

PATENT SPECIFICATION

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(54) CONTAINERS AND CONTAINER/CLOSURE ASSEMBLIES

(71) We, BRISTOL-MYERS COMPANY, a Corporation organised and existing under the laws of the State of Delaware, United States of America, of 345 Park Avenue, New York, New York 10022, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention is concerned with containers and closures 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.

The solution to this problem is complicated by the fact that in designing safety closures for bottles 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 present a difficulty for old persons or adults suffering from arthritis.

According to one aspect of the invention there is provided a container having a snap-on snap-off closure receiving portion and being provided with a flange extending outwardly in the region adjacent said closure receiving portion, said flange having a flat top surface, a radially inwardly extending notch, and a stop extending upwardly from the flat top surface of the flange.

In a second aspect of the invention there is provided an assembly comprising a container (such as a bottle) as defined in the preceding paragraph together with a flexible snap-on snap-off closure engaging said closure receiving portion, said closure having a circular roof, a skirt extending from said roof, and a tab extending

outwardly from the lower marginal surface of the skirt with the lower marginal surface and the tab being planar, parallel to said roof, and flushly contacting and being capable of sliding upon the flat top surface of said flange; the flange extending radially outwardly beyond said lower marginal surface and the tab, except where said notch is disposed, whereby the closure may be removed from the container by manually engaging the tab when the latter is disposed adjacent the notch.

Preferred features of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a perspective view of a safety closure-bottle assembly according to 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 are perspective views of other modifications of the safety closure employed in this invention;

Figs. 6 and 7 are perspective views of another modification of the safety closure-bottle assembly of 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.

Referring to the drawings, 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 container, in this case a bottle 5. Safety closure 3 includes a roof 7 and a cylindrical skirt 9 extending from said roof 7. In the embodiment of this invention shown in Fig. 90

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.

5 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
10 about 180°. Although two tabs are shown in the modifications of this invention illustrated in this drawing, it is to be understood that only one of the tabs 15 or 15' is necessary for a safety closure employed
15 in the invention.

20 Tabs 15 and 15' in the embodiment 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.

25 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 and is located on the internal surface of skirt 9 so as to engage bead 21 on neck 23 of bottle 5 in a fashion
30 described in more detail below.

35 Variations of safety closure 3 are shown in Figs. 4 and 5; 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 tab 15 and 15' is reinforced with a single relatively thick support 27 and 27' respectively which is integral with skirt 9 and tabs 15
40 and 15'.

45 In the 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'.

50 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.

65 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 tabs is positioned so as to lie over notch 41. In
70 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 75 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 80 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
85 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. 90 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
95 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
100 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 105 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
110 appreciated by reference to Fig. 2. The radial distance r^1 is 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
115 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^4 120 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
125 it is in position over notch 41. The above described radial dimensions ensure that tabs 15 or 15' are only engageable for removal from below when a tab 15 or 15' of safety closure 3 is positioned above notch 41 130

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of flange 35.

Furthermore, notch 41 is dimensioned with respect to the dimensions of tabs 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 to 8 comprises still another safety feature in the guard ring 45. This guard ring 45 comprises an oblique portion 46 following the contour of 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 ring 45 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 also positioned to 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. 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.

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 mentioned 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 present invention, different thermoplastic materials may be used for the safety closure and the bottle. This may take the form of different thermoplastic resins or different grades of the 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. The slip additive may be 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 1000 and 5000 ppm by weight of said molding mix.

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: erucadimes (e.g. erucic acid amide); silicones (e.g. dimethylpolysiloxane viscosity 20,000 to 60,000 centistokes); stearates (e.g. magnesium stearate); and oleoamides (e.g. hydrogenated tallow amide).

Another preferred 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 .001% to .002% 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, and aqueous ethyl alcohol.

- 5 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),
10 quinine, and brucine.

The following examples are further illustrative of the present invention.

15 EXAMPLE I

- Using the standard techniques well known to those skilled in this art, the safety closure 3 shown in Figs. 1 and 2, was molded from a thermoplastic molding mixture of low
20 density polyethylene containing 2000 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
25 and bottle was found to be satisfactory for the purposes of the present invention.

EXAMPLE II

- 30 The procedure of Example I was employed excepting that safety closure 3 was coated with an aqueous solution containing .001% by weight of BITREX (denatonium benzoate).

35 EXAMPLE III

The procedure of Example 2 was followed excepting that high density polyethylene was used to mold safety closure 3.

40 EXAMPLE IV

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

45 EXAMPLE V

- Each of the aforesaid Examples was repeated excepting that the material used to mold the bottle 5 was changed. In one
50 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
55 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
60 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
65 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 re-
70 moved by pushing tab 15 or 15' upwardly from below.

WHAT WE CLAIM IS:—

1. A container having a snap-on snap-off closure receiving portion and being provided with a flange extending outwardly in the region adjacent said closure receiving portion, said flange having a flat top surface, a radially inwardly extending notch, and a
75 stop extending upwardly from the flat top surface of the flange.
2. A container according to claim 1 wherein said stop is located to the left side of said notch when viewed from a position
80 in which the closure receiving portion is held uppermost with the notch facing the observer.
3. A container according to claim 1 or 2 including a guard ring mounted about said flange for rotation thereabout, the guard ring having an opening capable of being brought into registration with the notch.
4. A container according to any of
85 claims 1 to 3 when made from a flexible polymeric material.
5. An assembly comprising a container according to any of claims 1 to 4 together with a flexible snap-on snap-off closure en-
90 gaging said closure receiving portion; said closure having a circular roof, a skirt extending from said roof, and a tab extending outwardly from the lower marginal surface of the skirt with the lower
95 marginal surface and the tab being planar, parallel to said roof, and flushly contacting and being capable of sliding upon the flat top surface of said flange; the flange extending radially outwardly beyond said lower
100 marginal surface and the tab, except where said notch is disposed, whereby the closure may be removed from the container by manually engaging the tab when the latter is disposed adjacent the notch.
6. An assembly according to claim 5 wherein the container and closure are made from the same or dissimilar thermoplastic resin materials.
7. An assembly according to claim 6
105 wherein said closure is of substantially low density polyethylene, substantially high density polyethylene or polypropylene.
8. An assembly according to any of claims 5 to 7 wherein the closure is impreg-
110 nated or coated with a non-toxic, unpleasant tasting material to deter a child from holding the closure in its mouth.
9. A container substantially as herein described with reference to Figures 1 and 2
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used to dissolve the unpleasant tasting material. By way of illustration of said solvents, mention may be made of water, ethyl alcohol, and aqueous ethyl alcohol.

- 5 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),
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WHAT WE CLAIM IS:—

1. A container having a snap-on snap-off closure receiving portion and being provided with a flange extending outwardly in the region adjacent said closure receiving portion, said flange having a flat top surface, a radially inwardly extending notch, and a stop extending upwardly from the flat top surface of the flange. 75
2. A container according to claim 1 wherein said stop is located to the left side of said notch when viewed from a position in which the closure receiving portion is held uppermost with the notch facing the observer. 80
3. A container according to claim 1 or 2 including a guard ring mounted about said flange for rotation thereabout, the guard ring having an opening capable of being brought into registration with the notch. 85
4. A container according to any of claims 1 to 3 when made from a flexible polymeric material. 90
5. An assembly comprising a container according to any of claims 1 to 4 together with a flexible snap-on snap-off closure engaging said closure receiving portion; said closure having a circular roof, a skirt extending from said roof, and a tab extending outwardly from the lower marginal surface of the skirt with the lower marginal surface and the tab being planar, parallel to said roof, and flushly contacting and being capable of sliding upon the flat top surface of said flange; the flange extending radially outwardly beyond said lower marginal surface and the tab, except where said notch is disposed, whereby the closure may be removed from the container by manually engaging the tab when the latter is disposed adjacent the notch. 100
6. An assembly according to claim 5 wherein the container and closure are made from the same or dissimilar thermoplastic resin materials. 105
7. An assembly according to claim 6 wherein said closure is of substantially low density polyethylene, substantially high density polyethylene or polypropylene. 110
8. An assembly according to any of claims 5 to 7 wherein the closure is impregnated or coated with a non-toxic, unpleasant tasting material to deter a child from holding the closure in its mouth. 115
9. A container substantially as herein described with reference to Figures 1 and 2 120



or 6 to 8 of the accompanying drawings.

10. An assembly of a container according to claim 9 together with a flexible snap-on snap-off closure substantially as herein
5 described with reference to Figures 1 to 3, or 4, or 5, or 6 to 8 of the accompanying drawings.

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