

Aug. 27, 1968

D. W. DONOVAN
PACKAGING STRUCTURE

3,398,848

Filed April 7, 1967

2 Sheets-Sheet 1

FIG. I

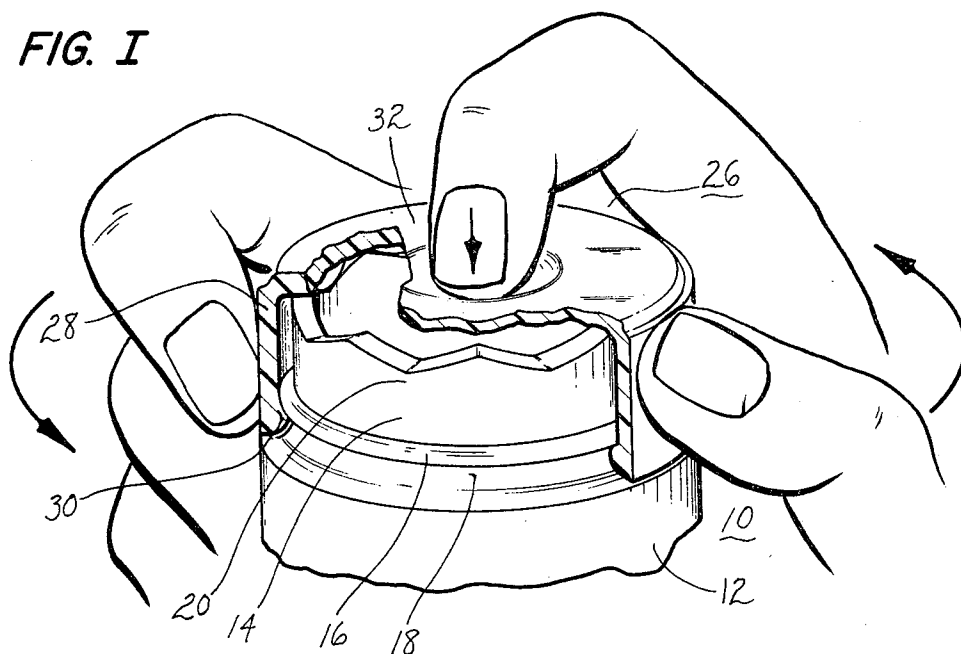
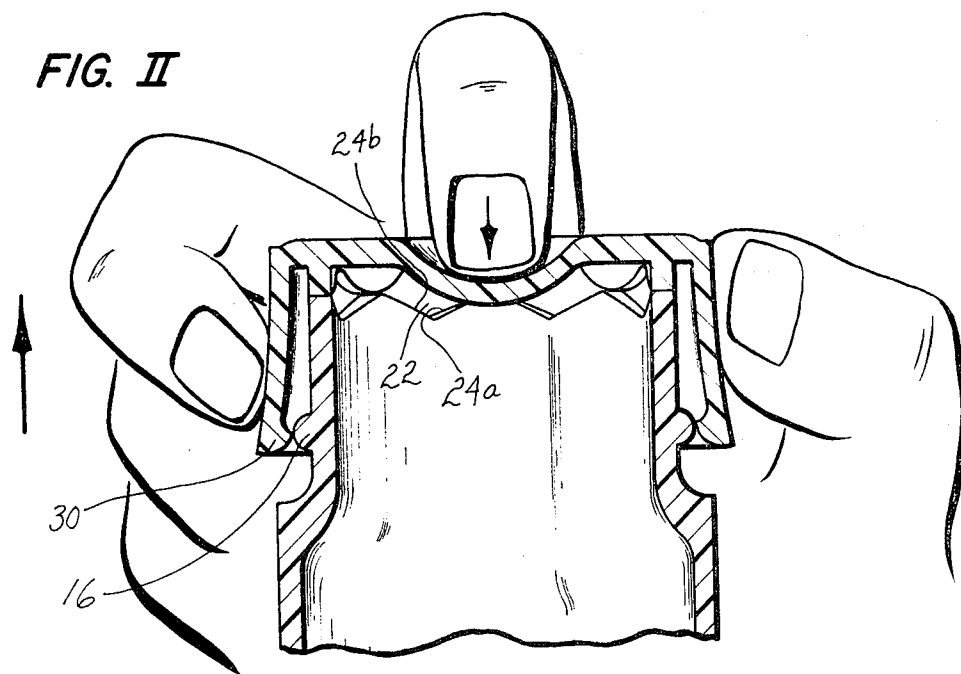


FIG. II



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FIG. III

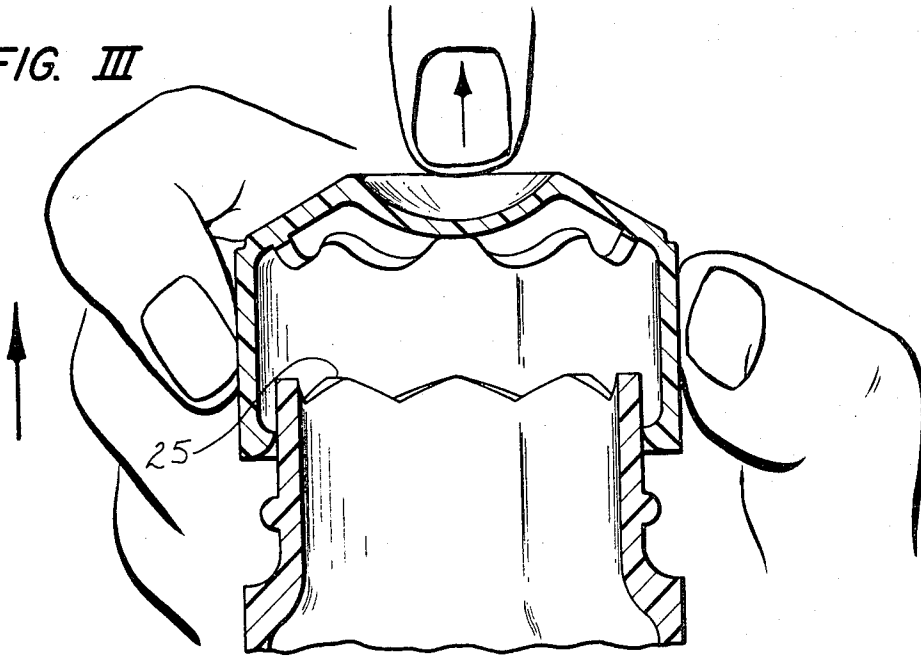
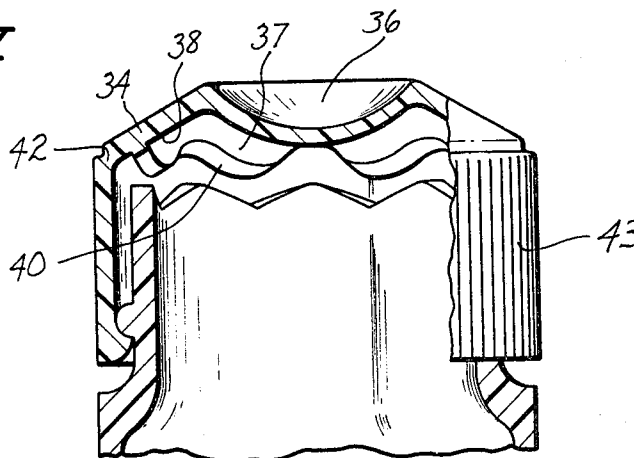


FIG. IV



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3,398,848

PACKAGING STRUCTURE

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12 Claims. (Cl. 215-9)

ABSTRACT OF THE DISCLOSURE

A container and safety closure requiring for removal, initial engagement of cam means, comprising a plurality of protuberances on either the closure or container which fit within cooperating depressions on deforming the closure endwall, followed by rotation, wherein the protuberances ride out of the depressions to disengage the means for locking the closure on the container.

Specification

This invention relates generally to the field of packages and closures therefor, and more particularly, to an improved form of bottle and safety closure therefor.

The number of medicinals usually available in the average household substantially increases the danger of accidental use by children. Although many safety precautions can be taken to minimize the risk of children obtaining and eating or drinking substances that are harmful, occasions nevertheless arise where small children manage to reach packages, bottles or other containers of drugs and pharmaceuticals. The likelihood of such a mishap has been increased in recent years through the advent of flavored medicines for children, thereby increasing their appetite for, and sharpening their already acute inquisitiveness concerning a variety of drugs.

Many prior art safety devices have been developed in an attempt to present a child-proof container for harmful drugs, tablets, and medicinals; however, such devices have proven to be complicated, expensive, and generally unreliable since the requirements for such a device are not only that it be child-proof, but also that the device permit an adult to readily obtain the contents of the container in an emergency.

It is therefore a primary object of this invention to provide an improved package which overcomes all of the aforementioned disadvantages and dangers, while still presenting structure convenient to manipulate by an adult intending to gain access to the contents of such package.

It is an additional object of this invention to provide a container or bottle and a one piece safety closure, which, while being child-proof, is nevertheless economical to manufacture.

Another important object of this invention is to provide a container and safety closure which is positive and absolute in its locking action, to prevent opening by a small child.

A further object of this invention is to provide a container and safety closure which includes means for positively preventing removal of the closure from the container by either simple turning of the closure or simple pulling of the cap relative to the container or a combination of such forces, but which permits easy removal of the closure on first pressing the closure to deform it from its normal configuration and then turning the closure relative to the container while the closure is depressed.

An additional object of this invention is to provide a safety closure structure in which the construction thereof may be varied to control the degree of safety, or the extent of difficulty in opening it.

Other objects of this invention will in part be obvious and will in part appear hereinafter.

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These and other objects are accomplished by providing a packaging structure comprising a container having a substantially cylindrical portion open at one extremity, to define an upper edge surface; a closure for the open extremity of the cylindrical portion having a sidewall and a resilient topwall; means associated with the sidewall and the cylindrical portion of the container for longitudinally securing the sidewall and the cylindrical portion relative to each other; and cam means associated with an inner surface of the closure and the edge surface of the cylindrical portion of the container, said cam means comprising a plurality of protuberances on one of said surfaces, and a plurality of cooperating depressions in the other of said surfaces for receiving the protuberances on deforming the resilient topwall.

In describing the overall invention, reference will be made to a preferred embodiment illustrated in the accompanying drawings in which:

FIG. I is a fragmentary elevational perspective view, partially in cross section showing a container of this invention with the safety closure in place thereon just prior to removal, and indicating the method of release of the closure from the container.

FIG. II is a view similar to FIG. I showing an intermediate position of the closure during removal from the container.

FIG. III is a view similar to FIGS. I and II showing the closure free of the container.

FIG. IV is a view similar to FIGS. I-III showing the closure locked in place on the container.

With reference to the drawings wherein identical numerals refer to identical parts there is shown in FIG. I a container or bottle 10 having a body 12, and a substantially cylindrical portion open at one end, comprising an open topped elongated neck 14 provided with first locking means 16, comprising an outturned annular locking ring intermediate its ends, and adjacent the lower end 18 of the neck. Neck 14 has an upper end or edge surface 20 in which are provided around the periphery a plurality of shaped depressions 22, which are shallow V-shaped notches having upwardly and outwardly diverging sides or sliding surfaces 24a and 24b as shown in FIG. II, with relatively sharp apexes 25 (FIG. III).

Closure 26 is provided for closing open-topped neck 14, and has a tubular sidewall 28 provided with second locking means comprising inturned flange 30 at its lower end for resiliently engaging the first locking means on the container neck when the closure is applied to the container. Closure 26 further comprises resilient top or end wall 32 for closing the upper end of sidewall 28. As shown in FIG. IV, end wall 32 of closure 26 has a border portion 34 which tapers upwardly and inwardly around the periphery of the end wall, from its junction with sidewall 28. Central section 36 of end wall 32 is provided within border portion 34, and may comprise a concave downwardly extending finger cavity. Adjacent the periphery of end wall 32 a plurality of protuberances 37 or rounded projections extend downwardly from the inner surface 38 of the border portion. Each protuberance 37 has a curved engaging surface 40 for intermeshing within the cooperating V-shaped grooves 32 of the container neck. Thinned section or flexing joint 42 is provided around the periphery at the point of connection of end wall 32 with sidewall 28. A knurled gripping surface 43 comprising a series of longitudinal slits to aid in turning the closure is provided on the outer surface of sidewall 28.

To remove closure 26 from cylindrical portion or neck 14 of container 12, it is necessary that one understand the function of the structure so as to be able to exert different and cooperating forces, as indicated by the fingers and direction of the arrows in FIG. I. One finger of the user's

hand (most likely the forefinger) must axially depress end wall 32 of closure 26 downward, preferably from within the central finger cavity 36 so as to deform yieldable and resilient end wall 32 until the curved engaging surface 40 of the rounded projections 37 are engaged within the V-shaped notches of the container neck, and contact at least a portion of surfaces 24a and 24b thereof. With the protuberances thus engaged within the depressions, generally the thumb and another finger of the hand, most likely the second, grip the knurled outer surface 43 of sidewall 28 and turn the closure in either direction at substantially right angles to the initial finger force while maintaining the container stationary. When this rotational movement is imparted to the closure, the curved surface 40 of each projection 37 within depression 22 slidingly and frictionally moves longitudinally upward along either sliding surface or side of the notch depending on the direction of rotation, until the curved surface 40 rests atop sharp apex 25 of the sides. This rotation thus imparts translational movement to the closure as illustrated in FIG. II, until inturned flange 30 of the closure sidewall has become disengaged from locking ring 16 of the container neck, since location of the flange and ring is such that they are disengaged when the protuberances rest atop the apexes of the notches. The closure may be then lifted free of the container to expose the open ended neck as illustrated in FIG. III and permit access to the container contents. On releasing the downward compressive force, the resilient top returns to its non-depressed, at rest position. During early ages most children lack the reasoning ability, dexterity, and coordination to use the fingers to apply two substantially differing forces in the manner described in order to remove the closure from the container.

To apply the closure to the container, it is fitted over the open top, and the convex downward outer surface of the inturned flange on the sidewall resiliently pressed with some force beyond the locking ring of the container, in an axial direction until the flange yieldably snaps under the locking ring as shown in FIG. IV. When the closure is locked on the container in an at rest position, the resilient top wall is in a non-depressed retracted position as shown in FIG. IV, with the protuberances substantially aligned but out of engagement with the depressions in the end of the container. The structure of the locking means associated with the sidewall and the cylindrical portion of the closure on the cylindrical portion must be sufficient to resist removal of the closure from the container by a simple axial pulling by a child or another. It is intended in the illustrated embodiment that the closure be removed only with the assistance of the resilient top thereof acting in the nature of a cam follower, whereby the closure protuberances first become engaged in the notches of the container end and then ride up the sides of the notches as the closure is turned in either direction, to impart substantially axially upward movement to the entire closure.

The above description and particularly the drawings are set forth for purposes of illustration only and are not to be taken in a limited sense.

As previously mentioned, the invention is directed toward a packaging structure comprising a container having a substantially cylindrical portion open at one extremity, to define an upper edge surface; a closure for the open extremity of the cylindrical portion having a sidewall and a resilient topwall; means associated with the sidewall and the cylindrical portion of the container for longitudinally securing the sidewall and the cylindrical portion relative to each other; cam means associated with an inner surface of the closure and the edge surface of the cylindrical portion of the container, said cam means comprising a plurality of protuberances on one of said surfaces, and a plurality of cooperating depressions in the

other of said surfaces for receiving the protuberances on deforming the resilient topwall.

Container 10 may of course be formed of any suitable material such as glass, metal, plastic or the like. Thermoplastic is preferred. The closure is preferably formed of a resilient thermoplastic such as low or high density polyethylene.

The present invention is not meant to be construed as limited to bottles, it being apparent that the principles of the invention would apply equally well to a container having a uniform diameter throughout its length, except for the closure locking provisions. Containers of such substantially cylindrical configuration are, of course, relatively common for use in the packaging of prescriptions and medicinal products.

The end wall of the container closure must be sufficiently yieldable to permit manual deformation by the fingers of an adult, yet sufficiently resiliently to return to its non-deformed position on release of the fingers. In other words an engaging step must be performed during removal. Resiliency may be provided by a relatively thin constant thickness of material throughout the end wall, or a thinned portion at or adjacent the junction between sidewall and end wall, with a thickened non-resilient section within this border portion. Otherwise the end wall may take any shape. It is preferred that a central finger cavity be provided therein to aid in depression during removal, but obviously a flat central portion would also be suitable.

The cam means of the packaging structure of the present invention comprises a plurality of protuberances or projections, alignable with their cooperating depressions. Though it is preferred that the projections be on the closure for cooperation with depressions in the periphery of the container end portion, the reverse configuration would also give satisfactory results, i.e. depressions in the closure for receiving projections on the container upper end.

To achieve the inclined plane concept of closure removal, wherein one surface frictionally slides along another, it is necessary that the cam means of the present invention have a sliding surface portion maintained at an acute angle with the horizontal, measured in the direction of closure rotation relative to the container. This angle is defined herein as the angle of slide. The sliding surface controls the movement of the cooperating parts, and may be located on either the projection or the depression. As illustrated in the preferred embodiment, the surface is preferably straight, as shown by side (24a or 24b) of the depression, and located at a point of contact of the protuberance within the depression, though it may have some curvature.

Obviously the magnitude of the angle of slide affects the ease of removal of the closure. Optimum results are obtained at an angle of between about 5 to 80 degrees, and preferably between about 30 to 65 degrees. By varying the angle of slide within these limits, it can be seen that the degree of difficulty of removal of the closure from the container can be controlled, thereby controlling in a sense, the degree of safety of the package structure. Thus, if it is desired to prevent removal of the closure, for example by a five year old child, yet permit removal by a ten year old, the angle of slide might be maintained at 10-15 degrees, whereas if it is desired to prevent removal even by a ten year old, the angle of slide might be maintained at 45-60 degrees.

The configuration of a projection which mates with a depression must be such that at least a portion of it fits within its cooperating depression, in order to obtain the desired camming action between the surfaces on rotation. Otherwise, the projections and depressions may be of any shape.

The axial depth of the depressions of the cam means of the present invention may vary within wide limits, but must be at least sufficient to permit disengaging or

releasing the locking means when the closure is rotated with the cam means engaged. For most closures a depth of at least $\frac{1}{16}$ " is satisfactory.

The number of cooperating depressions and protuberances may also vary within wide limits, dependent, obviously, on the diameter of the container end wall and the width of the depressions. At least two, however, are essential. They may be positioned around the entire periphery, or alternatively provided in spaced groups on the periphery, with each group comprising a series of cooperating depressions and protuberances.

The locking means for holding the closure on the container likewise may take a variety of forms, in addition to that shown in the preferred embodiment. Alternate locking provisions which yield satisfactory results would be one or more grooves in the container cooperating with one or more rings on the closure sidewall, or one or more grooves in the sidewall cooperating with one or more outward projections on the neck, either continuous or interruptedly positioned around the periphery, in either case.

Sealing provisions in addition to the seal provided by the locking means may be included on the closure or container end when the contents is a hygroscopic material, for example, aspirin. This may take the form of a bead or fin on either the outside surface of the container end, or the inside of the closure sidewall, preferably above the previously described locking means, to maintain a seal between the interior of the container and the locking means.

It will be apparent that the packaging structure of this invention is well adapted for accomplishing the aforementioned objects by providing a container and one piece safety closure which is positive in operation, simple and versatile in construction, and economical to manufacture.

While the present invention has been described in detail, it will be readily appreciated that many modifications and variations can be made from the structure disclosed without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A packaging structure comprising:

- (a) a container having a substantially cylindrical portion open at one extremity to define an upper edge surface;
- (b) a closure for the open extremity of the cylindrical portion having a sidewall and a resilient topwall;
- (c) means associated with the sidewall and the cylindrical portion of the container for longitudinally securing the sidewall and the cylindrical portion relative to each other; and
- (d) cam means associated with an inner surface of the closure and the edge surface of the cylindrical portion of the container, said cam means comprising a plurality of protuberances on one of said surfaces, and a plurality of cooperating depressions in the other of said surfaces for receiving the protuberances on deforming the resilient topwall.

2. The structure of claim 1 wherein the protuberances are retractably positioned on the inside of the topwall of

the closure and the depressions are in the top face of the upper edge surface of the cylindrical portion of the container.

3. The structure of claim 2 wherein the depressions are V-shaped notches and the protuberances are rounded projections.

4. The structure of claim 3 wherein the closure is a one piece structure.

5. A packaging structure comprising:

- (A) a container having a substantially cylindrical portion open at one extremity thereof provided with
 - (a) first locking means on the outer surface of the cylindrical portion below the upper end,
 - (b) a plurality of shallow depressions around the periphery in the upper end of the cylindrical portion; and
- (B) a rotatable closure for the cylindrical portion having
 - (a) a tubular sidewall provided with second locking means at its lower end for resiliently engaging the first locking means of the cylindrical portion,
 - (b) a resilient end wall closing the opposite end of the sidewall, having a border portion tapering upwardly and inwardly from the periphery of the end wall, and a central section within the border portion,
 - (c) a plurality of rounded projections extending downwardly from the inner surface of the border portion which fit within the depressions on pressing the end wall downward when the first and second locking means are engaged.

6. The structure of claim 5 including a sliding surface as a side portion of the depressions.

7. The structure of claim 6 wherein the first locking means is a ring, and the second locking means is an in-turned flange.

8. The structure of claim 7 wherein the central section of the resilient end wall is a concave downwardly extending finger cavity, and the rounded projections are located adjacent the outer edge of the tapering portion of the end wall.

9. The structure of claim 8 wherein the angle of the sliding surface with the horizontal, in the direction of rotation of the closure, is between about 5 to 80 degrees.

10. The structure of claim 8 wherein the resiliency of the end wall is provided by reducing the thickness of the junction of the side wall with the tapering portion of the end wall.

11. The structure of claim 10 wherein the closure is of one piece construction.

12. The structure of claim 11 wherein the container is a bottle and the cylindrical portion of the container is a neck.

References Cited

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DONALD F. NORTON, *Primary Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,398,848

August 27, 1968

Donald W. Donovan

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 61, "32" should read -- 22 --. Column 4, line 18, "resiliently" should read -- resilient --; line 71, "propections" should read -- projections --.

Signed and sealed this 17th day of March 1970.

(SEAL)

Attest:

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Attesting Officer

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Commissioner of Patents