

June 23, 1970

L. A. MICALLEF  
TOGGLE TYPE CLOSURE

3,516,581

Filed Sept. 6, 1968

3 Sheets-Sheet 1

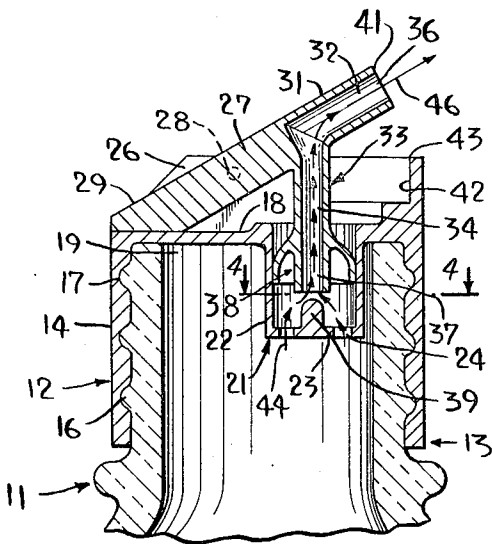
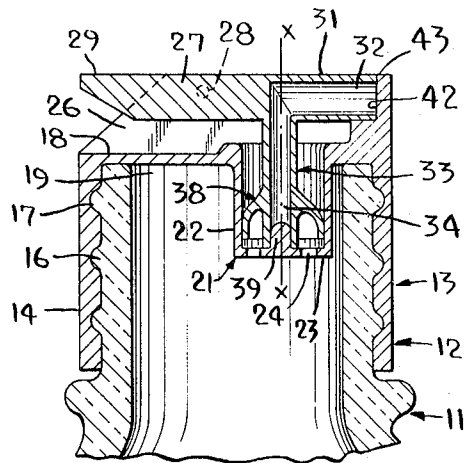
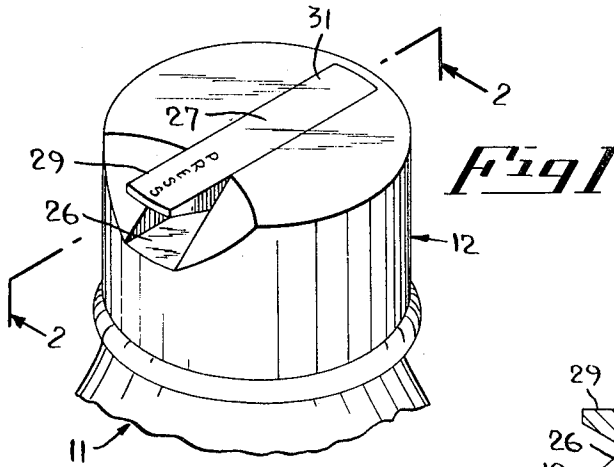


Fig 2

Fig 3

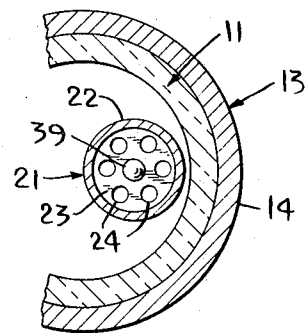


Fig 4

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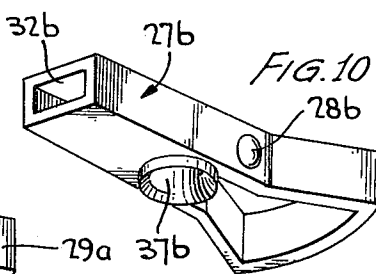
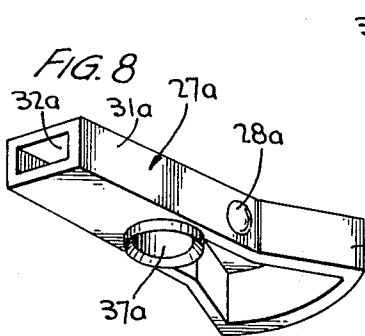
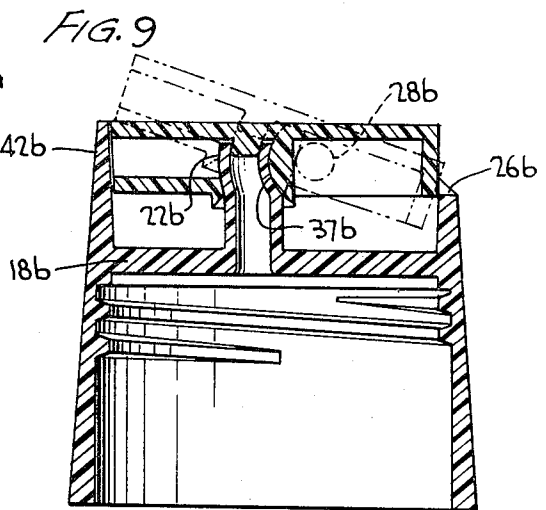
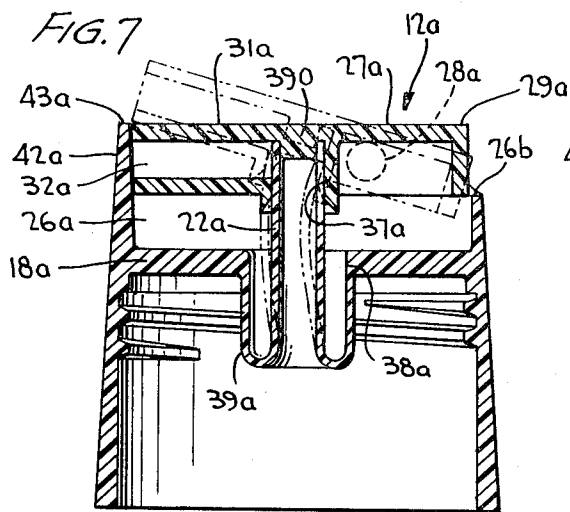
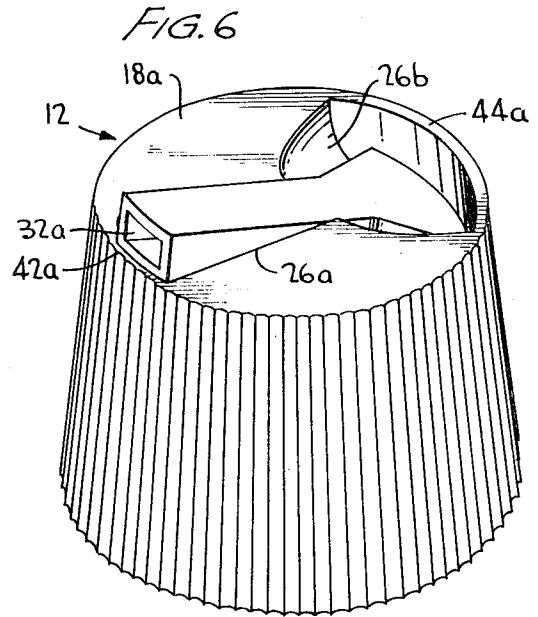
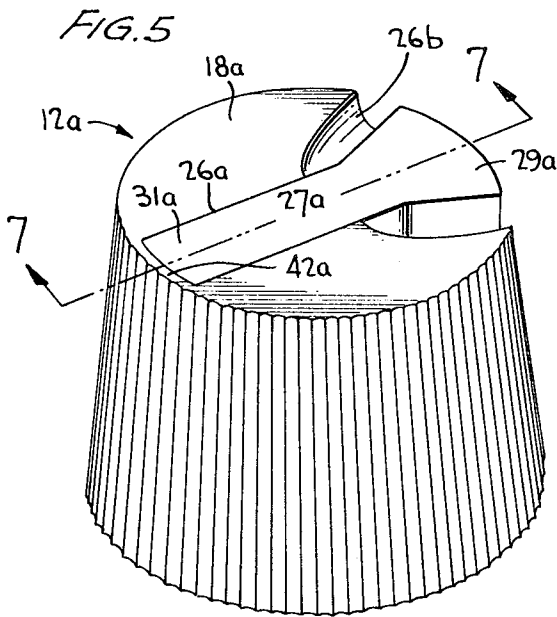
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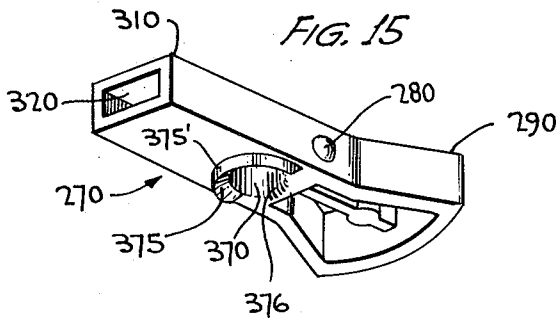
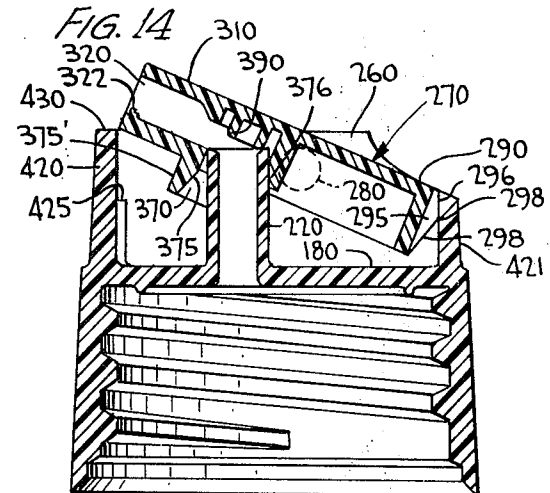
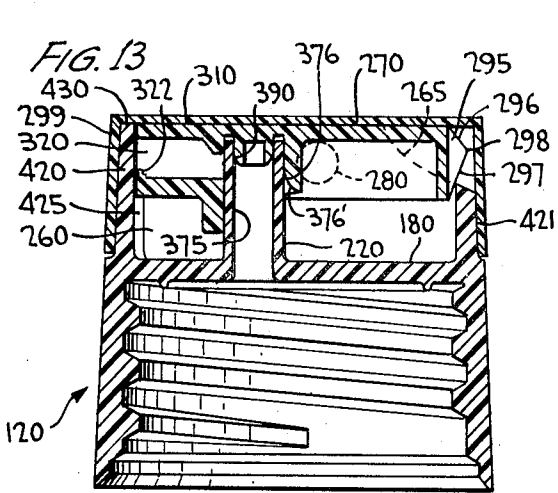
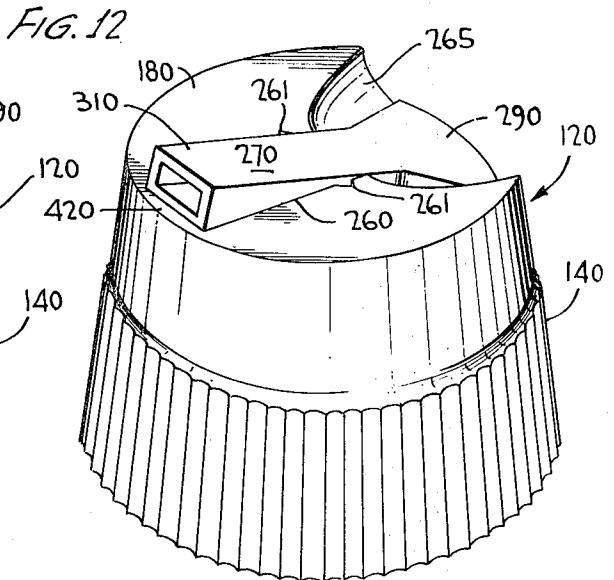
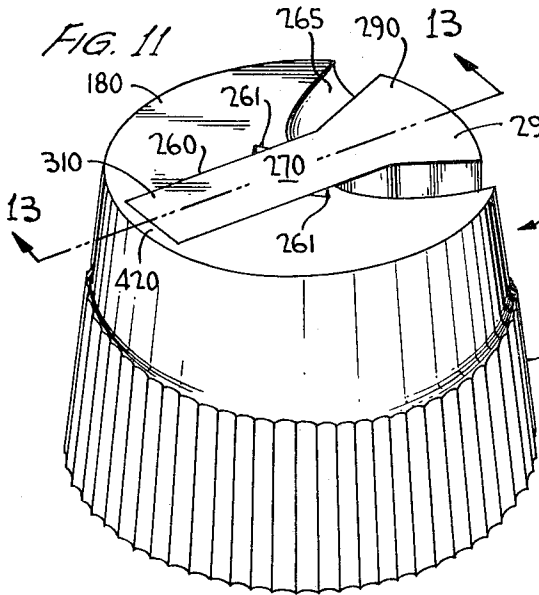
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3 Sheets-Sheet 3



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3,516,581

**TOGGLE TYPE CLOSURE**

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Continuation-in-part of application Ser. No. 666,335, Sept. 8, 1967. This application Sept. 6, 1968, Ser. No. 757,891

Int. Cl. B67d 3/00

U.S. Cl. 222-529

22 Claims

**ABSTRACT OF THE DISCLOSURE**

A dispensing closure in which the discharge passage extends through a lever pivoted on the container of material to be dispensed for angular movement between dispensing and sealing positions. Telescopically associated ducts from the lever and the container establish communication between the container and the passage through the lever at a location eccentric to the angular movement of the lever, and suitable means associated with the lever are provided for closing the passage in the sealing position of the lever. Various means are provided for permitting simultaneous angular and telescopic movement between the telescopically associated ducts without damaging them or impairing the substantially fluid-tight connection between them.

The application is a continuation-in-part of my prior application, now abandoned, Ser. No. 666,335, for Toggle Type Closure, filed Sept. 8, 1967.

This invention relates to a dispensing closure of the type in which the discharge passage from a container of flowable material to be dispensed, extends through a lever pivoted on the container for limited angular movement between predetermined dispensing and sealing positions. Telescopically associated ducts from the lever and the container establish communication between the container and the said passage through the lever at a location eccentric to the pivotal axis of the lever, and suitable sealing means within the lever passage closes the normally open outer end of the container duct in the sealing position of the lever.

In such type of dispenser, the angular movement of the lever between its extreme positions normally causes a simultaneous relative angular and telescoping movement between the telescopically associated ducts of the lever and the container.

It is therefore an important object of the present invention to improve a dispenser of this type by constructing same in a manner to permit such simultaneous angular and telescoping movement between the telescopically interconnected ducts thereof without damaging them or impairing the fluid-tight interconnection between them, as well as to achieve this end by an extremely simple construction in which the said interconnected ducts may constitute integrally molded portions of the lever and the container or container closure respectively.

In accordance with the invention, this broad object is achieved by various structures, exemplified by the specific embodiments hereinafter illustrated.

Thus, in some embodiments of the invention at least one of the telescopically interconnected ducts is made flexible, so that its free end portion which is telescopically associated with the other duct, is free to be resiliently deflected incident to angular movement of the lever, and the material of which the duct and/or the lever are formed, is capable of sufficient resilient deformation to permit the necessary amount of relatively angular displacement between the lever and duct while obtaining a fluid-tight coupling between them in the dispensing position of the lever.

In another specific embodiment, the telescopically interconnected portions of the container outlet duct and the lever are curved concentrically to the axis of angular movement of the lever so as to avoid the necessity for deflection of either portion, while permitting telescoping movement between the members in an arcuate path.

In a still further embodiment, adapted for formation from substantially rigid plastic materials, such as polystyrene, the telescopically interconnected portion of the container outlet duct and the lever are mutually conformed in a novel manner to establish a fluid-tight coupling in the sealing position of the lever, while requiring but a minimum and insignificant flexing and/or deformation of the telescopically associated portions of the lever and duct.

Thus, in the last-mentioned embodiment, the side wall of the inlet opening of the lever, on the side thereof adjacent to its axis of angular movement, is curved concentrically to the said axis in a manner to abut constantly against the free end portion of the duct to prevent the duct from being deflected toward the axis incident to swinging of the lever. On the other hand, the relatively remote side wall of the inlet opening from the said axis is arranged and positioned for movement in an arcuate path substantially tangentially to the free end of the said duct, but in sufficiently snug engagement therewith in the dispensing position of the lever to effect a fluid-tight seal.

A further important object of the invention which is achieved in each of the specific embodiments, is to provide means for removing excess material at the discharge end of the lever as well as for sealing the outer end of the discharge passage of the lever as the lever is moved to its sealing position.

A further important object of the invention, achieved in one of the illustrated embodiments, is to afford for the lever a resilient snap action which assures its full movement to and retention in either its sealing or dispensing positions.

The foregoing primary objects and advantages, as well as further subsidiary features and advantages of the invention will be more fully understood from the following detailed description of specific embodiments of the invention in conjunction with the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of one form of the closure of the invention mounted on the container;

FIG. 2 is a fragmentary sectional view taken on the line 2-2 of FIG. 1, showing the closure parts in closed inactive or sealing position;

FIG. 3 is a fragmentary sectional view similar to FIG. 2, but showing the closure parts in active dispensing position;

FIG. 4 is a fragmentary sectional view taken on the line 4-4 of FIG. 3;

FIG. 5 is a perspective view of a second form of closure in accordance with the invention, the same being in its closed sealing position;

FIG. 6 is a view similar to FIG. 5 with the closure in its open or dispensing position;

FIG. 7 is a vertical section on the line 7-7 of FIG. 5 showing in broken lines the positions assumed by the parts when the closure is in its dispensing position;

FIG. 8 is a perspective view of the toggle bar or lever portion of the closure shown in FIGS. 5, 6 and 7;

FIG. 9 is a view similar to FIG. 7, but showing a third form or modification of the invention;

FIG. 10 is a perspective view of the toggle bar or lever for the embodiment shown in FIG. 9;

FIG. 11 is a perspective view of a still further embodiment of the invention with the parts of the closure in their closed sealing position;

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FIG. 12 is a view similar to FIG. 11, but with the parts in their open dispensing position;

FIG. 13 is a vertical section on the line 13—13 of FIG. 11, but showing in addition a protective over-cap applied to the closure;

FIG. 14 is a view similar to FIG. 13 omitting the over-cap and showing the parts in their dispensing position; and

FIG. 15 is a perspective view of the toggle bar or lever employed with the embodiment of FIGS. 11 to 14, inclusive.

Referring now to the embodiment of the invention shown in FIGS. 1 to 4 of the drawings, and referring now particularly to FIG. 1, there is provided a container 11, such as glass or plastic bottle, on which there is mounted a closure generally indicated at 12. As best shown in FIGS. 2 and 3, the closure 12 comprises a cap 13 that includes a body member or skirt.

The container 11 holds a flowable material, such as a gaseous, liquid, creamy, granular, powdery, or similar substance; such a material may be for use at table, in the household, or for cosmetic or industrial use.

In FIGS. 2 and 3, a skirt 14 of the cap 13 is shown engaging the bottle 11 by means of an external thread 16 that is formed on the neck portion of the bottle 11, and an internal thread 17 that is formed on the body member 14. Thus the threads 16 and 17 form the releasable engagement between the cap 13 and the container 11.

The cap 13 may be screwed, as shown, on the container 11, or may otherwise releasably be positioned thereon. It may, however, alternatively be permanently connected to the container 11; and even may be integral therewith, for instance where the container 11 is composed of plastic, and forms a so-called squeeze bottle. Thus the details of the cap 13 in its engagement on the container 11 are shown and described herein merely by way of example and not in any limiting sense, save as restricted in the claims hereof.

The cap 13 comprises a lid portion 18 that extends across the open mouth 19 of the bottle 11 and normally closes it. A well 21 is suspended from the lid portion 18 and, as shown in FIGS. 2 and 3, may be integral therewith. The well 21 has a wall 22, the interior surface of which is substantially in the shape of an upright cylinder about the cylinder axis  $x-x$ . The well 21 is provided with a bottom section 23 in which there are formed apertures 24 (see FIGS. 3 and 4). In this instance the well 31 defines an outlet duct for the container 11.

The cap 13 has near its top a slot 26 that receives a tiltable lever 27, sometimes hereinafter referred to as a toggle member or toggle bar. The lever 27 is a two-armed lever that is pivoted at 28 to the body member 14. In practice, pivoting about the pivot 28 is accomplished by two pins projecting from both sides in the slot 26 and engaging there an aperture, or small depressions in the lever 27, at the pivot 28 of the lever 27. The pivot 28 forms a fulcrum, about which the lever 27 is tilted between an inactive sealing position (shown in FIG. 2) and an active dispensing position (shown in FIG. 3). The two arms of the lever 27 include a handle or actuating arm 29 on which, as best shown in FIG. 1, the word "PRESS" may be marked, and a dispensing part or arm 31 that is generally disposed above the well 21. As best shown in FIGS. 2 and 3, when the handle arm 29 is pressed downwardly, the dispensing arm 31 is raised accordingly.

The dispensing arm 31 has a hollow portion 32 that forms the upper portion of a conduit 33. A lower portion 34 of the conduit 33 extends with its free end into the well 21, and defines a duct for telescopic association with the duct or well 21 of the container cap 12.

The free ends 36 and 37 of the conduit 33 are open, so that in the open position (FIG. 3) fluid can pass through the conduit 33; and the open ends 36 and 37 can be closed (FIG. 2), as will be explained later on. The lower conduit portion or duct 34 is flexibly connected to the

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upper conduit portion 32 and intercommunicates interiorly therewith.

As previously briefly indicated, the material of the container 11 may be glass, or plastic, such as polyethylene, or any suitable well-known conventional material. The cap 13 including the body member 14 may be plastic material, such as polyethylene, or other plastic of well-known composition and, in fact, may be formed of any other suitable conventional material. It is preferred, however, that the cap 13 is molded of plastic, and the pivot pins for the pivot 28, mentioned hereinbefore, may be molded on the cap 13.

The toggle bar 27 may also be made of plastic, and preferably both portions 32 and 34 of the conduit 33 are integrally molded with the toggle bar 27. The material of the toggle bar 27 and the portions 32 and 34 of the conduit 33 must be of such material that flexing of the lower conduit portion 34 relative to the upper conduit portion 32 is rendered possible.

Sealing means generally indicated at 38 are provided in the well 21. The sealing means, as best shown in FIGS. 2 and 3 include a piston element the external surface of which is shaped substantially as a portion of a sphere; and the sphere is hollow, rendering the sealing means 38 flexible. The shape of the sealing means may, however, be non-spherical, and instead be a flexible cone or other suitable plunger shape. For the sake of convenience, the shape of the sealing means 38 is sometimes referred to herein as spherical or spheroid. The diameter of said sphere is slightly larger than the diameter of the aforesaid cylinder of the well 21, so that the spheroid sealing means 38 will at all times engage the internal surface of the well 21 at sufficient pressure to provide for good sealing.

The sealing means 38 is sufficiently large so that it will engage the cylindrical surface of the well 21 along a complete circle irrespective of the position of tilting the lower conduit portion 34 will assume relative to the axis  $x-x$ . During the movement between the sealing and dispensing positions by the lever 27 the lower duct portion 34 will assume various positions of tilting relative to the axis  $x-x$ ; this tilting movement of the lower duct portion 34 is due to the fact that its upper end that is connected to the upper portion 32 describes a circle about the pivot 28; its lower end 37, however, due to the guidance provided by the spherical sealing means 38, has its center in all positions substantially coinciding with the axis  $x-x$ . Therefore, the upper and lower ends of the lower conduit portion 34 will during the movement between the active and inactive stations not at all times be aligned with the axis  $x-x$  but will assume various degrees of inclination relative thereto.

Sealing means are provided for closing the open ends 36 and 37 of the conduit 33. The sealing means include a stopper 39 that projects upwardly from the bottom section 23 of the well 21 and that engages in the sealing position (FIG. 2) the open end 37 of the lower conduit portion 34.

The open end 36 of the upper conduit portion 32, on the other hand, is surrounded by a lip 43 that, as best shown in FIG. 2, is parallel to the axis  $x-x$ , but may if desired, be inclined at an angle thereto. The body member 14 has a matching surface 42. In the closed position (FIG. 2), the lip 41 engages the surface 42, and this engagement contact is arranged with a sufficient amount of pressure to provide for sealing between the lip 41 and the surface 42. The surface 42 has an upper edge 43. As the toggle bar is lowered to the inactive position, the edge of the lip 41 will brush past the edge 43, the latter acting to wipe off the lip 41 any excess fluid that may have adhered thereto.

The operation of the above described closure is as follows. The container 11 is filled with a flowable material. To dispense the material, the operator will depress the lever arm 29 from the position of FIGS. 1 and 2 into the position of FIG. 3. During this movement, the dispensing arm 31 will be raised, thereby will pull upwardly the lower

conduit portion 34 and the sealing means 38. Thereupon, the material from the interior of the container 11 may be forced into the interior of the well 21, as shown by arrows 44. The forcing can be by shaking, by squeezing where the container 11 is squeezable, or by tilting the container 11 sufficiently to force the material to flow into the well 21 by gravity. From the inside of the well 21, the fluid may be dispensed through the conduit 33, for instance by gravity or by shaking, to the exterior as indicated by the arrows 46.

To close the dispenser closure 12, the operator will press downwardly on the dispensing arm 31. Alternatively, a spring may be provided, urging the lever 27 to be returned into the inactive position of FIG. 2. As the lever 27 returns about the pivot 28 to the inactive position (in a clockwise direction, FIGS. 2 and 3) the lip 41 will brush the edge 43 so that any excess of the fluid adhering to the lip 41, will be wiped off the lip 41. The spheroid sealing means 38, on the other hand, during this return movement will pump any excess material from the well 21 through the apertures 24 back into the container 11.

In the modified form of the invention illustrated in FIGS. 5, 6, 7 and 8 of the accompanying drawings, the closure cap 12a again is of conventional circular configuration with an externally ribbed and internally threaded skirt 14a to be secured on the externally threaded neck of a container. The lid portion 18a of the cap is formed to define an upwardly opening channel 26a extending diametrically thereacross and closed at one end by a marginal lip or sealing abutment 42a, as in the preceding embodiment. The lower face of lid 18a is adapted to close the upper end of the container neck.

Disposed for angular movement within this channel 26a, in a plane normal to that of the lid portion 18a, is the rigid unitarily formed integral lever 27a provided with trunnions in the form of rounded protuberances or bosses 28a (in FIG. 7), adapted for reception in opposed sockets in the respective channel walls. In the form here shown, it is contemplated that the lever 27a may be substantially rigid and the cap 120 will be formed of suitable plastic material having sufficient resiliency that in order to assemble the lever within the cap channel, the lever is forced into the channel to compress the hemispherical trunnions 28a toward each other until they are moved into registry with the recesses and automatically project themselves outwardly or, in other words, are snap-fitted into the respective recesses or sockets in the channel walls. The resiliency of the cap material also permits the necessary flexing and/or distortion of the container outlet duct 22a as hereinafter described.

When thus assembled, the lever is fulcrumed on the cap by means of the trunnions 28a for angular movement in a plane normal to the lid portion 18a of the cap and between a predetermined sealing position (shown in FIG. 5), in which it is wholly within the channel 26a flush with the upper surface of the cap, and a predetermined dispensing position as shown in broken lines in FIG. 7, in which one arm 29a of the lever is depressed into the channel, and the other arm 31a of the lever is raised from the channel to project above the sealing lip or abutment 42a at the closed end of the channel.

As shown in FIG. 7, the two arms 29a, 31a of the lever are in substantial alignment on opposite sides of its fulcrum 28a which is at the juncture of these arms. The arm 31a adjacent to the lip or sealing abutment 42a constitutes a discharge spout for the closure and for this purpose has a discharge passage 32a opening through its outer end at a location adjacent to the sealing abutment 42a. It will be noted that the sealing abutment 42a is located contiguously to the path of angular movement of the spout arm 31a so as to cover and seal the end of its discharge opening 32a when the lever is in its predetermined sealed position, with the spout defining arm 31a depressed into the channel 26a. However, when the lever is moved angularly to its dispensing position to elevate

the spout defining arm 31a upwardly out of the channel 26a, its discharge passage 32a will be uncovered to direct the discharged material outwardly over the top edge 43a of the sealing lip or abutment 32a.

The other or actuating arm 29a of the lever preferably extends to the adjacent end of the channel and, in the sealed position, is spaced above the floor of the channel 26a so that downward finger pressure may be employed to swing the lever 27a to its dispensing position with the spout defining arm 31a thereof raised out of the channel. To facilitate the application of finger pressure to the actuating arm, the cap preferably is formed with a rounded recess 26b, as best shown in FIGS. 5 and 6, merging with the open end portion of the channel 26a.

However, if desired, and as shown in FIG. 6, the outer end of the recess 26b may be closed by a wall 44b having its upper edge in the same plane as the cap surface 18a, to facilitate stacking of the containers without risk of accidentally tilting their levers. The inner end of the discharge passage 32a opens through the lower face portion of the spout defining arm 31a to define an intake duct 37a which is directed toward the lid portion and spaced from the lever fulcrum at a location between the fulcrum and the end of the arm 31a for movement toward and away from the lid portion 18a in response to swinging of the lever.

Extending upwardly into the channel 26a from the lid portion 18a is a container discharge tube 22a, defining a container outlet duct, the inner end of which is adapted to communicate with the interior of the container to which the closure cap is applied. The exterior end of this tube 22a extends in the plane of angular movement of the spout defining arm 31a and is slidably disposed through the intake opening or duct 37a of the nozzle defining arm, generally tangentially to the direction of angular movement thereof to establish a substantially fluid tight telescoping coupling between the container and the arm. To provide a flexible connection between the duct 37a and lid portion 18a, the duct extends with substantial clearance through a central opening 38a in the lid portion. An enlarged diameter upturned cuff 39a on the duct is integrally connected both to the duct and to the lid 18a.

For closing the exterior end of the tube 22a in the sealing position of the lever 27a, the lever arm 31a is provided within its discharge passage with suitable sealing means positioned for angular movement with the spout defining arm into and from sealing engagement with the exterior end of the tube. While such sealing means may assume various forms, it is here exemplified by a depending plug or stopper 390 formed integrally with the lever.

In the operation of this embodiment of the invention, when the lever 27a is in its predetermined sealing position, the sealing means or stopper 390 (FIG. 7) within the spout discharge passage 32a is inserted in the upper end of the container discharge tube 22a to effectually close same while, at the same time, the outer or discharge end of the spout defining arm 31a is in end-wise sealing engagement with the sealing abutment or lip 42a which thus closes and substantially seals the discharge passage 32a at the end of this arm. When the lever is swung to its dispensing position by downward finger pressure on the actuating arm 29a thereof, its spout defining arm 31a is raised out of the recess or channel 26a to position the end of discharge passage 32a above the sealing lip 42a of the cap, while, at the same time, the sealing means or stopper 390 within the discharge passage is removed or unseated from the end of the container discharge tube 22a to permit outward flow of material into and through the discharge passage.

Return of the lever 27a to its sealed position may be achieved by finger pressure on the spout defining arm 29a of the lever to urge the same back into the channel 26a and to thus bring the open end of the spout defining arm 31a and the exterior end of the tube 22a into sealing

engagement with the sealing lip or abutment 42a and the plug 390, respectively.

By virtue of the flexibility of the container discharge tube 22a, the same will be sealingly received within the intake duct 37a of the spout discharge passage 32a throughout the angular movement of the lever, and even though the arc of such movement is about a comparatively short radius. It will be understood that such flexing of the discharge tube may involve not only bending or curving in the direction of its length, but also may involve a local distortion of the cross-sectional shape of the tube from its normal circular shape to a generally elliptical shape. Such elliptical shape may result because of the fact that the angular movement of the lever will position the periphery of the intake opening 37a at times in other than a radial plane with respect to the discharge tube.

In the embodiment of the invention illustrated in FIGS. 9 and 10, the construction and arrangement are generally similar to those of the immediately preceding embodiment, except that the telescopically associated portions of the tube 22b and the intake opening 37b are both concentrically curved around the axis of angular movement of the lever 27b defined by the trunnions 28b.

With this arrangement, the telescopic interconnection thus defined will remain fluid tight throughout the entire range of angular movement of the lever.

In the preferred embodiment of the invention illustrated in FIGS. 11 to 15 of the accompanying drawings, the closure cap 120 again has a threaded skirt 140 to be secured on the externally threaded neck of a container. The lid portion 180 of the cap is formed to define an upwardly opening channel 260 extending diametrically thereacross and closed at one end by a marginal lip or sealing abutment 420. A lever positioning lip or projection 421 is at the other end of the channel.

Disposed for angular movement within this channel, in a plane normal to that of the lid portion 180, is the unitarily formed integral lever 270 (illustrated per se in FIG. 15) provided with trunnions in the form of rounded protuberances or bosses 280, adapted for reception in opposed sockets in the respective channel walls. In the form here shown, it is contemplated that the lever 270 and/or the cap 120 will be formed of suitable plastic material having sufficient resiliency that in order to assemble the lever within the cap channel, the lever is forced into the channel to move the hemispherical trunnions 280 into registry with the recesses so that they may be snap-fitted into the respective recesses or sockets in the channel walls. To facilitate such assembly of the lever and cap, the cap may be formed on opposite sides of the channel 260 with guide notches 261, extending toward the recesses, to cam the trunnions 280 into the recesses.

When thus assembled, the lever is fulcrumed on the cap by means of the trunnions 280 for angular movement in a plane normal to the lid portion 180 of the cap and between a predetermined sealing position in which it is wholly within the channel 260 flush with the upper surface of the cap, as in FIG. 11, and a predetermined dispensing position in which the actuating arm 290 of the lever is depressed into the channel, as in FIG. 12, and the dispensing or spout defining arm 310 of the lever is raised from the channel to project above the sealing lip or abutment 420 at one closed end of the channel.

The two arms 290, 310 of the lever are in substantial alignment on opposite sides of its fulcrum 280, which is at the juncture of these arms. The arm 310 adjacent to the lip or sealing abutment 420 constitutes a discharge spout for the closure and for this purpose has a discharge passage 320 opening through its outer end toward the sealing abutment 420. An antidrip rib 322 is disposed across the lower portion of the passage 320 near its outlet end. It will be noted that the sealing abutment 420 is located contiguously to the path of angular movement

of the spout arm 310 so as to cover and seal the end of its discharge passage 320 when the lever is in its predetermined sealing position, with the spout defining arm 310 depressed into the channel 260, all as shown in FIGS. 11 and 13. However, when the lever is moved angularly to its dispensing position (shown in FIGS. 12 and 14) to elevate the spout defining arm 310 upwardly out of the channel 260, its discharge passage 320 will be uncovered to direct the discharged material outwardly over the top edge 430 of the sealing lip or abutment 420.

The other or actuating arm 290 of the lever preferably extends to the adjacent end of the channel and, in the sealed position, is spaced above the floor 180 of the channel 260 so that downward finger pressure may be employed to swing the lever 270 to its dispensing position with the spout defining arm 310 thereof raised out of the channel 260. To facilitate the application of finger pressure to the actuating arm, the cap preferably is formed with a rounded recess 265 merging with the channel 260.

A positioning stop 425 on the lip 420 is located to abut against the discharge spout or spile 310 to prevent angular movement of the latter beyond its sealing position.

The inner end of the discharge passage 320 opens through the lower face portion of the spout defining arm 310 in the manner shown in FIG. 15, to define an intake duct 370 which is directed toward the lid portion and spaced from the lever fulcrum 280 at a location between the fulcrum and the end of the arm 310, for movement and away from the lid portion 180 in response to swinging of the lever.

Projecting upwardly from the lid portion 180 is a container discharge tube 220 (best shown in FIGS. 13 and 14), defining a container outlet duct, the inner end of which communicates with the interior of the container to which the closure cap is applied. This tube 220 extends in the plane of angular movement of the spout defining arm 310 and is slidably disposed through the intake opening or duct 370 of the nozzle defining arm, generally tangentially to the direction of angular movement thereof to establish a telescoping coupling between the container and the arm.

To facilitate the initial assembly of the parts, the lever is formed on one side of the opening 270 with a projection 375 which flares downwardly and cooperates with the downwardly flaring surface portion 376 to define a funnel or guide.

In the embodiment of FIGS. 12 to 15, the container discharge tube or duct 220 is of circular exterior cross section, and its free upper end is telescopically received in the intake opening 370 to the discharge passage 320 of the lever.

That surface portion 376 of the intake opening adjacent the lever fulcrum 280 is of compound curvature, being of semi-circular configuration, concentrically and of similar radius to the duct 220, and also being curved concentrically to the fulcrum or axis of pivotal movement 280 of the lever.

Manifestly therefore, this surface portion 376 will be in snug sealing engagement with the duct 220 throughout the angular movement of the lever, and will reinforce the free end of the lever against bending or deflecting under the pressure exerted by the opposing semicircular surface portion 375 of the lever around opening 370.

In the sealing position of the lever 270, as in FIG. 13, the semi-circular surface portion 375 which defines the other half of the opening 370, is curved concentrically to the duct exterior, and about a similar radius, so that it sealingly engages the duct. Therefore, in the sealing position of the lever, the complementary semi-circular surfaces 375 and 376 together completely encircle and sealingly engage the duct 220.

In the open or dispensing position of the lever 270, as in FIGURE 14, upward swinging of the lever will have caused the surface portion 376 to approach slightly

toward the longitudinal axis of the duct 220 to thus compress the free end of the duct diametrically between the opposed surface portions 375 and 376.

Its abutting engagement with the surface 376 will prevent any significant lateral flexing or bending of the duct, while its free end portion and/or the peripheral surface portion 376 are subjected to sufficient resilient deformation to achieve a substantially effective sealing engagement with each other.

For closing the exterior end of the tube 220 in the sealing position of the lever 270, the lever arm 310 is provided within its discharge passage with suitable sealing means positioned for angular movement with the spout defining arm into and from sealing engagement with the exterior end of the tube. While such sealing means may assume various forms, it is here exemplified by a depending plug or stopper 390 formed integrally with the lever.

For retaining the lever 310 either in its sealing or its dispensing position, the free outer end of the lever actuating arm 290 is provided with a detent 295 (FIGS. 13 and 14), having sloping surfaces 296 and 297 converging outwardly to its apex 298, at equal acute angles to a radial plane of the lever with respect to its axis of angular movement.

The surface 296 is arranged for flush engagement with the lip 421 in the dispensing position of the lever, and the surface 297 is arranged for flush engagement with the lip 421 in the sealing position of the lever 310. In order to move from one position to the other, the lever must pass through a dead center position in which the apex 298 of the detent thrusts against and deflects the lip 420 outwardly. The cap is formed of sufficiently resilient material that the lip 421 yields outwardly under the radial pressure exerted by the detent, and functions as a spring to urge the lever toward one position or the other after it has passed dead center position in either direction. The lever is thus afforded a resilient snap action which assures its full movement to and retention in either its sealed or dispensing positions.

If desired, a conventional overcap may be removably applied over the closure cap both for the purpose of discouraging unauthorized dispensing of the contents of a container equipped with the closure of the invention, when such container is on display for merchandising purposes and for permitting stacking of the containers. The overcap 299 illustrated in FIG. 13, comprises a skirt portion surrounding and conforming in cross sectional shape to the upper portion of the cap. The flat top wall of the overcap 299 rests on the flat upper surface of the closure cap and extends across the rounded depression 265 to support other containers and to discourage actuation of the lever.

In the operation of this embodiment of the invention, when the lever 270 is in its predetermined sealing position, the sealing means or stopper 390 within the spout discharge passage 320 is inserted in the upper end of the container discharge tube 220 to effectually close same while, at the same time, the outer or discharge end of the spout defining arm is in endwise sealing engagement with the sealing abutment or lip 420 which thus closes and substantially seals the discharge opening 360 at the end of this arm. When the lever is swung to its dispensing position by downward finger pressure on the actuating arm 290 thereof, its spout defining arm 310 is raised out of the recess or channel 260 to position the discharge opening 320 above the sealing lip 420 of the cap, while, at the same time, the sealing means or stopper 390 within the discharge passage is removed from the end of the container discharge tube 220 to permit outward flow of material into and through the discharge passage.

Return of the lever 270 to its sealed position may be achieved by finger pressure on the spout defining arm 290 of the lever to urge the same back into the channel 260 and to thus bring both the discharge end of the spout 310 and the exterior end of the tube 220 into sealing engage-

ment with the sealing lip or abutment 420 and the plug 390, respectively.

In each of the embodiments of the invention, it will be apparent that after movement of the lever to its dispensing position, dispensing of the container contents normally will be achieved by tilting the container so that its contents tend to flow by gravity toward its discharge end.

It will be readily understood, however, that the invention, in each of its forms, may readily be adapted for use in upright position on a flexible walled squeeze type plastic container, by the addition of a conventional dip tube extending from the intake end of the container outlet tube to a location adjacent the bottom of the container.

Having thus described my invention, I claim:

1. A closure for use on a container of flowable material, comprising: a closure cap for mounting on said container and having a lid portion to close the container; a rigid unitary lever having a spout defining arm fulcrumed on the cap for angular movement in a plane normal to said lid portion between predetermined sealing and dispensing positions in which said spout defining arm is swung toward and away from said lid portion respectively; said arm defining a discharge passage which opens through the end of said arm remote from said fulcrum; said arm being formed with means defining an intake duct opening from its discharge passage toward said lid portion at a location between said end and the fulcrum; said cap including means defining an outlet duct opening from the container toward said arm, said duct defining means of the arm and cap respectively being telescopically interconnected to form a coupling between said means and mutually conformed to render said coupling fluid tight in the dispensing position of said arm; cooperating sealing means carried by said arm and said cap respectively for closing one of said ducts in the sealing position of said arm, and a sealing abutment on said cap contiguous to the path of movement of said arm to seal said discharge passage at the end of the arm.

2. A closure as defined in claim 1, in which said lever comprises an actuating arm substantially aligned with said spout defining arm, said fulcrum being at the juncture of said arms.

3. A closure as defined in claim 2, in which said cap is formed with an upwardly presented diametrical channel, said lever being fulcrumed in said channel, with its upper face flush with that of the cap in the sealing position of said lever, said sealing abutment extending across one end of the channel, said actuating arm being spaced from the bottom of the channel in said sealing position of the lever.

4. A closure as defined in claim 1, in which one of said duct defining means is sufficiently flexible to maintain sealing relation with the other said duct defining means throughout the angular movement of the lever.

5. A closure as defined in claim 2, in which one of said telescopically interconnected duct defining means comprises a flexible tube which is slidably disposed in the duct defined by the other of said telescopically interconnected duct defining means.

6. A closure as defined in claim 1 in which said duct defining means of the cap comprises a discharge tube extending in the plane of angular movement of the spout defining arm, said tube being snugly slidably received in said intake opening of the arm.

7. A closure as defined in claim 6, in which said discharge tube is sufficiently flexible to maintain sealing relation with said spout defining arm throughout the angular movement of the latter.

8. A closure as defined in claim 6, in which said tube is resiliently deformable in cross-section to maintain sealing relation with the said duct of the spout defining arm throughout angular movement of the spout defining arm.



9. A closure as defined in claim 1, in which one of said duct defining means comprises a discharge tube curved concentrically to said fulcrum.

10. A closure as defined in claim 9, in which said curved discharge tube is carried by the cap.

11. A closure as defined in claim 1, wherein said outlet duct is elongated and is telescopically received in said intake duct of the lever, said intake duct being conjointly defined by opposed semi-circular surface portions of the lever of different configurations on the sides thereof adjacent and remote from the said fulcrum respectively, said surface portion adjacent the fulcrum being conformed concentrically both to the fulcrum and to the outlet duct for sealing engagement with said outlet duct throughout the angular movement of the lever, and said surface portion remote from the fulcrum being conformed to sealingly engage said outlet duct at one extremity of the angular movement of said lever.

12. A closure as defined in claim 11, in which said remote surface portion is concentric to and sealingly engages the said outlet duct in the sealing position of said lever.

13. A closure as defined in claim 12 in which said outlet duct is diametrically compressed between said surface portions in the dispensing position of said lever to achieve sealing relation with said portions, while avoiding flexing of said outlet duct.

14. A closure, for use in connection with a container for flowable material, comprising:

a cap adapted to be mounted on said container and comprising a lid portion normally closing said container, means establishing

a well on said lid portion, said well having at least one aperture providing interior intercommunication between the inside of said container and said well,

a toggle bar connected to said cap and being tiltable between opposite extreme active and inactive stations,

a hollow conduit member open at both ends and including an upper conduit portion movable with a part of said toggle bar, and a lower conduit portion intercommunicating with said upper conduit portion and being positioned in said well and movable therein between the upper and lower positions as said part is moved between the active and inactive stations, respectively,

stopper means positioned in said well and connected to said lower conduit portion and being movable therewith and engaging in all positions the interior wall surface of said well thereby sealing it and being operable, when raised, to permit material to flow through said aperture from said container into said well for subsequent discharge of the fluid through said upper conduit portion and, respectively, when lowered, to return through said aperture excess material from said well into the container,

and sealing means operable for sealing said open ends of said conduit when said part is near its inactive station.

15. A closure, as claimed in claim 14, said toggle bar being tiltable about a fulcrum, the open end of said upper conduit portion being connected to said toggle bar at a point spaced from said fulcrum for a distance sufficiently

long to uncover said open end of said upper conduit portion in the active position.

16. A closure, as claimed in claim 14, said toggle bar being a two-armed lever hinged between said arms to said cap, one of said arms forming said part, the other arm being operable to move said part from said inactive to said active station.

17. A closure, as claimed in claim 14, the interior wall surface of said well having the shape substantially of a cylinder about an upright axis, said part being hollow and forming said upper conduit portion, said lower conduit portion being flexibly connected to said part and movable relative thereto between various positions of inclination relative to said toggle bar and also relative to said axis, said stopper means comprising a flexible element having an external shape substantially of a portion of a sphere, whereby said element will be in sealing contact with said interior wall surface of said well in all positions of inclination of said lower conduit portion relative to said axis.

18. A closure, as claimed in claim 17, said element during movement of said lower conduit portion being in sliding engagement with said interior wall surface of said well, said element surrounding the lower end of said lower conduit portion and being integral therewith.

19. A closure, as claimed in claim 14, said sealing means including a sealing pin disposed in said well and engaging the open end of said lower conduit portion near the lowest position thereof.

20. A closure, as claimed in claim 14, said sealing means including a lip formed near the open end of said upper conduit portion, and a surface formed on said cap, said lip making sealing contact with said surface in the inactive station, said surface including an edge, said lip when moving from said active to said inactive station engaging said edge thereby transferring any fluid adhering to the lip onto said edge.

21. A closure, as claimed in claim 14, said cap defining a slot, said toggle bar being positioned in said slot, and hinge means connected to said cap pivoting said toggle bar, said slot being so shaped as to permit tilting movement of said toggle bar.

22. A closure, as claimed in claim 21, said toggle bar being a two-armed lever, one of said arms forming said part, the other arm forming a handle operable when pressed downwardly to raise said part to the active station, said cap having an external depression to provide clearance for a finger of the operator depressing said handle downward.

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