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SAFETY CLOSURE FOR CONTAINERS

Filed March 2, 1965

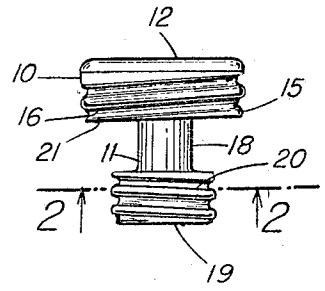


FIG. 1

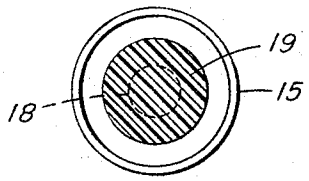


FIG. 2

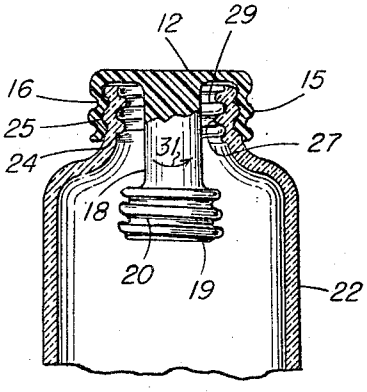


FIG. 3

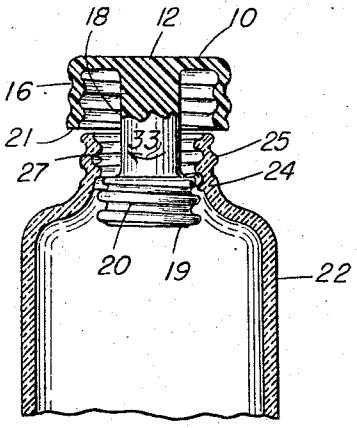


FIG. 4

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SAFETY CLOSURE FOR CONTAINERS

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This invention relates to closure devices for containers, and more particularly to safety caps for bottles and the like, adapted to deter access to the contents thereof.

Ordinary household supplies usually include a variety of potentially hazardous liquid and solid substances such as medicines, capsules, poisons, cleaning fluids and other materials inappropriate for unsupervised consumption by small children. The accessibility of these substances to children is a frequent occasion of accidents in the home. To prevent or at least minimize the chance of such accidents, it is desirable not only to keep the bottles or other containers holding these substances out of the reach of children as far as possible, but also to provide the bottles with closure devices that cannot readily be opened by children. Another common cause of accidents is the consumption of medicines or the like by mistake, even by adults, as when the wrong bottle is taken from a medicine cabinet or shelf by error and the contents used before the error is discovered; again, to reduce the likelihood of such mistakes, it is advantageous to provide special closure means for unconventional operation for bottles containing dangerous ingredients, so that the act of opening the bottle will itself provide a warning that the contents should be used with care.

An object of the present invention is to provide a safety closure structure, for bottles or other containers that may contain hazardous materials, effective to deter access to the contents thereof by small children. Another object is to provide such safety closure structure which also affords a warning against accidental or mistaken use of the container contents, by requiring for opening a particular and unusual sequence of manipulative steps serving to put the person opening the bottle on notice of the nature of its contents. Still another object is to provide such safety cap device that, while affording the foregoing advantages, may nevertheless be opened with relative ease by adults instructed in its use. A further object is to provide such a device which for convenience and facility of handling, comprises a unitary cap structure.

Further objects and advantages of the invention will be apparent from the detailed description hereinbelow set forth, together with the accompanying drawings, wherein:

FIG. 1 is a side view of a bottle cap structure embodying the present invention in a particular form;

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

FIG. 3 is an elevational section view of the device of FIG. 1 in closed position on a bottle adapted to receive the same; and

FIG. 4 is an elevational sectional view of the bottle and cap of FIG. 3, showing the cap in partly open position.

Referring to the drawings, the safety closure device of the invention in its illustrated embodiment broadly comprises a screw cap **10**, having formed integrally therewith a central plug or stud **11** that projects through and beyond the interior of the cap so as to extend into the neck or mouth portion of a bottle on which the cap is placed, the cap and stud together constituting a unitary structure. This closure device may be made of plastic, metal or other suitable material, e.g., as conventionally used for screw caps, and may be formed by any convenient procedure.

More particularly, the cap **10** may be of generally conventional screw cap form, having a closed end **12** and a hollow cylindrical portion **15** which projects from one side of the end **12** so as to form therewith a cup-shaped body. The portion **15** bears an internal screw thread **16** of given rotational sense, i.e., either left-handed or right-handed; for example, the thread **16** may be a conventional right-handed helical screw thread adapted to mesh with an internal right-handed screw thread on the neck of a bottle.

In this connection, it will be appreciated that screw threads are formed either right-handed or left-handed in rotational sense, and that the rotational sense determines the direction in which the thread is turned. Thus, for example, a screw cap having a right-handed screw thread is turned in clockwise direction when screwed onto a bottle, and in counterclockwise direction when unscrewed; conversely, a screw cap having a left-handed screw thread is turned in counterclockwise direction when screwed onto a bottle and in clockwise direction when unscrewed.

The stud **11**, secured to and carried with the cap, comprises a shaft portion **18**, e.g., of cylindrical configuration, attached at one end to the cap end portion **12** and projecting therefrom through the interior of the cap, i.e., through cylindrical portion **15**, in coaxial relation to the latter cylindrical portion. At its outer end, the shaft **18** bears a cylindrical plug portion **19**, formed coaxially with the shaft portion **18** and having on its outer surface an external screw thread **20**. In accordance with the invention, the rotational sense of the screw thread **20** is opposite to that of the internal screw thread **16** of the cap and thus when (as shown) the cap screw thread **16** is a right-handed screw thread, the thread **20** is left-handed in rotational sense.

It will be seen that in this arrangement of elements the screw threads **16** and **20** are disposed along a common axis. Shaft **18** is made sufficiently long to project for some distance beyond the lower edge or lip **21** of the cylindrical cap portion **15**, so that the upper end of plug portion **19** (the end facing the cap end **12**) is more remote from the cap end **12** than lip **21**; consequently the two screw threads **16** and **20** are spaced apart along their common axis, as hereinafter further explained.

As shown more particularly in FIG. 3, the closure device of FIG. 1 is adapted for use with a bottle **22**, e.g. of glass, which has a cylindrical opening-defining neck or mouth portion **24** bearing on its outer surface an external screw thread **25** of rotational sense corresponding to screw thread **16** of cap **10**, and bearing on its inner surface an internal screw thread **27** of opposite rotational sense i.e. corresponding to screw thread **20** of plug portion **19**. Thus, in the illustrated embodiment, the external neck thread **25** is right-handed, and the internal neck thread **27** is left-handed. The cap **10** of the present closure device is dimensioned to fit over the neck of the bottle to provide closure thereof, as in conventional manner, the internal cap thread **16** being adapted to mesh with the external neck thread **25**; plug portion **19** is dimensioned to fit within and pass through the central cylindrical opening **29** of the neck portion **24**, and the external screw thread **20** of this plug portion is adapted to mesh with the internal neck thread **27**.

Accordingly, as shown in FIG. 2, the internal diameter of the cap **10** is greater than the exterior diameter of the plug **19**, i.e. by an amount sufficient to accommodate the thickness of the neck of the bottle. The shaft portion **18** of the stud **11** is very preferably of dimeter at least somewhat smaller than the diameter of plug portion **19**, so as to pass with clearance through the neck opening **29** after plug **19** is screwed therethrough as the cap is moved into closed position on the bottle. As indicated in FIG. 3, when the cap is fully closed, the thread of the cap portion **15** meshes with the external thread of the bottle neck **24** and the plug portion **19** projects into the bottle **22** for some distance below the neck opening **29**, the plug thread

20 thus being out of engagement with the internal neck thread 27.

In use of the described closure device, to open the bottle (starting with the cap 10 in fully closed position as shown in FIG. 3) the device is first rotated manually in such direction as to unscrew the cap, i.e. to displace the cap upwardly out of engagement with the neck portion as indicated in FIG. 4. To effect such unscrewing with the device of FIG. 1 having a right-handed cap thread 16, the cap is turned counterclockwise as indicated by arrow 31 in FIG. 3. As the screw thread 16 of the cap 10 disengages from the external screw thread 25 of the bottle neck portion 24, the upward movement of the cap elevates the upper end of plug portion 19 into engagement with the lower end of the internal neck thread 27, i.e. into the position shown in FIG. 4. Further counterclockwise rotation of the cap is ineffective to remove the closure device, because as stated the external plug thread 20 and internal neck thread 27 are left-handed, i.e. opposite in rotational sense to the internal cap thread and external neck thread.

Accordingly it is necessary to reverse the direction of rotation at this point and to turn the cap clockwise (as indicated by arrow 33 in FIG. 4), in order to thread the plug portion 19 upwardly through the neck 24 and remove the cap.

Thus, in short, removal of the cap from the bottle requires not merely a simple unscrewing of the cap, but instead a succession of operations, namely first turning the cap in one direction to disengage the cap thread, and then (while holding the cap up so that the upper end of the plug 19 engages the lower end of neck 24), turning the cap in the opposite direction to thread the plug through the neck. While this sequence of motions is not difficult for one who understands or can read simple instructions, it is a substantial deterrent to very small children and hence effectively prevents their getting into a bottle so capped. In addition, the necessity of performing these manipulative steps to open the bottle serves as a warning to adults handling the bottle that the contents should be used with caution. At the same time, these advantages are provided in a unitary closure structure which can be removed with one hand and handled, when off the bottle, as easily as a conventional screw cap.

To close the bottle the above-described sequence of operations is simply reversed; in other words, the plug portion 19 is first brought into engagement with the upper end of the bottle neck, the cap is rotated in counterclockwise direction to thread the plug portion down through the neck of the bottle, and as the upper end of the plug portion 19 disengages from the lower end of the internal neck thread 27, the direction of cap rotation is reversed (i.e. the cap is turned clockwise) to thread the cylindrical cap portion 15 onto the neck 24 until the bottle is fully closed by abutment of the upper edge of neck 24 with the inner face of the cap end 12. When the device is thus in closed position, it provides closure of the bottle equivalent in effectiveness, i.e. for prevention of spilling, evaporation or deterioration of the bottle contents, to the closure afforded by a conventional screw cap, since the cap thread and external neck thread mesh (to provide such closure) in the same way as in a conventional screw cap and threaded bottle neck.

As will now be apparent, since the cap and plug threads 16 and 20 are opposite to each other in rotational sense, to enable the closure device to be screwed onto the bottle neck 24 it is necessary that these cap and plug threads be so disposed, in relation to each other and to the external and internal neck threads 25 and 27, that as the closure device is moved between fully closed and fully open position the cap and plug threads do not at any time simultaneously engage the respective external and internal neck threads. This relative disposition of the threads is provided, in the illustrated embodiment of the invention, by spacing the plug portion 19 sufficiently far from the cap 10 so that as the closure device is unscrewed the cap thread 16 clears the external neck thread 25 (as shown in FIG. 4) before the plug thread 20 engages the lower end of the internal neck thread 27. As a specific example of such arrangement, for use with a bottle having a neck portion 24 on which the external and internal threads 25 and 27 are substantially coextensive with each other along a common axis, the length of shaft 18 may be such that the axial distance between the end of plug portion 19 facing cap 10 and the lip 21 of cap portion 15 is at least equal to the internal depth of the cap (viz the axial distance between the inner face of cap end 12 and lip 21); in other words, the length of shaft 18 should in such case be at least equal to twice the internal depth of the cap.

While in the foregoing embodiment, for purposes of illustration, the thread 16 of the cap 10 has been specified as having a right-handed rotational sense, i.e., the conventional sense of rotation for screw caps and the thread 20 of the plug 19 has been specified as left handed (with corresponding rotational senses for the external and internal threads of the bottle neck 24), the rotational senses of these screw threads may be reversed if desired, the advantages of the invention inhering broadly in the provision of a cap 10 having an internal screw thread of one rotational sense with a plug portion 19 having an external screw thread of opposite rotational sense, for use with a bottle which has a neck portion bearing internal and external threads of corresponding and respectively opposite rotational senses.

Although alternative configurations and arrangements of plug and cap may be employed within the scope of the invention to provide the safety closure features set forth above, as likewise (in conjunction therewith) other relative dispositions of external and internal screw threads on the bottle neck, the embodiment shown and described herein possesses certain special advantages; in particular, the cap, plug and bottle neck shown afford a container neck and closure which in external appearance, shape and dimensions correspond to those of a conventional screw-cap bottle, no special elongation or other enlargement of the external cap and bottle neck being required to provide the aforementioned safety-closure features.

The bottle 22 may be used to contain any sort of potentially hazardous substance which it is desired to keep out of reach of children. Thus, the bottle may contain capsules, liquid medicines, poisons, cleaning fluid, or other materials. It will further be appreciated that while a bottle of glass having a somewhat restricted neck orifice has been shown, the safety closure device of the invention may be used with other shapes and types of containers having a neck or opening portion adapted to cooperate therewith.

It is to be understood that the invention is not limited to the features and embodiments herein above specifically set forth but may be carried out in other ways without departure from its spirit.

I claim:

1. In a container structure, in combination, a container vessel having an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense; and a closure device comprising a screw cap dimensioned to fit over said neck portion for closure thereof and bearing an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion, and a plug dimensioned to pass through the opening defined by said neck portion and having a surface portion bearing an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion; said plug being secured to said cap and projecting therefrom so as to extend through said opening when said cap is in position closing said neck portion; said internal thread of said cap and said external thread of said plug being relatively positioned to engage said external and internal neck threads respectively as

said closure device is moved between a first position in which said cap fully closes said neck portion and a second position in which said closure device is fully disengaged from said neck portion, and to prevent simultaneous engagement of said cap thread and said plug thread with said external and internal neck threads respectively as said closure device is moved between said first and second positions.

2. A closure device for a container which has an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense, said closure device comprising a screw cap dimensioned to fit over said neck portion for closure thereof and bearing an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion; and a plug dimensioned to pass through the opening defined by said neck portion and having a surface portion bearing an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion; said plug being secured to said cap and projecting therefrom so as to extend through said opening when said cap is in position closing said neck portion; said internal thread of said cap and said external thread of said plug being relatively positioned to engage said external and internal neck threads respectively as said closure device is moved between a first position in which said cap fully closes said neck portion and a second position in which said closure device is fully disengaged from said neck portion, and to prevent simultaneous engagement of said cap thread and said plug thread with said external and internal neck threads respectively as said closure device is moved between said first and second positions.

3. A closure device for a container which has an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense, said closure device comprising a screw cap dimensioned to fit over said neck portion for closure thereof and having an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion; and a plug dimensioned to pass through the opening defined by said neck portion and having a surface portion bearing an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion; said plug being secured to said cap and projecting therefrom in coaxial relation to said cap so as to extend through said opening when said cap is in position closing said neck portion; said internal thread of said cap and said external thread of said plug being disposed along a common axis and relatively spaced along said common axis by a distance sufficient to prevent simultaneous engagement of said cap thread and said plug thread with said external and internal neck threads respectively as said closure device is moved between a first position in which said cap fully closes said neck portion and a second position in which said closure device is fully disengaged from said neck portion.

4. A closure device for a container which has an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense, said closure device comprising a screw cap dimensioned to fit over said neck portion for closure thereof, said screw cap having a closed end and bearing an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion; and a stud dimensioned to pass through the opening defined by said neck portion, said stud having a shaft portion secured to said cap and projecting therefrom in coaxial relation to said cap so as to extend through said opening when said cap is in position closing said neck portion, said stud further having a plug portion secured to the end of said shaft remote from said cap in coaxial relation thereto, said plug portion bearing on its surface an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion; said internal thread of said cap and said external thread of said plug being disposed along a common axis with said plug thread more remote from said closed cap end than said cap thread, said cap thread and said plug thread being spaced apart along said comon axis by a distance sufficient to prevent simultaneous engagement of said cap thread and said plug thread with said external and internal neck threads respectively as said closure device is moved between a first position in which said cap fully closes said neck portion and a second position in which said closure device is fully disengaged from said neck portion.

5. A closure device for a container which has an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense, said closure device comprising a screw cap dimensioned to fit over said neck portion for closure thereof, said screw cap having a closed end and a cylindrical portion projecting from one face of said closed end and bearing an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion; and a stud dimensioned to pass through the opening defined by said neck portion, said stud having a cylindrical shaft portion secured to said one face of said closed cap end and projecting therefrom in coaxial relation to said cylindrical cap portion so as to extend through said opening when said cap is in position closing said neck portion, said stud further having a cylindrical plug portion secured to the end of said shaft portion remote from said cap in coaxial relation thereto, said plug portion bearing on its surface an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion, said shaft portion having a diameter smaller than that of said plug portion; said shaft portion having an axial dimension, between said closed cap end and said plug portion, equal to at least twice the axial dimension of said cylindrical cap portion.

6. In a container structure, in combination, a bottle having an opening-defining neck portion bearing on its outer surface an external screw thread of one rotational sense and bearing on its inner surface an internal screw thread of opposite rotational sense concentric with said external neck thread; and a closure device comprising a screw cap and a stud; said screw cap being dimensioned to fit over said neck portion for closure thereof and having a closed end and bearing an internal screw thread of said one rotational sense for meshing with said external screw thread of said neck portion; said stud being dimensioned to pass through the opening defined by said neck portion and having a shaft portion secured to said cap and projecting therefrom in coaxial relation to said cap so as to extend through said opening when said cap is in position closing said opening, said stud further having a plug portion secured to the end of said shaft remote from said cap in coaxial relation thereto, said plug portion bearing on its surface an external screw thread of said opposite rotational sense for meshing with said internal screw thread of said neck portion; said internal thread of said cap and said external thread of said plug being disposed along a common axis with said plug thread more remote from said closed cap end than said cap thread, said cap thread and said plug thread being spaced apart along said common axis by a distance sufficient to prevent simultaneous engagement of said cap thread and said plug thread with said external and internal neck threads respectively as said closure device is moved between a first position in which said cap fully

closes said neck portion and a second position in which said closure device is fully disengaged from said neck portion.

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