

[54] SAFETY CLOSURE

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[51] Int. Cl.² B65D 55/02

[58] Field of Search 215/9, 219, 218, 220, 258

[56] **References Cited**

UNITED STATES PATENTS

3,394,829 7/1968 Peterson 215/220

3,737,064 6/1973 Patel et al. 215/258
3,795,338 3/1974 Swartzbaugh et al. 215/9

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[57] **ABSTRACT**

A safety closure for containers comprising an inner and an outer cap which can be screwed on a neck of the container, with the safety closure being positively mounted on the container neck by solely rotating the outer cap in a first direction, and being dismounted by simultaneously depressing and rotating the outer cap in the opposite direction. A coupling structure is provided with both caps including at least two interengageable stops for positively coupling the outer cap to the inner cap during rotation in the first direction.

9 Claims, 5 Drawing Figures

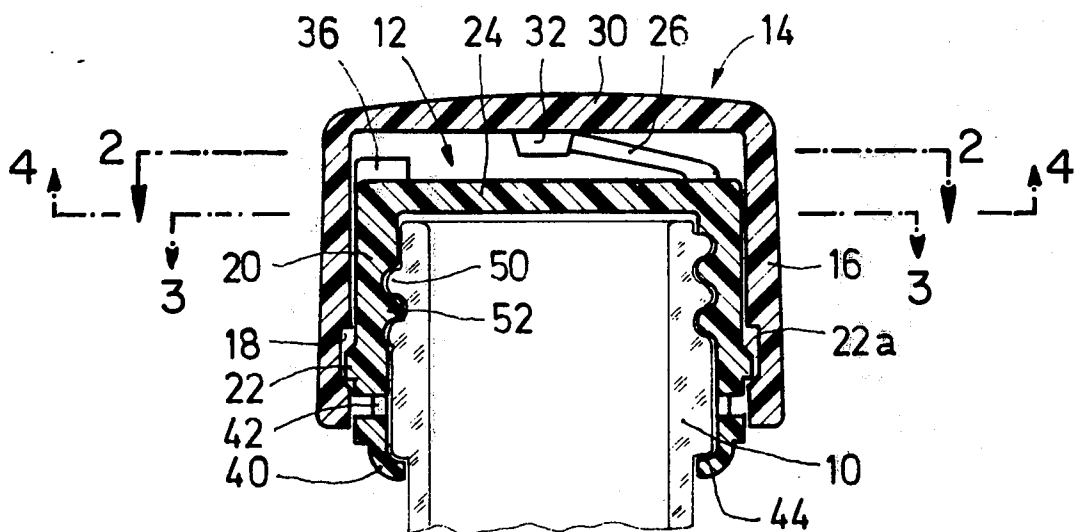


Fig. 1

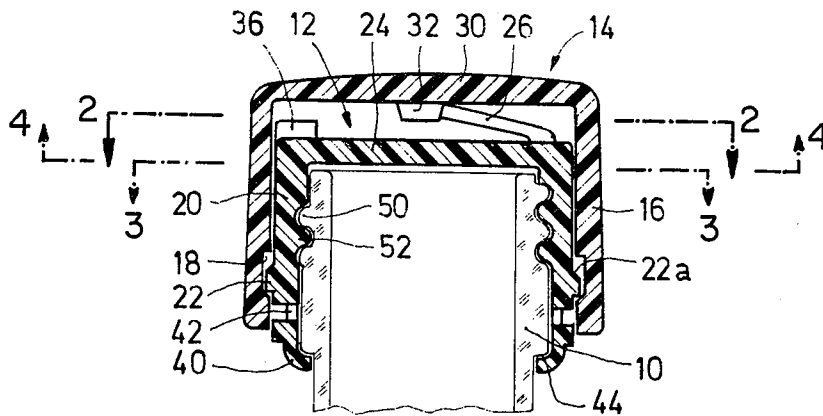


Fig. 2

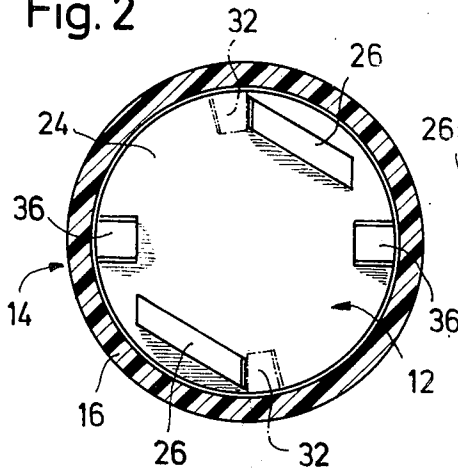


Fig. 3

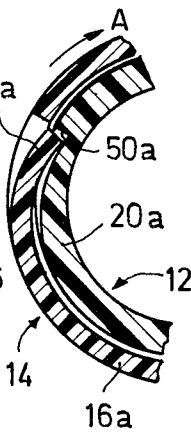


Fig. 4

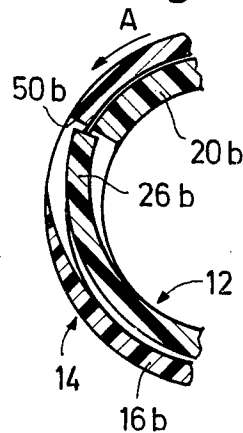
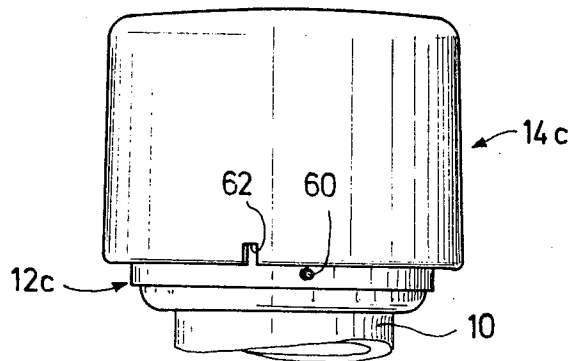


Fig. 5



SAFETY CLOSURE

This is a continuation, of application Ser. No. 239,565, filed Mar. 30, 1972.

BACKGROUND OF THE INVENTION

The invention relates to a safety closure for containers and especially for bottles with a threaded neck containing medicines, pills or other potentially dangerous substances, where it is desirable to prevent access thereto by small children.

In a known safety closure of this kind where superimposed caps are utilized, such that disclosed in U.S. Pat. No. 3,374,912, a cam is attached to the circumferential region of the inside bottom surface of the outside cap and a cooperating wedge as well as an adjacent notch are provided on the top of the inside cap. Further, in the middle of the top of the inside cap two spring arms are provided which maintain the confronting surfaces of the two caps spaced away from each other so that the dependent cam of the outside cap can rest against the shoulder formed by the wedge but cannot engage in the notch. Now, if the outside cap under its own weight rests upon the spring arms, which is the case only when we have at least almost upright containers, then the safety closure can be secured upon the container without any need for overcoming the force of the spring arms through axial pressure upon the outside cap. Any unintentional or undesired opening of the lock is prevented in the following manner: During rotation in the opposite direction, the cam can slide up on the wedge and thus the outside cap cannot pick up and take along the inside cap, if the outside cap is not pressed axially toward the inside cap against the action of the spring arms so that the cam will engage the previously mentioned notch and thus couple the two caps firmly together so that they cannot rotate relative to each other. This known safety closure involves two disadvantages: First of all, without pressing down on the outside cap, one cannot be sure that the inside cap will be moved along during the locking of a container if this container does not stand upright; and, furthermore, the spring arms are positioned in the middle of the inside cap so that this lock is not suitable for medication bottles which have a so-called dropper insert because the latter requires a conical or cone-shaped design for the central areas of the caps. Likewise, it is rather unpleasing in a screw closure when the two caps rest upon each other so loosely that they are inclined to rattle.

Another known safety closure or safety lock exemplified by U.S. Pat. No. 3,472,411, which also includes an inside and an outside cap having complementally formed portions, operates in the following manner. The bottom of the outside cap has a series of hemispherical protrusions which engage complementally formed depressions provided on top of the inside cap which constitute a coupling means for operation of the lock and which, because of the outwardly bulging elastic top of the outer cap, are normally not engaged. To form the one-way coupling between the outside and the inside cap, which is used to secure the cap assembly to a bottle, the confronting surfaces adjacent to the circumferential walls of each of the inner and outer caps are provided with ramp like surfaces. Now, in order to obtain the effect of a one-way coupling, the outside and inside cap in this known lock must be held within each other with axial leeway otherwise the simple turning of the outside cap could enable one to open a lock in spite of

the wedge-shape design of the coupling parts without any need for pressing into the elastic top portion of the outside cap for this purpose.

Consequently, it is seen that in this known safety closure, when the outside cap is turned in the direction of locking, it is not necessary in the coupled state; instead, the one-way coupling is only engaged if the outside cap rests upon the inside cap of its own weight or if the operator presses the outside cap downwardly upon the inside cap. The disadvantages of the first-described known lock thus also are present here to the same extent.

Finally, various safety locks are known whose outside and inside caps are kept apart from each other at an axial interval by means of a separate ring which lies between them and which has integral elastic tongues. These locks involve the disadvantage that they cannot be assembled automatically due to the separate ring because such parts cannot be sorted automatically.

OBJECTS, SUMMARY AND ADVANTAGES OF THE INVENTION

The principal object of the present invention is to provide the existing state of the art with a safety lock of the kind mentioned earlier herein which can be assembled automatically and which is designed such that the two locking parts need not be held within each other with leeway and especially not with axial leeway and that at the same time one can be sure that the lock, during rotation in one direction, will always lock, that is, especially that it will be screwed securely upon the container independent of its position. It is, however, quite natural and contemplated that this kind of lock can be designed not just as a screw lock but, for example, as a bayonet lock or the like. This and other objects are accomplished according to the present invention by the provision that one of the bosses of the one-way coupling is constituted by the free end of an elastic tongue. Because of the elastic property of this boss, there is no axial leeway necessary between the two locking parts and this is the prerequisite for making sure that the internal locking part will be picked up and moved along when the lock is screwed shut.

Now, one of the parts of the one-way coupling is made in the form of a spring and this is why the invention also creates the prerequisite for holding the middle of the locking parts free of functional elements, so that, in one advantageous form of the invention, the coupling parts and the tongue can all be arranged in proximity of or at the circumference of the locking parts. The elastic tongues which, in the known lock just described, are provided in the middle of that lock, can be omitted because the elastic tongue — which is arranged along the periphery of the lock — can take over their function of disengaging the coupling for the purpose of opening the lock.

The lock according to the invention is thus also suitable for medication bottles with a dropper insert.

It is also conceivable, in the lock according to the invention, to place the coupling for the opening of the lock and/or the one-way coupling entirely into the circumferential walls of the caps and/or to separate the two couplings entirely from each other. For example, the coupling provided for the opening of the lock could be designed as described, for example, in U.S. Pat. Nos. 3,260,393 and 3,343,697. The one-way coupling may be formed on the circumferential wall of the caps when one cap is formed with an outwardly projecting elastic

tongue which may extend into a recess in the circumferential wall of the other cap. On the other hand, the coupling means, which serves to assure opening of the lock, could also be positioned in the circumferential walls of the cap. In such an arrangement there is provided, in one cap, a slit of limited length, which extends in an axial direction and is arranged to engage one cam of the circumferential wall of the other cap, if the two caps are moved toward each other in an axial direction.

In order not to have to provide an unnecessarily large number of cams or the like upon the locking part for these two couplings, it is recommended, for the purpose of constituting the one-way coupling, to form, in proximity of the circumference of the locking parts and on the opposed cap surfaces of at least one locking part, one elastic tongue running roughly tangentially to the circumference and to provide on the other locking part at least one cam. Furthermore, for the purpose of forming the coupling for the opening of the lock, it is also contemplated to provide, at the locking part carrying the tongue, at least one cam which will cooperate with the cam of the other locking part.

Further objects and advantages will become more apparent from a reading of the following specification taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal cross section through a first embodiment of the lock according to the invention;

FIG. 2 is a cross section along line 2—2 of FIG. 1;

FIG. 3 is a cross section through parts of the circumferential walls of two caps, and taken in the direction of line 3—3 of FIG. 1 the two caps together, constituting a further embodiment of the invention whereby FIG. 3 shows the one-way coupling;

FIG. 4 is a cross section, corresponding to FIG. 3, but taken in the direction of line 4—4 of FIG. 1 showing still another embodiment of this invention; and

FIG. 5 is a side view of a fourth embodiment of the invention which reveals the coupling for the opening of the lock.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the preferred embodiment of the invention shown in FIGS. 1 and 2, an inside cap 12 — over which is gripped an outside cap 14 — is screwed upon the neck 10 of a bottle. Together, the two caps form the lock according to the invention and they are connected with each other so that they cannot be lost; for this purpose the outside cap includes on the inside of its circumferential wall 16 a groove 18 into which engages an annular collar 22 which is formed on the outside of the circumferential wall 20 of the inside cap 12. This annular collar has a chamfered edge portion 22a, as shown, so that the two caps, during the assembly of the lock according to the invention, can easily be pushed together, this action slightly widening the lower portion of the outside cap, until the annular collar 22 snaps into the groove 18.

During manufacture of the inner cap 12, at least two integral elastic tongues 26 are formed upon the top wall 24 thereof and these tongues are arranged to cooperate with the cams 32 which are formed upon the inside wall 30 of the inside cap 14. It is worth mentioning here that the tongues 26 extend obliquely upward and roughly parallel to one circumferential tangent of the circumferential wall 20. Finally, two integral cams 36, which

are formed on the part 24 of the inside cap, are arranged to cooperate with cams 32 provided on the outer cap.

For locking the assembly of the respective caps with a neck 10 of a bottle, there is included on the terminal portion of the inner cap 12 a snap ring 40 which is connected with the circumferential wall 20 of the inner cap by means of thin frangible bars 42 for a reason that will become apparent later.

The numbers 50 and 52, respectively, refer to the threading on the bottle neck 10 as well as those on the inside cap 12.

If the outside cap 14, looking at it from above, is turned in a clockwise direction, then its cams 32 will come into engagement with the free offstanding edges of the slightly prestressed elastic tongues 26, so that the inside cap 12 will necessarily be moved along with the outer cap and thereby be screwed tightly upon the bottle neck 10. The lock, however, is secured against being unscrewed unintentionally, for example, by a child, because, in case of rotation of the outside cap 14 in a counterclockwise direction, the cams 32 will slide up over the tongues 26 and will press them downwardly out of the way so that there will be no torsionproof connection between the two caps 12, 14. Only by pressing the outside cap downwardly against the inside cap 12, contrary to the action of the elastic tongues 26, do the cams 32 project into the path of the cams 36 of the inside cap 12 so that the lock can be screwed off the bottle neck 10 by means of rotation in a counterclockwise direction.

When the lock according to the invention is attached to the neck 10 of a bottle for the first time, the terminal portion 40 of cap 12 is caused to conform to the shoulder 44 by means of a suitable tool, for example, a heated ring. Such a tool is particularly appropriate if the two caps 12, 14 are comprised of a thermoplastic synthetic material. If, after initial application, the cap assembly is to be removed from the bottle for the first time, the frangible bars 42 will break when the top cap is rotated. Therefore, the inventive lock can be designed as a tamperproof closure.

For simplifying the tools, it is entirely possible to provide — instead of cams 36 — shaped steps at the foot of tongues 26. It is also conceivable under certain circumstances to provide three resilient tongues on the inner cap instead of two tongues in order to prevent tipping of the two caps relative to each other. It is further conceivable that one could reverse the arrangement of the elastic tongues and the cams, that is to say, one might attach each of these elements to the opposite cap rather than in the manner shown in FIGS. 1 and 2.

In the sense of the description initially provided, the cams 32, 36 thus form the coupling for opening the lock according to the invention, while cams 32 and tongues 26 constitute the one-way coupling.

In the embodiment of the invention to FIGS. 3 and 4, respectively, the circumferential walls of the outside caps are designated with 16a and 20a, and those of the inside caps are designated 16b and 20b. The coupling for dismounting of the lock is not shown and may have the design illustrated in FIGS. 1 and 2; but, it can also be designed as shown, for example, in U.S. Pat. No. 3,260,393 or as proposed in German Utility Model No. 7,018,433.

In the two examples according to FIGS. 3 and 4, the one-way coupling is constituted by an elastic tongue on resilient reed 26a or 26b provided on one or the other

of the circumferential walls skirts of the caps with the tongue being arranged to cooperate with a corresponding recess 50a or 50b, as shown in these respective views. Thus, it is believed that it will be apparent from each of these views that the inside cap will also be rotated when the outside cap is rotated in a clockwise direction, (direction A) while, however, the inside cap will not be coupled with the outside cap if the outer cap is rotated in the opposite direction.

FIG. 5 shows another embodiment of a coupling for opening the lock which simply consists of an offstanding pin 60 integral with the inside cap 12c and a cooperating detent or slit 62 adjacent to the terminal edge of outside cap 14c. The one-way coupling again can be designed as shown in FIGS. 1 and 2. By pressing the outside cap downwardly as explained earlier herein against the action of the elastic tongues 26, the pin 60 will engage the slit 62 so that the two caps are then connected with each other so that the lock can be opened.

Preference here is given to a design according to FIGS. 1 and 2 because the caps are closed there and particularly because children cannot recognize the coupling mechanism.

That which is claimed is:

1. A safety closure for containers, comprising an outer cap as a first closure element and an inner cap as a second closure element, for sealing the opening of a container neck, said outer cap being arranged to substantially concentrically encompass the inner cap and further being capable of relative rotary and axial movement with respect to the inner cap, the inner part of the inner cap and the outer part of the container neck being provided with means for mounting the inner cap onto the container neck by relative rotation therebetween in a first direction and for dismounting by relative rotation therebetween in the opposite direction, one of said closure elements having at least one flexible cantilever arm integral therewith and having a free end contacting the other closure member, the outer and inner caps being provided with first coupling means being engageable by an axial approach of both closure elements against the biasing effect of said at least one flexible arm, and unidirectional second coupling means on the outer and inner caps adapted for positively coupling the outer cap to the inner cap when being rotated in said first direction for sealing the container neck and permitting continuous relative rotation of the outer cap with respect to the inner cap when being rotated in the opposite direction, said second coupling means comprising at least two interengaging stop means for coupling the inner cap to the outer cap when the latter is rotated in said first direction, one of said stop means being provided at the free end of said at least one flexible arm, said flexible arm, said flexible arm also including inclined ramp means slidably engageable with said stop means for preventing coupling when the outer cap is rotated in the opposite direction.

2. A safety closure as claimed in claim 1, wherein said first and second coupling means are arranged at least nearby the circumference of the closure elements.

3. A safety closure as claimed in claim 1, wherein said flexible arm also provides said spring element.

4. A safety closure as claimed in claim 3, wherein each of the outer and inner caps has a top wall portion, and for providing said unidirectional second coupling means, upon the surfaces of the top wall portions facing each other, at least one flexible cantilever arm extending substantially in the direction of the circumference

of the caps is formed integral with one of the top wall portions, whereas at least one of said stop means is a projection engaging the free end of the arm and is integral with the other top wall portion.

5. A safety closure as claimed in claim 4, wherein for dismounting the inner cap wall portion carrying the flexible arm is provided with at least one further projection for engaging the projection of the other top wall portion.

6. A safety closure as claimed in claim 5, wherein said projections have the form of cams.

7. A safety closure for containers, comprising an outer cap as a first closure element and an inner cap as a second closure element, for sealing the opening of a container neck, said outer cap being arranged to substantially concentrically encompass the inner cap and further being capable of relative rotary and axial movement with respect to the inner cap, the inner part of the inner cap and the outer part of the container neck being provided with means for mounting the inner cap onto the container neck by relative rotation therebetween in a first direction and for dismounting by relative rotation therebetween in the opposite direction, one of said closure elements having at least one flexible cantilever arm integral therewith and having an edge contacting the other closure member, the outer and inner caps being provided with first coupling means being engageable by an axial approach of both closure elements against the biasing effect of said at least one flexible arm, and unidirectional second coupling means on the outer and inner caps adapted for positively coupling the outer cap to the inner cap when being rotated in said first direction for sealing the container neck and permitting continuous relative rotation of the outer cap with respect to the inner cap when being rotated in the opposite direction, said second coupling means comprising at least two interengaging stop means for coupling the inner cap to the outer cap when the latter is rotated in said first direction, one of said stop means being provided by said edge of said at least one flexible arm, said flexible arm also including inclined ramp means slidably engageable with said stop means for preventing coupling when the outer cap is rotated in the opposite direction.

8. A safety closure for containers, comprising an outer cap as a first closure element and an inner cap as a second closure element, for sealing the opening of a container neck, both said caps being provided with skirts with the skirt of the outer cap encompassing the skirt of the inner cap, said outer cap being arranged to substantially concentrically encompass the inner cap and further being capable of relative rotary and axial movement with respect to the inner cap, the inner part of the inner cap and the outer part of the container neck being provided with means for mounting the inner cap onto the container neck by relative rotation therebetween in a first direction and for dismounting by relative rotation therebetween in the opposite direction, one of said closure elements having at least one flexible cantilever arm in the form of a flexible reed integral therewith and projecting therefrom and having a free end contacting the other closure element and extending into a recess in the skirt of said other closure element, the outer and inner caps being provided with first coupling means being arranged at least nearby the circumference of the closure elements and engageable by an axial approach of both closure elements against the biasing effect of said at least one flexible arm, and uni-

directional second coupling means on the outer and inner caps being arranged at least nearby the circumference of the closure elements and adapted for positively coupling the outer cap to the inner cap when being rotated in said first direction for sealing the container neck and permitting continuous relative rotation of the outer cap with respect to the inner cap when being rotated in the opposite direction, said second coupling means comprising at least two inter-engaging stop means for coupling the inner cap to the outer cap when the latter is rotated in said first direction, one of said stop means being provided at the free end of said at least one flexible arm, said flexible arm also including inclined ramp means slidably engageable with said stop means for preventing coupling when the outer cap is rotated in the opposite direction.

9. A safety closure for containers, comprising an outer cap as a first closure element and an inner cap as a second closure element, for sealing the opening of a container neck, the container neck having a shoulder and the inner cap having a frangible circumferential ring projecting under the shoulder on the container neck, said outer cap being arranged to substantially concentrically encompass the inner cap and further being capable of relative rotary and axial movement with respect to the inner cap, the inner part of the inner cap and the outer part of the container neck being pro-

vided with means for mounting the inner cap onto the container neck by relative rotation therebetween in a first direction and for dismounting by relative rotation therebetween in the opposite direction, one of said closure elements having at least one flexible cantilever arm integral therewith and having a free end contacting the other closure member, the outer and inner caps being provided with first coupling means being engageable by an axial approach of both closure elements against the biasing effect of said at least one flexible arm, and unidirectional second coupling means on the outer and inner caps adapted to positively coupling the outer cap to the inner cap when being rotated in said first direction for sealing the container neck and permitting continuous relative rotation of the outer cap with respect to the inner cap when being rotated in the opposite direction, said second coupling means comprising at least two interengaging stop means for coupling the inner cap to the outer cap when the latter is rotated in said first direction, one of said stop means being provided at the free end of said at least one flexible arm, said flexible arm also including inclined ramp means slidably engageable with said stop means for preventing coupling when the outer cap is rotated in the opposite direction.

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