United States Patent [19]

Berghahn

[11] **3,757,979**

[45] **Sept. 11, 1973**

[54] **SAFETY CLOSURE-BOTTLE ASSEMBLY**

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[22] Filed: **Jan. 19, 1972**

[21] Appl. No.: **218,885**

[52] **U.S. Cl.** **215/9**

[51] **Int. Cl.** **A61j 1/00,** B65d 55/02

[58] **Field of Search** 215/9.46, 41

[56] **References Cited**

UNITED STATES PATENTS

3,393,816	7/1968	Grimm	215/9
3,584,760	6/1971	Grinker	215/9
3,627,160	12/1971	Horvath	215/9

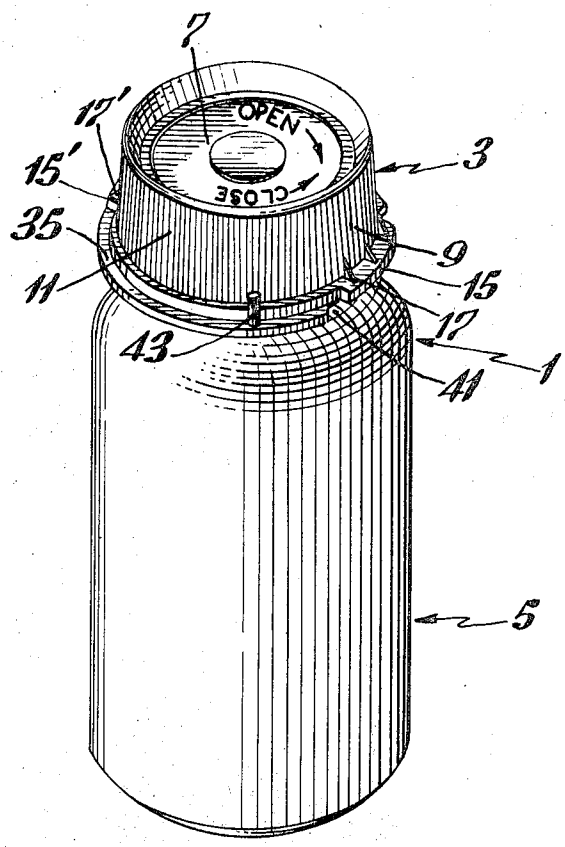
Primary Examiner—George T. Hall

Attorney—David J. Mugford et al.

[57] **ABSTRACT**

A safety closure-bottle assembly comprising a snap-on closure and bottle in which the closure is provided with a tab and the bottle neck with a notched flange which registers with said tab.

7 Claims, 9 Drawing Figures



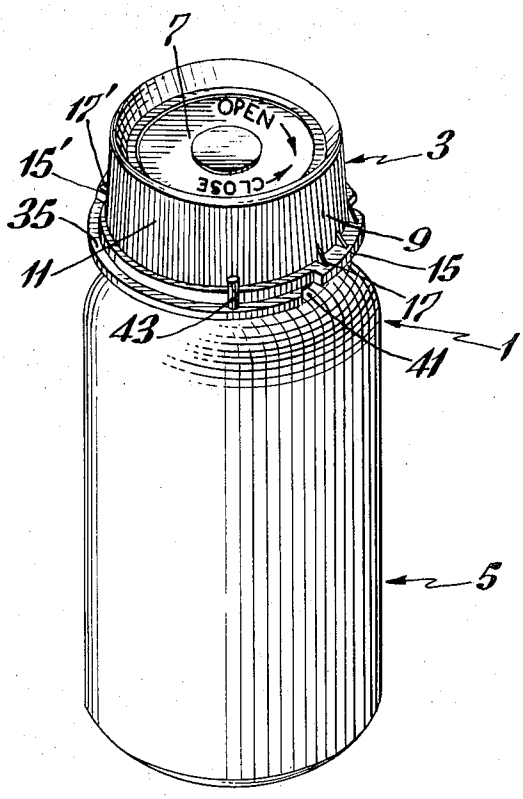


Fig. 1

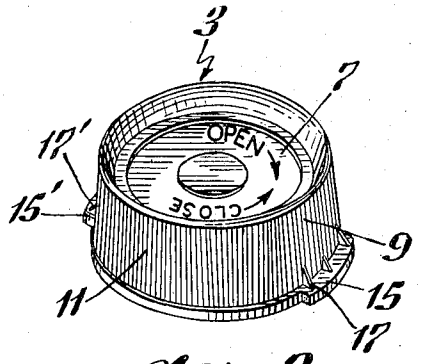


Fig. 3

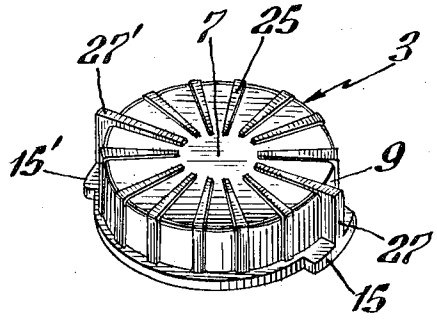


Fig. 4

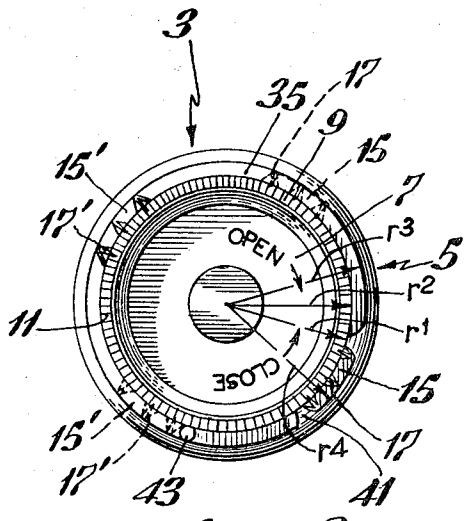


Fig. 2

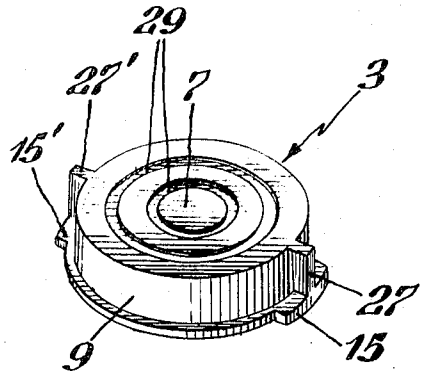


Fig. 5

2 Sheets-Sheet 2

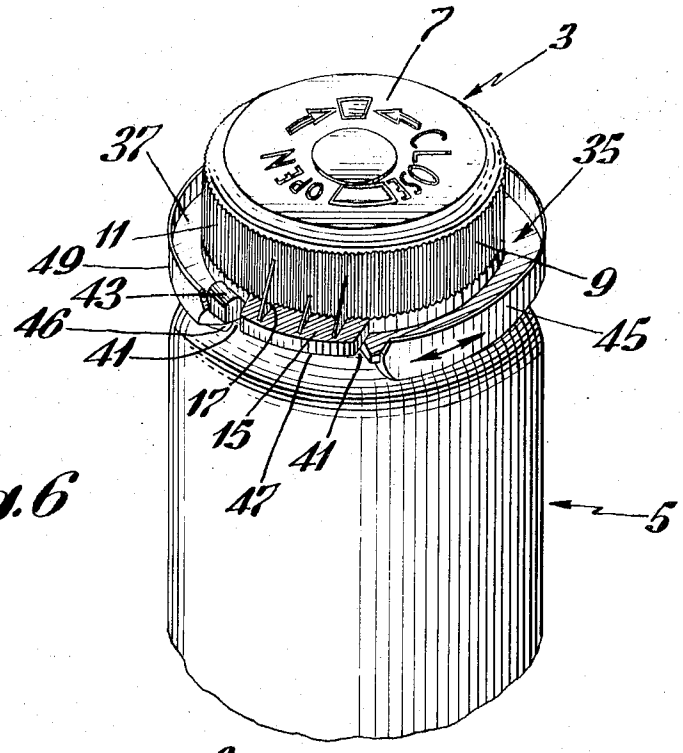


Fig. 6

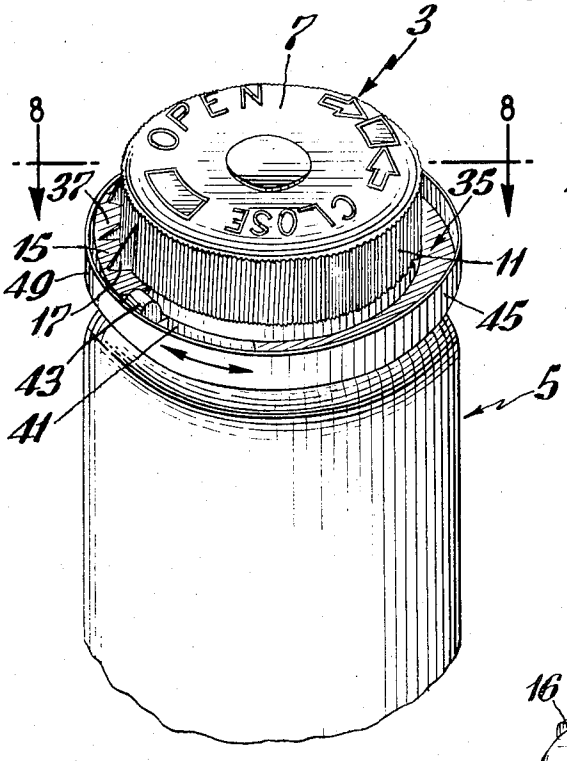


Fig. 7

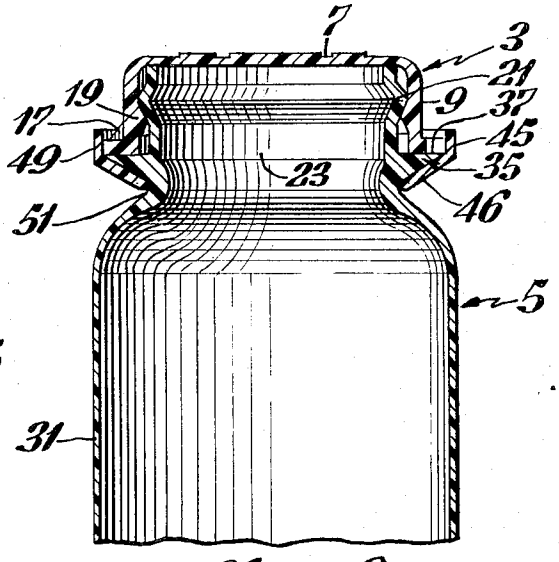


Fig. 8

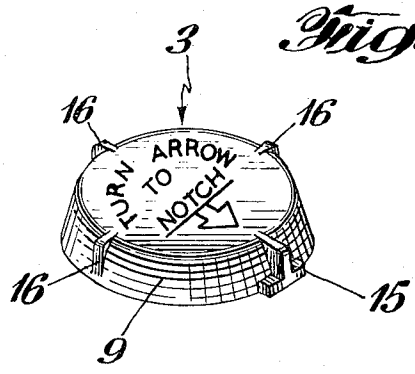


Fig. 9

SAFETY CLOSURE-BOTTLE ASSEMBLY

This invention relates to a safety closure-bottle assembly designed to deter children from opening bottles containing hazardous substances. The danger of small children getting into medicine cabinets and removing dangerous pills from bottles is a well-known problem. This invention seeks to minimize this possibility.

The solution to the above problem is complicated by the fact that in designing these safety closures it must also be taken into account that these closures should not afford an obstacle to handicapped adults. Thus, for example, though the safety closure-bottle assembly must serve as a deterrent to a child, it must not by the same token present a difficulty for old persons or adults suffering from arthritis.

It is, accordingly, an object of the present invention to provide a safety closure-bottle assembly which will successfully serve to prevent children from getting access to dangerous materials which are contained in said bottle.

It is a further object of this invention to provide a safety closure-bottle assembly of the aforesaid type in which the removal of the safety closure from the bottle affords substantially no obstacle to physically incapacitated adults.

Other and more detailed objects will be apparent from the following descriptions, claims and drawings wherein:

FIG. 1 is a perspective view of a safety closure-bottle assembly embodied in this invention;

FIG. 2 is a top plan view of the assembly shown in FIG. 1, the open position of the tabs on the safety closure being shown in full line and their location in a closed position shown in dotted line;

FIGS. 3–5 and 9 are perspective views of other modifications of safety closure embodied in this invention;

FIGS. 6 and 7 are perspective views of another modification of the safety closure-bottle assembly embodied in this invention, this modification being provided with an extra guard ring shown in the open position in FIG. 6 and the closed position in FIG. 7;

FIG. 8 is a longitudinal sectional view of the assembly shown in FIG. 7 taken through line 8—8 of FIG. 7.

A variety of safety closure-bottle assemblies have been described in the prior art. Thus, U.S. Pat. No. 3,170,585 to O'Donnell relates to a safety snap-on cap intended for use in connection with a bottle. Although not particularly mentioned, from the drawings it appears quite obvious that a glass bottle was intended by O'Donnell

As will be noted from FIGS. 2 and 3 of said O'Donnell patent, the bottle 10 is provided with a rounded bead 17 which lies adjacent and below the lower margin of closure 20 when closure 20 is positioned on bottle 10. This rounded bead is a distinct disadvantage in that it permits relatively ready access to the lower margin of cap 20. A child can get a good purchase on this margin with his teeth or nails and readily lift the cap off even when tab 24 of the O'Donnell device is in the sheltered position shown in FIG. 2. Moreover, cap 20 of the O'Donnell device is fully rotatable in either direction. As a consequence, it is relatively easy to position tab 24 over notch 18 of this device and bring it into its readily removable position. This is simple enough so that it can be easily learned by a child. As will be apparent from the discussion below, the present invention avoids these disadvantages.

The U.S. Pat. to Thomas No. 3,071,271 also relates to a safety closure designed to be difficulty removable by a child. Although this construction does not have some of the disadvantages noted above in connection with the bead construction of the O'Donnell patent, it also is rotatable fully in either direction so as to enable the cap to be rotated into a removable position with a greater amount of ease. This increases the chances that it may be removed by a child.

The U.S. Pat. to Hohl et al. No. 2,953,271 also describes a safety closure-bottle assembly provided with a bead construction that is somewhat similar to the O'-Donnell construction of U.S. Pat. No. 3,170,585. This, accordingly, has the same disadvantages noted above in connection with the O'Donnell bead construction.

To exemplify other prior art safety closure-bottle assemblies, attention is invited to the following U.S. Pats: Grimm No. 3,393,816; Velt No. 3,374,912; Weigand No. 3,435,975; Turner No. 3,450,290 and Thornton No. 2,776,066. They, however, do not have the advantages of devices embodied in the present invention as will be made more apparent below.

Referring now to the drawings of the present case in which like numbers represent the same structure in the various views, the safety closure-bottle assembly is shown generally in FIG. 1 and comprises a flexible safety closure 3 and a bottle 5. Safety closure 3 includes a roof 7 and a cylindrical skirt 9 extending from said roof 7. In the modification of this invention shown in FIG. 1, skirt 9 is provided with a plurality of serrations 11 which serve as a gripping surface to enable the rotation of safety closure 3.

Adjacent to the lower margin of skirt 9 and extending outwardly therefrom there is provided a pair of tabs 15 and 15′ separated from each other around the circumference of the lower margin of cylindrical skirt 9 by about 180°. Although two tabs are shown in the modifications of this invention illustrated in this drawing, it is to be understood that one of the tabs 15 or 15′ may be removed from safety closure 3 without departing from the spirit of this invention.

Tabs 15 and 15′ in the modification shown in FIGS. 1, 2 and 3 are provided with a plurality of supports 17 which are integral with tabs 15 or 15′ on the one hand and skirt 9 on the other hand. These serve to strengthen tabs 15 and 15′ so that they may not be easily broken off from skirt 9.

Safety closure 3 is also constructed with an inwardly extending annular bead 19 best seen in the longitudinal sectional view of FIG. 8. Annular bead 19 is spaced from the lower margin of skirt 9 nad is located on the internal surface of skirt 9 so as to engage bead 21 on neck 23 of bottle 5 in a fashion described in more detail below.

Variations of safety closure 3 are shown in FIGS. 4, 5 and 9, the safety closure of FIG. 3 being the one also shown in FIG. 1. In the safety closure of FIG. 4 a plurality of ribs 25 are provided on the closure to serve as a gripping surface. In addition, each present 15 and 15′ in reinforced with single relatively safety support 27 and 27′ respectively take are integral with skirt 9 and tabs 15 and 15′the

In the a safety closure shown in FIG. 5 the gripping surface is supplied by a pair of concentrically arranged annular ribs 29 integral with roof 7 of this closure. In

this modification also the tabs 15 and 15' are reinforced with single relatively thick supports 27 and 27'.

The safety closure 3 shown in FIG. 9 is a low profile closure and is provided with a single tab 15. To facilitate the turning of the closure there is further made available three lugs 16 which protrude outwardly slightly from the relatively low skirt 9. These are distributed about the circumference of the closure at approximately 90°, 180° and 270° relative to the tab 15. These lugs can be engaged by the nails so that the closure may be rotated for opening or closing. The shortness of skirt 9 in this modification (about one tenth the outer diameter of the major portion of closure 3) and the downward and outward taper of skirt 9 as is apparent from FIG. 9 makes it difficult for a child to get its teeth on it.

The bottle 5 of the present assembly comprises a neck portion 23 previously mentioned and a body portion 31. Slightly above the base of neck portion 23 there is provided an annular flange 35 extending outwardly from said neck portion. Flange 35 has a flat upper surface 37 which extends outwardly well beyond the major portion of the circumference of the safety closure 3 when the latter is seated on bottle 5 as described in more detail below. As best seen in FIG. 8, flange 35 in cross-section tapers upwardly and outwardly and thus has its thickest portion at a point adjacent the neck of the bottle. This thickness provides bulk and strength to flange 35 so as to prevent its ready fracture.

Flange 35 is also provided with a notch 41 dimensioned so as to be at least as long as tab 15 or 15' along its circumference. Notch 41 permits ready access to tab 15 or 15' from below when one of the latter is positioned so as to lie over notch 41. In this position tab 15 or 15' may be engaged by the thumb and the safety closure 3 forced upwardly and removed.

Extending upwardly from the upper surface of flange 35 there is provided a stop 43. This may be made integral with flange 35 and is positioned to the left of notch 41 when the latter is viewed with the bottle held in an upright position and notch 41 facing the observer. The positioning of stop 43 in this location provides an extra safety feature. Thus, when safety cap 3 is rotated in a counterclockwise direction, which is the normal and expected direction for unscrewing a cap, stop 43 prevents the positioning of tab 15 and 15' over notch 41. The only way that tab 15 or 15' can be brought into a position over notch 41 so as to be engageable for removal is by rotating safety closure 3 in a clockwise direction. This is contrary to the normal and expected direction for unscrewing a cap. Another feature is thus provided which must be learned before the safety closure can be removed readily. This can be learned by an adult with no difficulty, but provides a problem and a deterrent for a child.

Neck 23 of bottle 5, as previously noted, is provided with an outwardly extending bead 21. This is best seen in FIG. 8. In applying safety closure 3 onto bottle 5 it is necessary to flex the safety closure over bead 21. When this is accomplished, annular bead 19 of the safety closure comes to rest below bead 21 of bottle 5. This relationship provides a certain amount of resistance which must be overcome in flipping the safety closure 3 upwardly.

The relative radial dimensions of the various portions of the assembly are best appreciated by reference to FIG. 2. The radial distance r^1 is the distance of the radius of flange 35 in the area of notch 41. This will be no less than and ordinarily equal to radius r^2 which is the radius of the safety closure 3 in all regions excepting in the region of tab 15 or 15'. The distance r^3 is the radius of the flange 35 in all areas excepting the area of notch 41. This will ordinarily be equal to or somewhat greater than the radius r^4 which is the radius of the safety closure in the area of tab 15 or 15'. The radius r^4 will always be greater than the radius r^1 of the notch 41 of flange 35 so as to permit the engagement of tab 15 or tab 15' when it is in position over notch 41. The above described radial dimensions insure that tab 15 or 15' are only engageable for removal from below when a tab 15 or 15' of safety closure 3 is positioned above notch 41 of flange 35.

Furthermore, notch 41 is dimensioned with respect to the dimension of tab 15 or 15' so that the latter are engageable from below by the thumb when they are disposed above notch 41 when the bottle is in the upright position. Ordinarily, the circumferential dimension of notch 41 will be equal to or somewhat longer than the circumferential dimension of the tabs 15 and 15'.

The modification of this invention shown particularly in FIGS. 6 through 8 contains still another safety feature in the guard ring 45. This guard ring 45 comprises an oblique portion 46 following to contour the lower surface of flange 35 and a vertical portion 49. It is also provided with a notch 47 that may be brought into registration with notch 41 of flange 35 and tab 15 or 15' of safety closure 3. Guard ring 45 is also flexible and is loosely mounted on bottle 5 in the region of neck 23 by stretching notch 47 sufficiently wide to snap it over neck 23. Guard ring 45 is supported below by shoulder 51 of bottle 5.

Guard ring 45 is rotatable in either direction around the long axis of bottle 5 so that its notch 47 may be brought into registration with notch 41 of flange 35. If tab 15 or 15' of safety closure 3 is positioned to also register with notch 41, the assembly is then in a condition whereby the safety closure 3 may be readily removed. This is illustrated in FIG. 6 of the drawings. The guarded or closed position of guard ring 45 is shown in FIG. 7 wherein guard ring 45 is rotated so that notch 47 is out of registration with notch 41 of flange 35.

An important feature of the present invention is the relationship that exists between the surface of the lower margin of safety closure 3 and flange 35. As previously noted, flange 35 is provided with a flat and extended upper surface 37. This abuts flushly against the surface of the lower margin of safety closure 3 when the latter is in position on the bottle so that the respective abutting surfaces are substantially at right angles to each other. This greatly reduces the possibility of obtaining a purchase on the lower margin of safety closure 3 with the thumb or even the teeth by getting them in between the said lower margin and said flat upper surface 37 of flange 35. This is to be contrasted with the rounded bead construction of the O'Donnell U.S. Pat. No. 3,170,585 discussed above. A flush and abutting relationship between the lower margin of the snap-on cap of the O'Donnell construction and the bead of the O'Donnell device cannot be accomplished. The curved bead of the O'Donnell device and the surface of the lower margin of O'Donnell's cap will only meet tangentially. It is, therefore, a relatively easy matter to obtain

a grip on the lower margin of the O'Donnell snap-on cap at substantially any point around the circumference of the lower margin of the O'Donnell cap and to remove the same.

Both safety closure 3 and bottle 5 of the present invention are each preferably molded as unitary pieces from thermoplastic resins. This has a distinct advantage, particularly with regard to bottle 5 since it makes possible the formation of the relatively extended flange 35 having a flat upper surface 37. It is not possible or practical to mold an equivalent structure in glass. A variety of thermoplastic resins are known in the prior art which are useful for this purpose. Among these mention may be made of high and low density polyethylene, polypropylene, polystyrene, and polyvinyl chloride.

In some instances when the safety closure 3 and bottle 5 are made of certain thermoplastic resins there is a tendency for the closure and bottle to bind so that it may be difficult to turn the safety closure when it is seated on the bottle. To minimize this, in accordance with the ppresent invention, different thermoplastic materials may be used for the afety closure and the bottle. This may taken the form of different thermoplastic resins or different grades of thhe same thermoplastic resin, e.g., high and low density polyethylene.

As an alternative to or in addition to employing different thermoplastic materials for the safety closure and bottle, the binding effect noted above may be minimized by incorporating in one or both of said components a slip additive. In a preferred form of this invention the slip additive is introduced into the thermoplastic material mix used to mold the safety closure prior to molding the same. In this instance it will be necessary to select a slip additive which is stable at relatively high temperatures, e.g., about 500° F since temperatures of this order are reached in molding the safety closure.

To be effective for the above purposes, i.e., to prevent binding between the safety closure and the bottle, the slip additive must be present in an amount of at least about 1000 ppm based on the total weight of the thermoplastic resin molding mix used to mold the safety closure and preferably between 1,000 and 5,000 ppm by weight of said molding mix. In this connection, applicant would like to call attention to the fact that it has been suggested to incorporate a slip additive in polyethylene before molding this material into a bottle cap. The purpose of this procedure was to lubricate the cap so that it would not get hung up in the assembly machinery. However, the quantities of slip additive used for this purpose are much lower than that needed to prevent the binding between the safety closure and the bottle in accordance with the present invention.

A variety of slip additives well known to those skilled in the art are available for the present purposes. By way of illustration, mention may be made of the following: erucamides (e.g. erucic acid amide); silicones (e.g., dimethylpolysiloxane viscosity 20,000 to 60,000 centistokes); stearates (e.g., magnesium stearate); oleoamides (e.g., hydrogenated tallow amide) etc.

Another feature of the present invention is the application of a substance to the safety closure which imparts to it an unpleasant taste. Often children attempt to remove a closure from a container by prying it off with their teeth. If the closure has an unpleasant taste, the likelihood that a child would keep it in his mouth long enough for him to pry it off would be reduced.

The unpleasant tasting substance may be applied to the present safety closure by impregnation or by coating. Ordinarily, it will be applied from a non-toxic solution containing about 0.001 percent to 0.002 percent by weight of the unpleasant tasting material. Ordinarily, this solution will be an aqueous solution, but other non-toxic solvents may also be used to dissolve the unpleasant tasting material. By way of illustration of said solvents, mention may be made of water, ethyl alcohol, aqueous ethyl alcohol, etc.

A variety of unpleasant tasting materials non-toxic in the concentrations employed in this invention are known in the prior art which are suitable for the present purposes. Among these the following may be mentioned: denatonium benzoate (BITREX), quinine, brucine, etc.

The following examples are further illustrative of the present invention.

EXAMPLE I

Using the standard techniques well known to those skilled in the art, the safety closure 3 shown in FIGS. 1 and 2 was molded from a thermoplastic molding mixture of low density polyethylene containing 2,000 ppm of eruric acid amide. In this case bottle 5 was molded of high density polyethylene using standard thermoplastic resin molding techniques. This combination of safety closure and bottle was found to be satisfactory for the purposes of the present invention.

EXAMPLE II

The procedure of Example I is employed excepting that safety closure 3 was coated with an aqueous solution containing 0.001 percent by weight of BITREX (denatonium benzoate).

EXAMPLE III

The procedure of Example II is followed excepting that high density polyethylene is used to mold safety closure 3.

EXAMPLE IV

The procedure of Example II is followed excepting that polypropylene thermoplastic resin was used to mold safety closure 3.

EXAMPLE V

Each of the aforesaid Examples was repeated excepting that the material used to mold the bottle 5 was changed. In one series of runs the material used for the bottle 5 was polystyrene thermoplastic resin. In the second series polypropylene thermoplastic resin was used for this purpose.

In use the flexible safety closure 3 of the present invention is snapped into place over neck 23 of bottle 5. If tab 15 or 15' is in registration with notch 41, safety closure 3 is turned counterclockwise around the long axis of bottle 5. It may thus be turned until tab 15 or 15' encounters stop 43. To remove safety closure 3 it must be rotated from the aforesaid position in a clockwise direction around the long axis of bottle 5 until tab 15 or 15' is in registration with notch 41 so that the thumb may reach and engage the tab from below. If the assembly is provided with a guard ring 45, this too must be rotated so that its notch 47 is in registration with notch 41 and tab 15 or 15'. The safety closure 3 may

now be removed by pushing tab 15 or 15' upwardly from below.

What is claimed is:

1. A safety closure-bottle assembly comprising a flexible snap-on closure having a bottle engaging portion which is substantially circular in cross-section, said snap-on closure having a lower marginal surface and being provided with a tab extending outwardly from said snap-on closure in the region of said lower marginal surface; a bottle having a closure receiving portion which is also substantially circular in cross-section, said bottle being provided with a flange extending outwardly from said bottle in the region adjacent its closure receiving portion, said flange having a flat top surface adapted to flushly engage said lower marginal surface of said snap-on closure and further being provided with a first notch; said flange also being provided with a stop extending upwardly from its top surface; said stop being located to the left side of said first notch when viewed from a position in which the bottle is held upright and said first notch faces the observer, the relative radial dimension of the various portions of the assembly and the relative dimensions of said tab and first notch bein such that said closure is engageable from below for removal substantially only when it is positioned so that said tab is above said first notch when the assembly is in its upright position.

2. An assembly according to claim 1 in which said safety closure and said bottle each are molded of thermoplastic resin material.

3. An assembly according to claim 2 wherein the safety closure and bottle are each molded of different thermoplastic resin material.

4. An assembly according to claim 2 in which at least one of said safety closure or bottle has incorporated therein a slip additive.

5. An assembly according to claim 2 wherein said safety closure contains a non-toxic unpleasant tasting material which serves to deter a child from holding said closure in its mouth.

6. An assembly closure according to claim 1 including a guard ring, said guard ring being provided with a notch and mounted about said flange for rotation about the long axis of said assembly; said guard ring being adapted to have its notch brought into registration with said first notch of said flange and said tabs of said snap-on closure.

7. As an article of manufacture a bottle adapted to receive a flexible snap-on closure having a tab extending outwardly therefrom; said bottle having a snap-on closure receiving portion and being provided with a flange extending outwardly from said bottle in the region adjacent said closure receiving portion, said flange having a flat top surface adapted to flushly engage the lower marginal surface of said snap-on closure and further being provided with notch; said flange also being provided with a stop extending upwardly from its top surface and being located to the left side of said notch when viewed from a position in which the bottle is held upright and said notch faces the observer, said notch being so dimensioned that the tab of said closure is engageable from below said flange for removal when it is positioned so that said tab is above said notch.

* * * * *