CHILDPROOF CLOSURES OF THE
PULL-PUSH TYPE

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ABSTRACT
An adjunct to be incorporated with an existing dispensing closure of the pull-push type to render the same resistant to opening by a small child and thereby avoid the hazard of ingestion of injurious substances by the child. In its basic form the adjunct is readily adaptable to virtually any design of existing closure of the foregoing type.

12 Claims, 11 Drawing Figures
CHILDPROOF CLOSURES OF THE PULL-PUSH TYPE

BACKGROUND OF THE INVENTION

Closures for a container for a flowable substance comprising a fixed part to be attached to the container and a movable part carried on the fixed part for translational shifting between "on" and "off" positions are well-known. In general the fixed part is secured to the neck of the container, e.g. a bottle; as by screw threads and the movable part, when in open position, allows flow of the substance; when in closed position, such flow is interrupted. The fixed part has passage means in communication with the interior of the container and the movable part has passage means in communication with atmosphere. A valve intermediate these passage means and having its inlet and outlet sides in communication therewith is adapted to be opened or closed for flow or termination of flow respectively. In the design most used today the movable part is shifted to "open" by pulling thereon and to "closed" by pushing thereon. Hence, the application, "pull-push". As examples of such closures, reference is made to U.S. Pat. Nos. D183,622; D198,598; D199,547; D200,023; D202,227; and D205,425. In these and others, the movable part is provided with an actuating head having a flange or enlargement to insure positive grip with the fingers as the part is manipulated to the outer limit of its stroke. Re-closing of the valve is accomplished by thrusting the part to the inner limit of its stroke. As thus constituted a child, even one of tender years, would have no great difficulty in "hooking" two fingers or the thumb and index finger around the head of the closure or in using his fist to gain access to the contents. In the event the manufacturer increases the sliding friction to a point calculated to thwart the child, the operation of opening becomes too much for an adult. In this case the manufacturer moves in a direction favoring the adult, for otherwise he may anticipate a large diminution in sales. Consequently, the problem of child-proofing remains a vexing one.

Furthermore, to introduce a substitute design of closure having acceptable means to render the same child-resistant involves a number of critical factors, for example, the expense of new molds and capping machinery, and esthetic considerations.

SUMMARY OF THE INVENTION

In accordance with the invention there is provided an adjunct for a dispensing closure of the pull-push type to preclude opening by a child of tender years. In one aspect the adjunct has an upper sleeve engaged with the flange of the movable part of the closure in all positions thereof. In another aspect the adjunct is provided with a flexible, upper sleeve surrounding the head of the movable part in order that the upper sleeve may be collapsed by digital squeezing force into contact with the head and the movable part thus shifted to "open". In both cases the adjunct is retained in position on the closure by forming the same integrally with another sleeve engaged over the base or fixed part of the closure, but capable of axial shifting jointly with the movable part.

In the preferred embodiment the upper sleeve has an internal groove of such cross sectional configuration as to receive and retain the flange or other enlargement on the head of the movable part of the closure. In this way, upon actuation of the upper sleeve inwardly or outwardly the movable part is shifted jointly therewith. Since the exterior surface of the upper sleeve is made smooth the child is unable to apply sufficient grip to pull the movable part to "open" position, since he is obliged not only to overcome friction inherent in the closure but to deform and maintain the resilient adjunct in operative position. To this end, it may be desirable to conform such exterior surface to a conical surface, with the smaller diameter outwardly whereby the child would encounter even greater difficulty in maintaining a satisfactory grasp.

In still another aspect the adjunct is so configured as to be capable of rapid assembly with the closure by the use of automatic machinery.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a combined cross section and side elevation of the closure with the adjunct attached and in closed position;

FIG. 2 is a view similar to FIG. 1, but in open position;

FIG. 3 is a bottom plan view as seen in the direction of the arrows 3—3;

FIG. 4 is a bottom plan view as seen in the direction of the arrows 4—4;

FIG. 5 is a perspective view of the closure and adjunct depicted in FIGS. 1 to 4;

FIG. 6 is a combined cross section and side elevation of an alternative embodiment in "closed" condition;

FIG. 7 is a view similar to FIG. 6, but in "open" condition;

FIG. 8 is a top plan view of the closure and adjunct of FIG. 6;

FIG. 9 is a combined side elevation and cross section of a modified form of adjunct;

FIG. 10 shows a combined side elevation and cross section of another embodiment; and

FIG. 11 shows still another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. 1 and 2 there is shown a typical pull-push closure 10 actuable between non-dispensing and dispensing positions, i.e., "off" and "on", as shown in FIGS. 1 and 2 respectively. The closure 10 has a fixed part 11, in this case, a skirt 12, by means of which the closure is secured to an appropriate portion of the container 15, in this case, a neck 16. The skirt may be secured by means of screw-threads, as at 17, a bayonet joint or by being molded integrally with the container. Since the mode of securing per se forms no part of the invention, and many types are well-known, further elucidation will be omitted.

The movable part 21 is connected to the fixed part for sliding movement between limit stops (not shown) allowing for a stroke S. Such stroke will be sufficient to permit a desired rate of flow of the substance from the container 15 to the exterior of the closure through a valve (not shown). Since many different forms of valve are known in the art and the same per se forms no part of the invention, expanded description is deemed unnecessary. It will be clear that a pull applied to the head 22 opens the valve and that a push will close the same. The parts 11 and 21 have respective coacting detent means to retain the latter in either "on" or "off" positions, e.g. a bead and groove as is well-known. To en-
able the functions of the closure and adjunct, any plastic composition characterized by resiliency and shape retention may be utilized. Such characteristics are sometimes referred to as “plastic memory”. Resins such as polyethylene and polypropylene have been found suitable.

As thus constituted the head 22 of the movable part 21 is accessible for operation. However, by assembling the invention adjunct 31 with the closure an effective guard to unauthorized actuation is provided, and will now be described.

The adjunct is desirably a one-piece device comprising an upper annular sleeve 32 and a lower annular sleeve 33 joined in any suitable manner, e.g. an annular disc 34. The disc 34 has minimum clearance at B and is of such thickness as to insure that, upon application of axial force the adjunct moves as a unit. At its upper end the sleeve 32 has an interior groove 38 of such transverse cross section as to receive the edge 39 of the head 22 with a snap fit of such degree as will cause the movable part 31 to shift between its two positions upon movement of the adjunct 31 up and down, it being understood that the stroke of the adjunct will be limited to the stroke of the movable part 21. However, movement of the part 21 is prevented by stop means in the form of ears 42 engaging under the rim of the skirt 11 which must be cleared from such engagement. The ears 42—42 project inwardly of sleeve 33 at diametrically opposite points (FIG. 3) and are desirably molded integrally therewith. Assuming no radial force is applied to the skirt 33 the adjunct will be locked against axial displacement. However, upon applying pressure to the sleeve 33 at two diametrically opposite points displaced circumferentially 90° from the ears 42—42, the sleeve will become ovalized (FIG. 4) and the ears 42—42 are withdrawn from under the skirt 12 whereupon the adjunct may be lifted (FIG. 2) to open the valve for dispensing. Upon reverse axial force applied at any convenient place on the exterior of the adjunct or the top of the head 22 the closure is closed, at which time the ears 42—42 are restored to normal (FIG. 1).

In order to facilitate initial assembly of the adjunct with the closure by automatic machinery the lower face of the ears 42—42 is chamfered, as shown, whereby the same may be easily positioned as in FIG. 1 notwithstanding the presence of the corner 49 of the skirt 12.

Early prototypes of the invention exhibited a tendency of the adjunct, during actuation, to cant with respect to its longitudinal axis. To remedy this misbehavior a plurality of ribs 51, for example, four in number, spaced apart about 90°, are provided on the interior of the sleeve 33. In this way the clearance which might be required between the exterior surface of the skirt 12 and the interior surface of the sleeve 33 is accommodated to a sliding fit. Thus canting is avoided.

The diametrically opposite points X—X at which finger pressure is applied to deform the sleeve 33 to ovalize the same may be in the form of bulges 53—53. Thus, the sleeve 33 may be deformed to a greater extent than would otherwise be the case and the ears 42—42 withdrawn positively and without fouling.

A modified form of the adjunct is illustrated in FIGS. 6, 7 and 8. In this embodiment the lower sleeve 61 is held permanently in a position surrounding the skirt 12 of the closure by any suitable means, such as by ears 62—62 which may be similar to the ears 42—42 previously described. Alternatively the ears 62—62 may be replaced by a rim extending over the entire circumference of the sleeve 61. An upper sleeve 65 surrounds the head 66 and the enlargement 60 thereof is spaced therefrom by an amount D. The sleeve 65 is united to the sleeve 61 by two or more straps 67—67 (FIG. 8). These latter are so dimensioned and proportioned with respect to the resiliency of the plastic utilized that they may flex the amount required without dislodging the sleeve 61 from the position shown.

Thus, to open the valve, forces Y—Y (FIG. 7) are applied by the fingers to pinch the sleeve 65 against the head 66 so that, while maintaining such pressure, the valve may be lifted to “open” position. Upon release of pressure the “open” condition of the valve will be maintained by reason of friction between the fixed and movable parts of the closure, but the straps 67—67 will restore themselves and the sleeve 65 to normal position (FIG. 6). To close the valve the head 66 is simply thrust inwardly.

From the foregoing it will have become apparent that the (1) force required to grip the head 66 by collapsing the sleeve 65, (2) maintaining the pinching action during opening of the valve and (3) concurrently overcoming the internal friction of the closure can readily be made large enough to foil the efforts of even the most determined child of tender years. It will be further understood that the configuration of the adjunct lends itself to assembly by automatic machinery, when considered in the light of FIGS. 1 to 4.

FIG. 9 illustrates another embodiment in which the upper sleeve 71 and lower sleeve 72 are integral with an annular disc 73. The stop means 75 may be ears similar to the ears 42—42 of FIG. 1 or a continuous rim as pointed out in connection with FIG. 6. However, in this embodiment, the entire adjunct is adapted to shift axially with respect to the closure and to carry with it the head 66. The concurrent pinching and pulling action is as described in connection with FIG. 7. The closed and open positions of the parts are depicted by full and broken lines respectively. It will be understood that the interior of the sleeve 71 may be provided with a member similar to member 38 of FIG. 1 to achieve better joint gripping of the sleeve and the enlargement of the head 66.

Parenthetically, it may be remarked that the words “childproof” and “child-resistant” are relative terms, since the reader will appreciate that an exceptionally strong and/or bright child may overcome practically any device designed to defeat the child’s ingenuity and physical ability. Government protocol governing tests on devices submitted as child-proof or child-resistant allows for exceptions of this character.

Another mode of fabricating a child-proof pull-push closure is shown in FIG. 10. In this form a base or fixed part 81 is shown as molded integrally with a container 82 but may be otherwise attached thereto. A pair of circumferential grooves 83 and 84 in the base 81 are spaced apart a distance Z corresponding to open and closed conditions of the device. The head 86 corresponding to the head 66 heretofore described, is formed integrally with a disc 87 which, in turn, has an integral skirt 88. The movable part comprised by the parts 86, 87 and 88 is molded of material having a plastic memory and is so dimensioned as to flex in assuming its two positions to be described. On the underside of the disc is a ridge 91 which is continuous or discontinuous and acts as a fulcrum 91. This fulcrum is located in
a radial position such that some given force \( W \) applied in the region of the periphery of the skirt \( 88 \) will, through lever action, result in shifting the head \( 86 \) between closed and open positions. The parts are so dimensioned and proportioned as to require a force \( W \) beyond the capacity of a child of tender years, but not so great as to interfere with opening and closing of the device by an adult of reasonable capability.

Reverting to FIG. 5, it is within contemplation to weaken the sleeve \( 33 \), as by means of grooves \( 30-30 \) in order than flexure thereof is more easily realized.

One of the cardinal features of the invention resides in the fact that opening of the closure may be accomplished with one hand, since the container may be gripped between the third, fourth and fifth digits and the thumb and second digit used to manipulate the adjunct. Thus, amputees, arthritis and others disabled in the use of one hand are not placed at a disadvantage by having to actuate a closure equipped with the invention adjunct.

FIG. 11 depicts another embodiment wherein the sleeve \( 32 \) and head \( 22 \) of FIG. 1 are merged into a single part. In this form of the invention the head \( 22a \) is integral with the disk \( 34a \) and the latter, in turn, has the skirt \( 33 \) and ears \( 42-42 \). The principles of operation are as described in connection with FIGS. 1 and 2, except that the operative connection between the sleeve \( 22 \) and part \( 38 \) is absent. The exterior of the head \( 22a \) may be frusto-conical in order to render it difficult for the child to take a firm, sustained hold.

I claim:

1. An adjunct useful with a dispensing closure of the pull-push type for a container for a hazardous substance potentially injurious to small children, the closure having a substantially cylindrical fixed part including a skirt and means to attach the closure to the container and a substantially cylindrical movable part shiftable axially manually with respect to the fixed part between “on” and “off” positions, first passage means in the fixed part and second passage means in the movable part and valve means common to both said passage means whereby, upon actuation of the movable part to “on” position provides for flow from the container to atmosphere, and vice versa, said adjunct comprising a first sleeve substantially coextensive with said fixed part attaching means, said first sleeve comprising material which is resilient and generally shape-retaining, a second sleeve extending from the first sleeve extending outwardly from the preventing access to the movable part, means interconnecting said first and second sleeves adapted for joint axial movement, cars on said first sleeve engageable with the fixed part to retain the adjunct on the closure, said ears adapted to be freed in an outward radial direction from said first sleeve upon radially-applied force at two diametrically opposite points of the first sleeve to ovalize the same whereby the ears are cleared for movement past the skirt and the valve opened concurrently, said adjunct comprising resilient but generally shape-retaining material.

2. A childproof closure of the pull-push type for use with a container for a hazardous substance potentially injurious to small children comprising a fixed part having means for attaching the closure to the container and a movable part slidably mounted on the fixed part for movement between “on” and “off” positions, said parts having a common axis, means on the fixed part constituting one part of a valve and means on the movable part constituting the other part of the valve, said “on” and “off” conditions corresponding to open and closed conditions of the valve, a passage in the fixed part providing fluid communication between the interior of the container and one side of the valve and a passage in the movable part in fluid communication with the other side of the valve and atmosphere through which the substance flows when the parts are “on” and termination of flow when the parts are “off”, a third part having a sleeve engaged with the fixed part and provided with a shield surrounding the movable part to preclude access to the movable part for actuation of the same, means forming part of the sleeve containing relative axial displacing movement between the sleeve and fixed part, said sleeve comprising resilient but generally shape-retaining material to be deformed by digital pressure, said shield and movable part being adapted for joint axial movement, means intermediate the fixed part and third part releasable by digital pressure radially applied to the sleeve to permit the third part to be displaced axially.

3. In combination, a dispensing closure of the pull-push type for a container for a hazardous substance potentially injurious to small children and the children having a closure to preclude opening of the closure by a child of tender years, the closure comprising a fixed part having means attaching the same to the container and a movable part operatively mounted on the fixed part for reciprocating movement between “on” and “off” positions for flow of contents from the container and termination of flow respectively, the fixed part having a passage in fluid communication with the interior of the container and the movable part having a passage for exit of the substance from the container, a valve intermediate said passages which, upon movement of the movable part to “on” position connects the passages for flow therethrough, the movable part having an actuating head and a stem extending therefrom into the fixed part to constitute the movable part of the valve, the adjunct having first means for attachment of the adjunct to the fixed part and second means cooperative with the head of the movable part of the closure for joint movement therewith, said second means including guard means normally preventing access to the head for actuation of the valve, said guard means comprising a sleeve of resilient but generally shape-retaining material around the head capable of being digitally squeezed against the head to couple said guard and head to open the valve.

4. The combination in accordance with claim 3 further characterized in that the fixed part and adjunct have respective interengageable means to limit the stroke of the adjunct upon movement of the head and adjunct to “on” position.

5. The combination in accordance with claim 3 in which the fixed part attaching means is a cylindrical shell and the adjunct has an inwardly extending projection which, upon movement of the adjunct to “on”, abuts the lower end of the shell to limit the movement of the adjunct and assembly thereof with the closure is maintained.

6. The combination in accordance with claim 5 wherein the projection is resilient to enable momentary displacement thereof by the fixed part attaching portion upon initial assembly of the adjunct with the closure.
7. The combination in accordance with claim 6 wherein said first means is a sleeve comprising resilient but generally shape-retaining material and the projection extends inwardly below the fixed part attaching means, said projection being so spaced relative to the lower edge of the skirt to allow axial movement of the adjunct a distance at least equal to the stroke of the movable part between "on" and "off" positions.

8. The combination in accordance with claim 7 further characterized in that the lower sleeve of the adjunct is radially flexible to enable manual deformation thereof from a cylindrical to an ovalized configuration, the projection lying on the major axis of the oval whereby, upon squeezing force being applied on the minor axis the projection is radially outwardly displaced to a position clearing the skirt.

9. In combination with a dispensing closure for use with the pouring neck of a container, said closure having a base part including means to attach the closure to the neck and a movable part mounted on said base part for translational movement with respect thereto, said base part and movable part being of substantially cylindrical form and on a common axis, said base part having a skirt including means to attach the closure to the container, said base part and movable part having respective means together constituting a valve having an inlet side and an outlet side operable between "on" and "off" positions, passage means in the base part providing fluid communication between the interior of the container and the inlet side of the valve and passage means in the movable part providing fluid communication between the outlet side of the valve and atmosphere, said movable part having a head including an embossment exteriorly thereof to facilitate digital actuation of the movable part between its two positions, an adjunct to preclude such actuation by a child of tender years comprising resilient but generally shape-retaining material, said adjunct adapted to be combined with the closure by thrusting the same over the same, said adjunct comprising a cylindrical lower sleeve fitting over the skirt with annular clearance therebetween and a cylindrical upper sleeve surrounding the head and spaced therefrom normally avoiding frictional coupling of the head and upper sleeve upon axial movement of the adjunct, the sleeve being digitally deformable by a squeezing force applied radially thereto to couple the head and upper sleeve for joint movement to open the valve, the lower sleeve, when squeezed by a digitally applied, radially-directed force, being converted from a transverse annular cross section to a transverse substantially elliptical cross section, the lower sleeve having at least one inwardly directed projection which, in the circular condition of the lower sleeve, underlies the skirt to limit axial movement of the lower sleeve and, in the ovalized condition of the same, is clear of the skirt to enable separation of the adjunct and closure.

10. The combination in accordance with claim 9 further characterized by a flexible connection between the two sleeves for joint actuation of the head and upper sleeve independently of the lower sleeve.

11. The combination in accordance with claim 9 in which the projection is spaced below the skirt an amount at least equal to the stroke of the movable part of the closure.

12. The combination in accordance with claim 9 further characterized by a plurality of embossments on the interior of the lower sleeve having a sliding fit with the exterior of the fixed part of the closure to preclude cocking of the adjunct when the same is assembled with the closure.

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