SAFETY CLOSURE CAP

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Abstract

A closure cap is snap-fitted over the neck of a container. A locking member rotatable and axially movable on the neck beneath the cap has depending spring fingers which abut against the container shoulder and urge the locking member into operative engagement with the cap. Axial projections on the cap and the locking member are interlocked to prevent relative rotation of the members, and a guard ring projecting upwardly from the locking member encircles and bars access to the lower edge of the cap skirt. Manual downward displacement of the locking member against the resilient thrust of the spring fingers disengages the interlocked projections and permit relative rotation between the members so that cooperating cam surfaces on their projections may engage and force the closure cap member axially from the container neck.

9 Claims, 7 Drawing Figures
SAFETY CLOSURE CAP

This invention relates to an improved safety closure cap, particularly adapted for use on containers for pills, drugs and the like to bar access to the container by young children while readily permitting access by persons who are aware of the manipulations necessary in order to remove the closure.

It has heretofore been known to provide a closure of the general type here involved including a snap-fitted cap for application to a container and a locking ring for removable application to the depending skirt of the container to confine the skirt against the expansion thereof, such as is necessary to permit its removal. Removal of the cap, therefore, can be achieved only by successive manual manipulation, first of the locking ring and then of the closure cap itself. This involves shifting the grip from one member to the other and also the exertion of force in opposite axial directions on the respective members. Moreover, removal of the closure cap itself is still required to be accomplished by the direct application of force without the benefit of any mechanical advantage, in direct opposition to the holding power of the snap-fitted cap.

In accordance with the present invention, however, removal of the closure cap may be achieved merely by manipulation of the snap-fitted member or ring. The locking ring and the skirt of the closure cap are provided with interfitting axially directed lugs or interlocking members and the locking ring is provided with spring fingers which coact with the container to urge the locking member toward the closure member whereby to cause interlocking engagement of these interlocking means in the manner of a dog clutch, to prevent relative rotation of the closure member and the locking member. However, the said interlocking means are provided with cooperating cam surfaces at their free ends, arranged so that after the two members are disengaged by axial downward movement of the locking member, rotation of the locking member and cooperation between said cam surfaces will apply an axial removing force to the snap-fitted closure member. Both the downward displacement and the rotary movement of the locking member may readily be achieved without shifting the grip on the locking member. Moreover, the inclination of the cooperating cam surfaces or means, may be such as to permit the obtaining of a substantial mechanical advantage in the application of the removal force.

Other features and advantages of the invention will be apparent from a consideration of the preferred embodiment of the invention illustrated in the accompanying drawings, in which:

FIG. 1 is an exploded perspective view of a safety closure cap construction in accordance with the invention, with the parts separated prior to application to a container, the upper end portion only of which is illustrated.

FIG. 2 is a plan view of the closure cap or member per se.

FIG. 3 is a section on the line 3—3 of FIG. 2.

FIG. 4 is a plan view of the locking member or ring.

FIG. 5 is a section on the line 5—5 of FIG. 4.

FIG. 6 is a vertical axial section through the assembled cap member and locking member as operatively applied in locking position to a bottle, the latter being illustrated in broken lines; and

FIG. 7 is a view similar to FIG. 6 but with the closure cap member and the locking member axially separated and relatively rotatable for removal of the closure cap.

Referring now in detail to the accompanying drawings, the closure cap assembly of the present invention is adapted for application to a conventional container 10, such as is illustrated fragmentarily in FIG. 1. Such a container has an upwardly directed neck 12 defining an upwardly directed access opening or mouth 14 and having adjacent its upper end a radially outwardly projecting annular flange 16 formed with an abruptly downwardly presented surface or shoulder 18 for coaction with the snap rib or bead of a snap fitted closure cap. It will be noted further that the container which is of circular cross section is provided adjacent its upper end with a downwardly and outwardly flaring or diverging shoulder 18 which concentrically encircles the neck 12 for coaction with the locking ring or member of the closure cap assembly in the manner hereinafter described.

The closure cap 20 itself, except as hereinafter indicated, is of a conventional type formed of a usual plastic or other material and comprising an upper end wall 22 adapted to extend across the mouth 14 of the container in engagement with the end wall of the container, together with a depending annular skirt 24 formed internally with a radially inwardly directed snap bead or rib 26, best shown in FIG. 3 positioned axially for reception beneath the flange 16 of the container to yieldably secure the closure cap 20 on the container in well-known manner. In accordance with usual practice, the material of which the cap is formed will have sufficient resilient qualities that when the cap is pressed downwardly onto the container, the snap bead or rib 26 within the cap skirt, may be cammed or expanded radially outwardly to ride downwardly over the container flange 16 and will elastically contract beneath the flange in abutting engagement with the underface 16' thereof as in FIG. 6 when the cap is fully applied. The cap is thus yieldably held on the container wherein they may be removed by upward pressure directed against the downwardly facing edge of its skirt 24. It will be understood that such a cap is normally rotatable on the container, though its rotation will be yieldably frictionally resisted by its engagement with the container neck.

In order to adapt such a closure cap for use as part of the present invention, the skirt 24 thereof has been modified to present one or more axially downwardly directed interlocking means in the form of locking lugs 28, each having a downwardly directed camming end or edge 28A and generally vertically or axially parallel circumferential end edges 28B and 28C, respectively, for cooperation with the locking member or ring 30. Also, in order that the cap end locking members, 20 and 30, respectively, may be of minimum axial extent, it is desirable, though not essential, to form the cap skirt on opposite sides of its respective locking lugs 28 with downwardly directed spiral edge portions 29 conforming to similar spirally inclined cam surfaces as hereinafter described at the ends of the interlocking means of the locking member 30.

The locking member or ring 30 which is illustrated in detail in FIGS. 4 and 5 is of annular configuration with the inner periphery 31 of its main body portion proportioned for free rotary and endwise or axial movement on the generally cylindrical container neck 12. The internal diameter of such main body portion of the locking member 30 will preferably be slightly smaller than the diameter of the flange 16 of the container and the locking member will be formed of a suitable plastic or other material having sufficient elasticity that the ring 30 may be slightly expanded as it is forced onto the container neck and past the flange 16 to be thereafter retained on the container by the flange 16. It will be seen that the member 30 is formed with an upwardly directed generally cylindrical guard flange or skirt 32, normally receiving and surrounding the depending skirt 24 of the closure member to prevent access to its lower edge, the depth or axial extent of the encircling guard flange 32 being sufficient to cover the lower edge of the cap skirt in all axial positions of the member 30. Thus, the locking ring or member 30 effectively prevents removal of the snap fitted cap 20 by upward finger pressure on the lower edge of its skirt.

The locking member 30 is formed internally with one or more axially upwardly opening locking recesses 34, there being a pair of diametrically opposed such recesses in the present embodiment, each of these recesses 34 conforming in shape to one of the two locking lugs 28 of the closure member and adapted to receive the same when the locking member 30 is in its fully raised locking position as shown in FIG. 6. On opposite side of each recess 34, the locking member has interlocking means in the form of axial projections 35 presenting upwardly directed spiral cam surfaces 36 for camming engagement with the lower ends of the closure cap lugs 28, 28.
In order to resiliently maintain the locking member 30 in its raised operative locking position as in FIG. 6, the member 30 is provided with a suitable plurality of depending resiliently flexible spring fingers 38, the free depending ends of which are located at a common level for abutting engagement with the sloping downwardly diverging annular shoulder 18 of the container. When the fingers 38 are in substantially their normal undeflected position, they will engage the container surface or shoulder 18 at a location to maintain the locking member or collar 30 in fully raised position with its cam surfaces 36—36 in abutment with the conformingly sloping surfaces 29—29 of the closure member 20. At the same time, the locking lugs 28 will be fully received within the upwardly presented locking lugs 34 with the opposite vertical or axially directed edges 2BB and 2BC of the locking lugs 28 in circumferential locking abutment with the corresponding edges of each recess 34.

The resiliently flexible spring fingers 38 cooperate with the container shoulder 18 to permit a sufficient range of downward displacement of the locking ring or collar 30 under suitable manually applied force, to permit the lower end edges 28A of the locking lugs on the closure cap to clear the adjacent lower ends of the camming surfaces 36 at the intersection of each surface 36 with the recess wall 34A, thus permitting counter-clockwise rotation of the locking collar or member 30 on the container neck. The lower end faces or surfaces 28A of each of the lugs preferably extends in a spiral plane parallel to that of the cam surfaces 36 for efficient camming engagement therewith during counter-clockwise rotation of the locking member 30 to cam the closure member 30 upwardly for removal from the container neck, it being appreciated that normally during rotation of the locking member 30, the closure member 20 will be frictionally restrained against rotation by its engagement with the container. After the locking member has been displaced downwardly to release the locking lugs 28 from recesses 34, as in FIG. 7, its further movement is substantially arrested in suitable manner, as by engagement of its annular lower edge 37 with the container shoulder 18, or by increased resistance to flexing of the fingers 38.

For facilitating the application of the closure assembly to a container, the closure member 20 and the locking member 30 may be provided with suitable orientation indicia, such as the arrow 39 on the closure member and the pointer 40 on the locking member. These indicia 39 and 40 are so located that when brought into registry, the locking lugs 28 of the closure cap will be angularly positioned in registry with the respective recesses 34 in the locking member.

It will be appreciated that although in the present preferred embodiment, the locking recesses 34 and the cam surfaces 36 have been formed in the locking member 30 and the lugs 28 have been formed on the closure cap 20, the arrangement may obviously be reversed within the contemplation of the invention.

In applying the closure assembly to the container 18, the locking ring or member 30 is first forced downwardly over the container neck until its main body portion engages beneath the retaining flange 16, following which the cap member 20 is placed over the end of the container neck and the members 20 and 30 are relatively rotated to bring their indicia 38 and 40 into registry, thus placing the locking lugs 28 of the closure member in registry with the recesses 36 of the locking member, following which the closure member 20 may be operatively applied and snap-fitted on to the container neck by appropriate downward pressure. As thus applied, the two members 20 and 30 are firmly interlocked against relative rotation and the upwardly projecting skirt 32 of the locking member shields the lower portion of the closure skirt from access such as would permit removal of the cap by upward finger pressure in conventional manner.

When it is desired to remove the closure cap 20, the locking member 30 is manually forced axially downwardly from the position shown in FIG. 6 to the position shown in FIG. 7 to release the locking lugs 28 from the recesses 34 and, while maintained in its lowered position, is rotated in a counter-clockwise direction to bring the lower ends of the cam surfaces 36 into camming engagement with the cooperating lower ends 28A of the locking lugs 28. Continuing rotation of the locking member 30 exerts an upward force for removing the snap-on closure cap 20 in obvious manner. The cap may thus be removed and reapplied as frequently as desired by one properly aware of the mode of operation. However, the mode of operation is such that removal of the closure cap will be virtually impossible by a small child of sufficiently tender years as to be incapable of reading the operating instructions such as would normally be applied to the closure assembly, thus greatly minimizing the risk of access by a child to any pills or medicine within the container. At the same time, the removal of the closure cap may be achieved quite easily, with the expenditure of but a minimum degree of force, such as would normally be within the capacity of even quite aged or infirm persons.

It will be apparent from the foregoing that the lugs 34 of the cap and the upward projections 35 bearing the cam surfaces 36 of the locking ring, in substance, constitute relative spaced axial projections of the two members which are adapted to interlock in the manner of a dog clutch when the two members are moved into relative axial engagement with each other as in FIG. 6, but which are disengaged to permit relative rotation of the members when the locking member is downwardly displaced as in FIG. 7. Further, it will be seen that such axially projecting interlocking means 28 and 34, respectively, are formed with cooperating cam surfaces 28A and 36 at their axial ends for coaction with each other to force the closure cap 20 from the container in response to relative rotary movement of the two members in their disengaged position of FIG. 7.

In this application I have shown and described only the preferred embodiment of the invention. Manifestly, however, the preferred embodiment herein illustrated, is subject to various modifications and alterations without departing from the invention, as defined in the appended claims.

Having thus described my invention, I claim:
1. The combination with a container having a generally up-standing cylindrical neck portion defining its access opening, a radially outwardly projecting Retainer Flange around said neck adjacent its upper end, and a downwardly diverging annular shoulder adjacent the lower end of said neck; of a safety closure comprising a cap member including an annular elastically deformable depending skirt disposed on said neck and including a snap rib within said skirt engaged beneath said flange; an annular locking member rotatably encircling said neck below said cap and disposed for limited axial movement between a normally raised locking position in operative engagement with the closure member and a relatively lowered releasing position on the container neck; axially presented interlocking means carried by said locking member and by the depending skirt of said closure member for operative engagement in the raised position of the locking member to secure said members against relative rotation and for release in the relatively lowered position of said closure member, resilient means carried by said locking member in operative engagement with said annular shoulder of the container for resiliently urging said locking member toward its raised operative position, said locking member being manually retractable to its lowered release position, said members respectively being provided with cooperating cam means operative responsive to relative rotation between said members for exerting an upward removal force on said closure member.
2. The combination defined in claim 1, in which said locking member is of resiliently expansible material and has a smaller internal diameter than said flange of the container whereby to be applied to the container by snap-fitting and thereafter to be retained thereon by the flange.
3. The combination defined in claim 1, in which said resilient means comprises a plurality of relative circumferentially spaced depending resiliently flexible spring fingers.
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carried by said locking member with the lower free ends of said fingers being disposed for relative outward deflection by camming engagement with said container shoulder during downward displacement of the locking member.

4. The combination of claim 3 in which said interlocking means comprises an axially directed locking lug projecting from one of said members for reception in an axially directed locking recess in the other said member.

5. The combination of claim 3 in which said axially presented interlocking means comprises an axially downwardly directed locking lug depending from the skirt of said closure member for operative reception in and withdrawal from a locking recess between axial projections in said locking member.

6. The combination of claim 5 in which said cam means comprises a spirally inclined cam surface on one said member adjoining one edge of said locking recess for rotation into camming engagement with the lower end of said locking lug of the other member.

7. The combination of claim 6 in which said cam surface and said locking recess are formed on the locking member, said lug being formed on the closure member.

8. A safety closure comprising a cap member having a depending skirt formed with a radially inwardly projecting snap bead internally thereof, an annular locking member having a portion beneath and in axial opposition to the lower edge of the skirt of said closure member, and having an upwardly directed cylindrical guard flange receiving and rotatably encircling said skirt, a locking lug projecting axially downwardly from said skirt for locking reception within a recess in said locking member, said locking member being axially displaceable relative to the closure member for disengaging said interlocking means and being formed with a spirally inclined cam surface adjacent said recess for cooperation with the free end of said locking lug to urge said closure member in an axial direction in response to rotary movement of the locking member.

9. The combination defined in claim 8 wherein said locking member includes a plurality of relatively spaced resiliently flexible co-terminus spring fingers for cooperation with the downwardly converging annular shoulder of a container to which the closure assembly is applied to urge the locking member resiliently into engagement with said closure member.

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