embodiment which is similar to FIGS. 1 and 2 except that the manner of causing the cap lower screw thread to pass over the neck upper screw thread is different. Accordingly, in the embodiment shown in FIGS. 3 and 4, the same reference numerals are used as are used in FIGS. 1 and 2, except as to the variant features and, as to those variant features, a parallel reference numeral system is employed.

In this FIG. 3 embodiment, the diameter of the neck lower screw thread 14 and the neck upper screw thread 116 is essentially the same. Accordingly, the diameter of the cap screw threads 124 and 26 are the same. In order for the cap lower screw thread 124 to pass over the neck upper screw thread 116, these two screw threads 116 and 124 are constructed in an intermittent or broken fashion as shown. These threads 116 and 124 each have alternate, preferably equal, axial zones 116a, 124a in which the thread is obliterated. The remaining portion of the threads 116 and 124 can then pass axially through one another much in the manner that axial splines would pass through one another. Although this is not a preferred embodiment, it is one way in which the stepped diameter of the neck and cap can be avoided.

Although the terms "upper" and "lower" are used in the specification and claims to refer to the two neck threads relative to each other and to the two cap threads relative to each other, it should be understood that this terminology is not limiting. Normally, of course, the neck thread closest to the rim 28 will be an upper neck thread because the container 10 will normally be held with its neck up. Obviously, however, the container might be in any orientation and it is to be understood herein that this change in orientation does not affect the scope of this invention. The terms upper and lower are used for convenience of visualization and it is to be understood that the upper thread of the neck is the one nearest to the rim of the neck and the lower thread of the cap is the one nearest to the rim of the cap.

I claim:

1. A safety closure for a container having a neck and a mating cap comprising:
 - a first screw thread on the outer surface of the neck, said first thread having a first rotational direction,
 - a second screw thread on the outer surface of the neck positioned above and spaced from said first thread, said first and second screw threads having opposite rotational directions,
 - a third screw thread on the inner surface of the cap, said third screw thread having a rotational direction permitting said third screw thread to be threaded onto said first screw thread,
 - a fourth screw thread on the inner surface of said cap and positioned above said third screw thread, said fourth screw thread having a rotational direction permitting it to be threaded onto said second screw thread,
 - said first and second screw threads on the neck being axially spaced apart by a distance at least equal to

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the axial length of the combination of said third and fourth screw threads on said cap, and means to permit said third thread to axially pass said second thread.

2. The closure of claim 1 wherein:

the peak diameter of said second thread is less than the peak diameter of said third thread so that said third thread can pass axially over said second thread.

3. A safety closure for a container having a neck and mating cap to inhibit opening by children comprising: a first screw thread on the outer surface of the neck, a second screw thread on the outer surface of the neck,

the rotational directions of said first and second screw threads being opposite to one another, a third screw thread on the inner surface of said cap, a fourth screw thread on the inner surface of said cap,

said third and fourth screw threads having rotational directions opposite to one another,

said first screw thread being lower on the neck than said second screw thread and said third screw thread being lower on the cap than said fourth screw thread,

said third screw thread being adapted to engage said first screw thread and said fourth screw thread being adapted to thread onto said second screw thread,

said first and second threads being axially spaced apart on said neck by a distance at least equal to the axial length of said third and fourth threads as a unit, and

means to permit said third thread to axially pass said second thread.

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4. The closure of claim 3, wherein:

the peak diameter of said second thread is less than the peak diameter of said third thread so that said third thread can pass axially over said second thread.

5. A container having a neck adapted to be closed by a cap to provide a safety closure to inhibit opening by children comprising:

a lower screw thread on the outer surface of said neck having a first rotational direction, and an upper screw thread on the outer surface of said neck having a second rotational direction, said first and said second rotational directions being opposite to one another,

said upper and lower screw threads on said neck being axially spaced from one another by a distance sufficient to accommodate mating cap screw threads,

the peak diameter of said upper screw thread being less than the root diameter of said lower screw thread.

6. A safety closure cap for a container having a neck to provide in combination with the container a closure that inhibits opening by children comprising:

an upper screw thread on the inner surface of said cap, and

a lower screw thread on the inner surface of said cap axially positioned closer to the rim of the cap than said upper screw thread,

the rotational directions of said upper and lower screw threads being opposite to one another, the peak diameter of said lower screw thread being greater than the root diameter of said upper screw thread.

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