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L. A. MICALLEF

3,371,827

CAPTIVE CLOSURE FOR CONTAINERS WITH TURNABLE RETRACTABLE SPOUT

Filed June 16, 1966

3 Sheets-Sheet 1

Fig 1

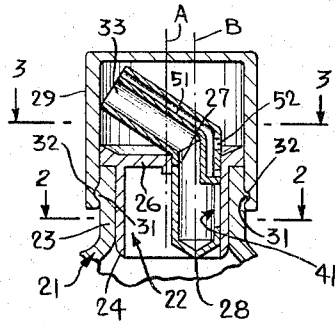


Fig 5

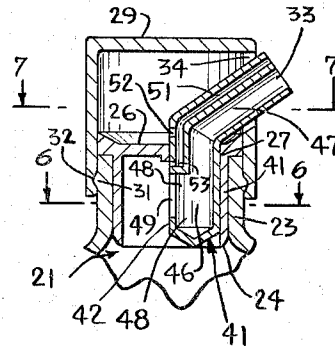
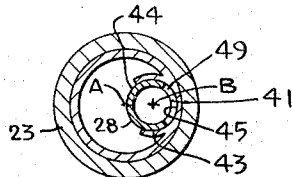


Fig 2

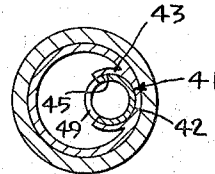


Fig 6

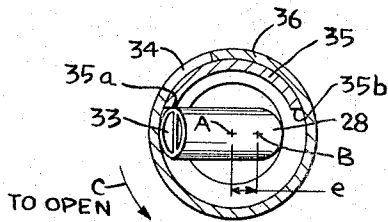


Fig 3

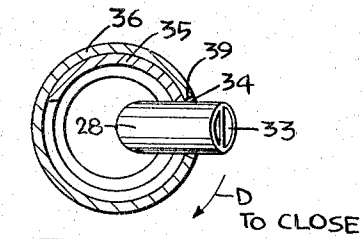


Fig 7

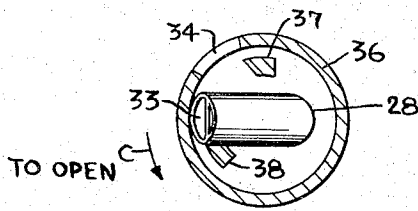


Fig 4

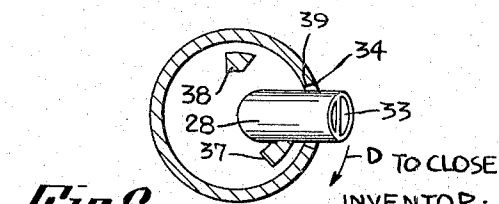


Fig 8

INVENTOR:
LEWIS A. MICALLEF,
BY *Lewis A. Micallef*
HIS ATTORNEY

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L. A. MICALLEF

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3 Sheets-Sheet 2

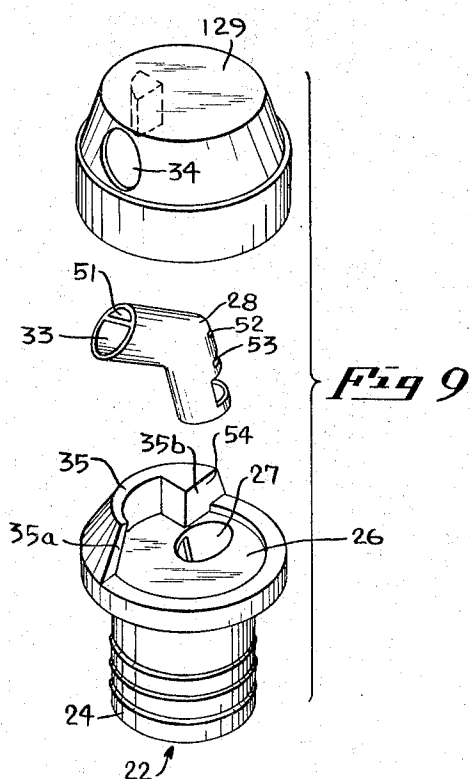


Fig 9

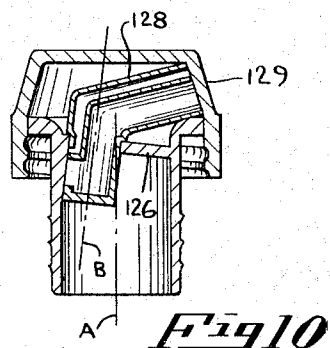


Fig 10

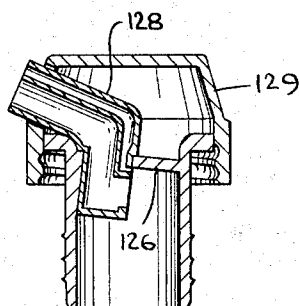


Fig 11

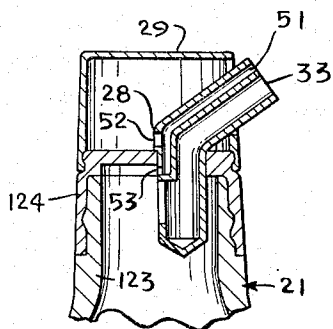


Fig 12

INVENTOR:
LEWIS A. MICALLEF,

BY *Samuel A. Marmorek*
HIS ATTORNEY.

March 5, 1968

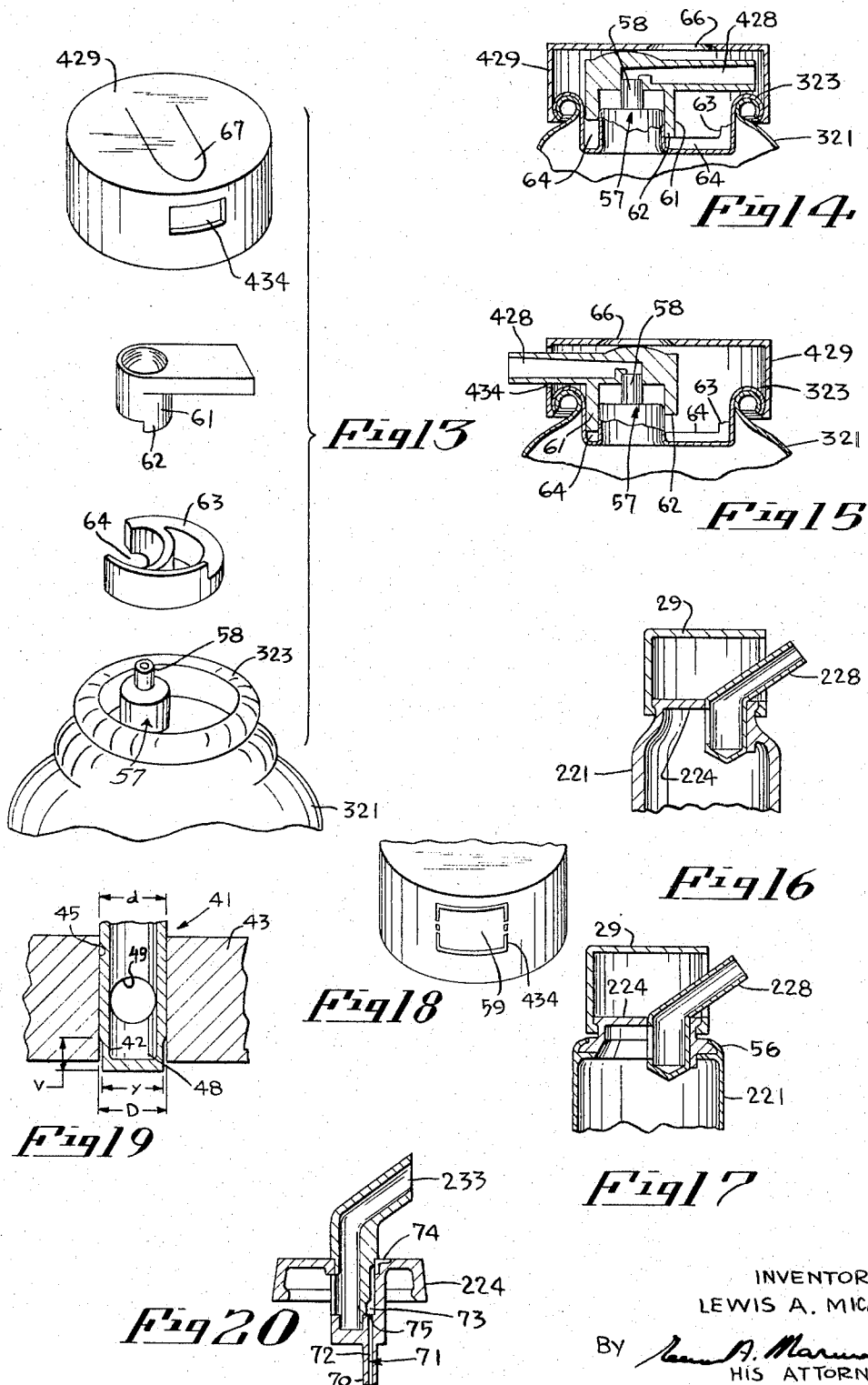
L. A. MICALLEF

3,371,827

CAPTIVE CLOSURE FOR CONTAINERS WITH TURNABLE RETRACTABLE SPOUT

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3 Sheets-Sheet 3



INVENTOR:

LEWIS A. MICALLEF,

By *Lewis A. Micallef*
HIS ATTORNEY

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3,371,827

CAPTIVE CLOSURE FOR CONTAINERS WITH TURNABLE RETRACTABLE SPOUT

Lewis A. Micallef, New York, N.Y., assignor to Leeds & Micallef, New York, N.Y., a partnership of New York
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25 Claims. (Cl. 222—507)

ABSTRACT OF THE DISCLOSURE

A dispensing cap, for a container, includes a rotatable valved spout and a cap and, when the cap is turned in opposite directions, the spout is cam moved to project through and, respectively, to be retracted from, an opening in the cap.

The invention relates to closures for containers, and relates more particularly to closures of the type known as "captive" closures, namely closures that are generally not being removed off the container when it is desired to dispense the contents of the container; more particularly, the invention relates to closures of this type in which there is a spout to facilitate dispensing of liquid of varying viscosities, pastes, powdery, and granular contents; still more particularly, the invention relates to such closures wherein the spout is adapted to be turned to project beyond the cap when ready for dispensing and, respectively, to be retracted within the confines of the cap when the contents are not to be dispensed.

Dispensing caps of this type have been proposed in the past, but these spouts presented difficulties of proper sealing and venting, thereby restricting the use of these spouts, and furthermore they severely limited the quantities of contents that could be poured per time unit. Lastly, these spouts between projected and retracted positions went through an angle of less than 90°.

It is accordingly among the principal objects of the invention to provide a dispensing cap of the type referred to, that avoids the drawbacks of the prior art.

It is another object of the invention to provide a dispensing cap that is sanitary, re-closable, non-removable, air-tight, tamper-proof, and can be manufactured at low cost.

It is still another object of the invention to provide such a dispensing cap which includes a spout that is positively guided by cam and cam follower means making alternatively contact with the opposite side surfaces of the spout, to project and, respectively, to retract the spout during the opposite turning of the cap.

It is a further object of the invention to provide such a spout that is turned between extreme positions of projection and retraction by cam means of the cap and cam follower means of the spout, whereby the spout during turning between the extreme positions turns through an angle larger than 90°.

It is still a further object of the invention to provide such a dispensing cap in which the spout is essentially formed of one piece and extends into the interior of the container.

It is yet another object of the invention to provide the combination with a container and a cap of this type in which the aforesaid aims are realized.

It is yet a further object of the invention to provide a dispensing cap that has valve means with an internal dispensing passage, the valve means including concave and convex matching surfaces for sealing the valve in the closed position.

It is still another object of the invention to provide such a dispensing cap and valve means, the cap being turnable between opposite positions, the valve means being

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operated by cam and cam follower means from the cap between opposite closed and open positions.

Further objects and advantages of the invention will be set forth in part in the following specification and in part will be obvious therefrom without being specifically referred to, the same being realized and attained as pointed out in the claims hereof.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, certain embodiments of the same being illustrated in the accompanying drawings and described in the specification.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary sectional view of a captive closure for containers with retractable turnable spout in accordance with the invention, with the spout within the cap, with the cap closed, and the spout valve in closed position;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is a sectional view similar to FIG. 3, but showing the cam and cam follower operation;

FIG. 5 is a vertical fragmentary sectional view similar to FIG. 1, but showing the parts in open position;

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 5;

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 5;

FIG. 8 is a sectional view similar to FIG. 7, but showing the cam and cam follower action, in open position as contrasted to the closed position of FIG. 4;

FIG. 9 is an extended view in perspective, showing the parts similar to those of FIGS. 1—8, but embodying a modification;

FIG. 10 is a vertical sectional view of the modification of FIG. 9, showing the parts in closed position;

FIG. 11 is a sectional view similar to FIG. 10, but showing the parts in open position;

FIG. 12 is a fragmentary sectional view similar to FIG. 5, but embodying a modification;

FIG. 13 is an extended view in perspective embodying a further modification;

FIG. 14 is a fragmentary vertical sectional view showing parts of the modification of FIG. 13 in closed, non-operative position;

FIG. 15 is a fragmentary vertical sectional view similar to FIG. 14, but showing the parts in open, operative position;

FIG. 16 is a fragmentary sectional view similar to FIGS. 5 and 12, but embodying a further modification;

FIG. 17 is a fragmentary vertical sectional view similar to FIG. 16, but embodying a still further modification;

FIG. 18 is a fragmentary perspective view embodying a further modification;

FIG. 19 is a large scale fragmentary sectional view of a valve embodying a still further modification; and

FIG. 20 is a fragmentary large scale sectional view of another modification.

In carrying the invention into effect in the embodiments which have been selected for illustration in the accompanying drawings and for description in this specification, and referring now particularly to FIGS. 1—8, there is provided a container generally indicated at 21. The container 21 may be a bottle such as for instance a bottle for holding liquids, powdery, paste, or the like made of

rigid or flexible material, for instance glass or metal or plastic or similar material; or it may be a tube, for holding liquids, powdery, paste, or the like made either of plastic, or of thin metal, or the like, or any other container of this or a similar type. In all the embodiments shown, except FIG. 16, all of the closure parts are separate from the container 21. In FIG. 16, however, the base or partition of the closure part is made in one piece integrally with the container.

Returning now to the description of the embodiment of FIGS. 1-8, the closure which is generally indicated at 22 is mounted on a portion of the container 21 which are designated receiving means 23. In the case of FIGS. 1-8, the receiving means 23 are formed by the very neck of the container bottle 21.

The closure comprises a plug 24 that is mounted on the receiving means 23. As shown in FIGS. 1-8, the plug 24 may be disposed inside the receiving means 23; as indicated in FIG. 12, however, the plug 24 may instead be disposed externally of the receiving means 123.

As shown in FIG. 17, it may be in rolled-on connection; and as shown in FIG. 16, it may be integrally therewith.

As previously mentioned, the plug 24 (see FIGS. 1-8) has a base member or partition 26 across the container 21 and, except for an aperture 27, closes it.

A spout or dispenser 28 is journaled for rotation in the partition 26 to rotate with relation to the container 21. The spout 28 rotates about an axis B (FIG. 1). As best shown in FIGS. 1-8, the spout 28 can rotate throughout about 180 degrees between the closed position shown in FIG. 1, and the open position shown in FIG. 5.

A cap 29 is provided that is rotatable relative to the container 21 about an axis A, which is off-set from the aforementioned axis B of rotation of the spout 28. In the embodiment shown in FIGS. 1-8, the axis A and B are substantially parallel to each other, while for instance in the modifications shown in FIGS. 10 and 11, the axes A and B are at an angle relative to each other.

The cap 29 may be journaled either on the receiving means 23, as shown in FIG. 1, or for instance, on the plug 124 as shown in FIG. 12, or as shown in FIG. 16.

Generally, the axis A of the cap 29 will substantially coincide with the axis of the topmost portion, such as the receiving means 23, of the container 21, while the axis B of the spout 28 is off-set therefrom. As best shown in FIGS. 1 and 5, the receiving means 23 and the cap 29 may be provided with means for promoting not only the turning of the cap 29 of the container 21, but also for retaining the cap 29 on the container 21, at least as long as no force of a predetermined value for removal is applied. In the embodiment of FIG. 1, this is shown by a ridge 31 that is formed on the receiving means 23 and a corresponding recess 32 in the cap 29 that matches the ridge 31. An arrangement of this type permits to snap on the cap 29 onto the container 21. In fact, the closure 22 may be so arranged that the entire closure may thus be snapped onto the container 21.

As best shown in FIGS. 1 and 5, the free end 33 of the spout 28 in the closed position (FIG. 1) is entirely surrounded and shielded by the cap 29, while in the open position (FIG. 5), the free end 33 is uncovered and projects to the exterior of the cap 29. The cap 29 is provided in its wall 36 with a lateral opening 34 (see FIG. 3) which is arranged substantially peripherally on the cap, for instance as shown in perspective in FIG. 9. As the cap 29 is turned from the closed position (FIG. 3) to the open position (FIG. 7), the opening 34 will change its position. In the open position (FIG. 7), the opening 34 is so positioned that the spout 28 will project therethrough to the exterior. In the closed position (FIG. 3), on the other hand, the opening 34 is so positioned that the spout 28 is concealed from the exterior.

To the base member 26, as best shown in FIG. 3, there is mounted immovably therewith a shield 35, one

purpose of which is to close the cap throughout its periphery in the closed position (FIG. 3). Another purpose of the shield 35 is to provide positive stopping means 35a and 35b, respectively, for the spout 28 in both open and closed positions.

To open, the operator will turn the cap 29 in the direction C (counterclockwise, FIG. 3). Cam and cam follower means are provided between the cap 29 and the spout 28 to turn the spout 28. An opening cam 37 (FIG. 4) is provided that will make contact with one side of the spout 28 after the cap 29 has been turned for a certain angle through a lost motion interval into the direction C, and will thereafter take along in the direction C the spout 28 until the spout 28 reaches the open or projecting position shown in FIG. 8. The aforesaid lost motion angle corresponds to the angular extent of the opening 34 that in the closed position is shielded by the shield 35. Thus, when the opening cam 37 makes contact with the one side of the spout 28, the opening 34 will be positioned substantially in radial alignment with the free end 33 of the spout 28, thereby permitting the spout 28 gradually to project through the opening 34, until it attains the open position shown in FIG. 8.

In the embodiment of FIGS. 1-8, the axis B of the spout 28 is eccentric relative to the axis A of the cap 29 for a distance e (FIG. 3). Due to this eccentricity, when the cap 29 is turned in the direction C, the spout 28 will project through the opening 34 increasingly radially outwardly beyond the confines of the cap 29, until it reaches the open position shown in FIG. 8 of maximum outward radial projection.

For closing, a somewhat different procedure takes place. To close, the operator will turn the cap 29 in the opposite direction, namely in the direction D (FIG. 8). During this turning, an edge portion 39 of the opening 34 of the cap 29 will make contact with the opposite side of the spout 28, and thus will act as a cam, with the said opposite side of the spout 28 acting as a cam follower. Due to this cam and cam follower contact action, the spout 28 will be turned about its axis B in the clockwise direction, similarly to the clockwise turning in direction D of the cap 29 (FIG. 8). This turning action continues until the free end 33 of the spout 28 has been withdrawn from the opening 34. In order to make sure that the spout 28 will be positioned at the place at which it is most withdrawn from the cap 29, namely that in which it is for about 180 degrees opposite the open position in FIG. 8, and is positioned positively in closed position, as shown in FIG. 4, there is provided a closing cam 38 that after a certain lost motion angular interval will make contact with the spout 28, as shown in FIG. 4, and place it in the closed position shown in FIG. 4.

A wall portion 35 is formed on the shield 36 that is disposed inside the cap 29. The wall portion 35 has an edge 35a (see FIGS. 3, 9) with which in the closed position the opposite side of the spout 28 makes contact. The closing cam 38 passes the spout 28 into engagement with the edge 35a in the closed position, in order to position and to lock the spout 28 positively in that position. In that closed position, as shown in FIG. 3, the opening 34 will again be sealed by the shield 36.

As best shown in FIGS. 1, 2, 5 and 6, valve means 41 are provided. They comprise a valve member 42 that is formed on the spout 28, and a valve seat 43 (FIG. 2) that is formed on the base member 26. The valve 41 is disposed inside the container 21, and provides for closable intercommunication between the interior of the container 21 and the exterior. The valve seat 43 includes a concave surface that, as shown in FIG. 2, preferably forms the periphery of a circle; and the valve member 42 includes a convex surface 44 that matches the concave surface of the valve seat 43 and forms therewith a seal in the closed valve position.

FIG. 19 is a large scale sectional view showing a fragment of the valve 41; it shows the valve member 42 and

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the valve seat 43. The purpose of FIG. 19 is to explain and to show unusual tolerances in connection with this type valve. The valve seat 43 has an internal passage 45. The passage 45 in the seat 43 may be a complete cylinder with the necessary discharge opening or, as shown in FIGS. 2 and 6, form a portion of a cylinder.

The valve member 42 has a diameter d throughout the major portion of its engagement in the passage 45 of the valve seat 43, while the valve seat 43 has the passage 45 with a diameter D . The relationship between these diameters is such that the diameter d of the valve member 42 before its insertion into the passage 45 is up to about $3\frac{1}{2}\%$ larger than the diameter D of the passage 45 of the valve seat 43. This difference in diameter is sufficiently large to assure a fluid-tight sealing and to assure that within a short time the valve member 42 will relax to a size at which the valve 41 is operable with conventional ease.

Near the lower, closed end, the valve member 42 throughout about a length v has an outside diameter y of decreased size as compared to the outside diameter d . The outside diameter y , however, is a little smaller than the smallest diameter D of the passage 45 of the valve seat 43 within the tolerances of that diameter D as described below.

EXAMPLE

The following example will illustrate the tolerances involved, it being assumed that the nominal width of the passage 45 is one-quarter of one inch; it will be understood, however, that substantially the same tolerances prevail above that size even up to 1 in. or more: the diameter D of the passage 45 of the valve seat 43 has a size of $.250 \pm .003$; the outside diameter d of the valve member 42 will be $.256 \pm .003$; and the outside diameter y will be .246 or less.

As previously stated the valve member 42 has a smaller diameter y near the lower end. The shape throughout most of that area of reduced diameter y is cylindrical, though at a lesser diameter than d .

The material of either the valve member 42 or of the seat may be metal, but both of the parts may not be made of metal. The other part, or both parts, may be made of a suitable plastic such as, for instance, as previously stated, of styrene, polyethylene, or the like.

The cost of maintaining the close tolerances in volume molding necessary to insure a leakproof fit between the parts would be prohibitive and would bring the piece price above acceptable limits. The following method, however, circumvents this difficulty and makes it possible to mold at the greatest commercial speed with only nominal attention to tolerances.

It is based on the fact that a plastic tube made of an elastomeric material, polyethylene for example, tends to relax when forced into a more or less rigid hole after an appropriate time. This phenomenon is known as cold flow and is, in effect, a method of resizing the tube. This means that the tube has permanently reduced its diameter to the proper dimension necessary to operate the valve with ease and to maintain a leakproof fit. It has been determined through experimentation that the diameter of the tube can be up to about $3\frac{1}{2}\%$ greater than that of the hole without affecting the final relation between the two parts. This $3\frac{1}{2}\%$ represents the outer limits of the tolerance ranges of the tube and the hole and is rarely encountered in production. If, in the foregoing example, the diameter of the hole is $.250'' \pm .003$, the smallest diameter the hole could be is .247'', the largest, .253''. This means that the smallest diameter the tube can be is .253'', the lower end of a tolerance of $.256'' \pm .003$ giving a maximum range of .009'' between the smallest diameter of the hole and the largest diameter of the tube. It must be stressed that this range seldom occurs in production and that this system is used to bring the number of units below the rejection rate acceptable to the industry.

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A main passage 46 is formed inside the spout 28 and includes an upper passage portion 47 that leads to the free end 33 and is disposed above the partition 26 and, respectively, a lower passage portion 48 that is disposed below the partition 26. The lower passage portion 48 terminates at an opening 49 which, as shown in FIGS. 5 and 6 in the open position faces the interior of the container 21 and thus is capable of receiving the contents thereof into the passage 48; and in the closed position, as shown in FIGS. 1 and 2, the opening 49 faces the concave surface of the valve seat 43 and is effectively sealed thereby, thus sealing the container 21.

Both the spout 28 and the valve seat 43 preferably are made of plastic material, such as for instance styrene, polyethylene or the like and, owing to their arcuate shape which extends both for the valve member 42 and for the valve seat 43 preferably beyond a semi-circle, permits a sealing due to the inherent resilience of the material, thus promoting an excellent sealing. If desired, these parts made either of the aforesaid or of other materials may additionally purposely be made resilient for promoting a good sealing.

This makes it possible to use wide tolerances in the production of the valve 42 and of the seat 43. These wide tolerances render feasible the economic commercial production of these parts and yet insure a leakproof seal for the life of the assembly.

The cap 29, instead of being of the snap-over type as previously explained, may also be of the normal screw threaded type for use in connection with bottles now in use which have external screw threads. One of the purposes of that construction is to make the bottle non-refillable, the closure non-removable. Furthermore, it will be noted that the instant captive closure heretofore described, as well as the one described below, are usable with rigid as well as with flexible and all other type containers 21.

As best shown in FIGS. 1 and 5, the spout 28 has an air relief passage or smaller chamber 51. The passage 51 has an opening 52 above the partition 26, and an aperture 53 below the partition 26. As best shown in FIG. 1, the opening 52 will never be closed, while in the closed valve position, the aperture 53 will be sealed. The air relief passage 51 serves to facilitate the pouring of liquids from the container 21, particularly if the container 21 is rigid. The opening 52, however, is not closed in either valve position. It serves to drain back, when the valve is opened, any liquid that may have been retained in the air relief passage 51 by capillary action.

When the container 21 is flexible, however, the air relief passage 51 may be dispensed with, as the squeezing pressure applied externally to the container will force the contents out through the spout, without need for air relief during the discharge of the contents. After the squeezing ceases, air will enter into the interior of the container 21 through the passage 46 of the spout 28.

As best shown in FIG. 9, the cap 129 there is shown partially conical and a reinforcement 54 is formed as a part of the wall portion 35. As previously explained, in connection with the preceding embodiment, the closing cam function is initiated by the edge portion 39 of the opening 34 of the cap; and the closing cam 38 has but a subsidiary function. In the embodiment shown in FIGS. 9-11, the closing cam 38 has not been shown; as it is merely auxiliary, it may if desired be dispensed with without causing any appreciable disadvantage.

In the embodiment shown in FIGS. 9-11, the partition 126 is inclined. Accordingly, the axis B of the spout 128 is inclined for an angle, so that the axes A and B are off-set angularly from each other. As a result of this arrangement, the free end of the spout 128 has in the closed position (FIG. 10) an elevation angle of about 15 degrees, whereas in the open position (FIG. 11) it has an elevation angle of about 25 degrees. Most of the details of the valve of FIGS. 1-8 are similar to those of FIGS. 9-11. The cap 129, however, includes an upper

tapered portion, and includes an internal thread for application to a standard threaded bottle.

As previously mentioned, and as shown in FIG. 12, the plug 124 may be mounted externally of the receiving means 123 of the container 21. All the other features of the cap 29 and the spout 28 are similar to those shown in FIGS. 1-8, and are not repeated here.

As shown in FIG. 16, the spout 228 is shown as a part of a captive closure for tubes. These tubes may be metallic or plastic. When metallic, the metal may be rolled over, as shown at 56 in FIG. 16.

When the tube is plastic, the plug 224 may be molded integrally with the tube 221. As previously mentioned, when the container 221 is made of non-rigid plastic, the spout 228 may be without air relief passage.

The instant invention is also applicable for use in connection with pressurized containers generally known as "Aerosol" cans. A pressurized container 321 (FIG. 13) is shown which has receiving means 323 of conventional rolled shape. Pressure cans of this type have a valve stanchion with a standard valve. In accordance with the instant invention, however, the stanchion 57 with the standard valve is off-set eccentrically from the center axis of the pressurized container 21. The valve tip is designated 58.

As best shown in FIGS. 14 and 15, the stanchion 57 is surmounted by a spout 428 that may be turned between a closed position (FIG. 14) and an open position (FIG. 15), which positions approximately are 180 degrees angularly apart. A cap 429 is rotatably connected to the receiving means in any suitable conventional manner, for instance as shown in FIGS. 14 and 15, by a snap fit.

In many respects the instant construction is similar to that previously described in connection with FIGS. 1-8. For instance, cam and cam follower means are provided between the cap 429 and the spout 428, to turn the spout when the cap is turned. Again the axes between the cap 429 and the spout 428 are off-set from each other, so that when the cap is turned towards opening, the spout 428 will in the open position (FIG. 15) project through the opening 434 (FIGS. 13 and 15) of the cap 429. Conversely, when the cap is turned towards closure, the spout 428 will be retracted from the opening 434 and will be positioned entirely within the confines of the cap 429.

In connection with all the embodiments of the instant invention, the opening 34 (FIGS. 1-8; 434, FIGS. 13, 15, 18) may originally be closed, at least partially by an integral portion of the cap. For example, perforations or a thinning of the border portions between the cap itself and what will be the opening may be provided, so that before the container is ever used, it is completely closed. Only during the first opening will the free end of the spout knock out from inside that portion, indicated at 59 in FIG. 18, out of the main wall of the cap. This arrangement has the advantage that it is tamper-proof and assures the customer upon even cursory inspection that he is buying a new heretofore unused closure arrangement or closed container.

Returning to the modification of FIGS. 13, 14 and 15, a further feature is provided here to prevent utilizing the pressure can accidentally and, conversely, to make sure that the pressure can can be used only when it is intended to use it. For this purpose, the spout 428 is provided with a special support 61 that has a downwardly protruding shoulder 62. On top of the container 321, there is provided a corresponding take-up support 63 that has a cam and recess 64 that cooperates with the shoulder 62. The shoulder 62 and the cam and recess 64 act as a locking means, to prevent in the closed position (FIG. 14) that the spout 428 may be pressed downwardly and, respectively, to permit such downward pressure in the open position (FIG. 15).

The pressure exerted onto the spout 428, in the open position, is transmitted to the valve 58 and permits the discharge of the contents of the pressurized can. The spout

428 is so constructed (see FIGS. 14, 15) that the contents will be conducted from the valve 58 through the internal passage of the spout 428 to the exterior. In order to exert that pressure to open the valve, the cap 429 may have a hole 66 through which the operator may depress the actuating portion of the spout 429, which is above the stanchion 57 (FIG. 15), when in the open position. It is, however, not necessary to provide an uncovered hole 66; and as shown in FIG. 13, there may instead be provided merely a cut-out 67 to accomplish the same purpose.

In FIG. 20 there is shown a spout 233. It is turnable in a plug 224. Instead of the previously discussed vent 51 (see FIGS. 9, 12), there is provided a vent 71 that is divided into three parts, namely into a part 72 that is bored in a downwardly extending portion 70 of the plug 224 that extends into the interior of the container on which the plug 224 is mounted; furthermore, the vent 71 has a second part 73 that is defined between the plug 224 and the spout 233; and has a third part 74 that is recessed in the top portion of the plug 224. In the pouring position (shown in FIG. 20, which is comparable to FIG. 5), the three vent parts 72, 73 and 74 are in intercommunication, and therefore the vent 71 will be operative. In the closed position of the spout 233, however, in which the spout 233 would be turned for 180° (comparable to FIG. 3), the body of the spout 233 would move the part 73 away from its intercommunication with the parts 72 and 74 of the vent 71, and at the same time would close the top 75 of the vent part 72, and would also close the inner end of the vent part 74, thereby interrupting the continuity of the vent 71 and hence making it inoperative when the turn spout closure is closed.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. A dispensing cap, for use in connection with a container having receiving means, comprising a cap mounted with relation to said receiving means and being rotatable about a first axis relative to said container and having an opening, a spout journaled for rotation with relation to said container about a second axis off-set from said first axis and being operable to establish releasably interior communication with said container, and cam and cam follower means intermediate said cap and spout comprising first and second contact elements positioned in the path of rotation of said spout and being operable to make alternative contact with the opposite side surfaces of said spout when said cap is turned in opposite directions, thereby turning said spout through an angle of more than 90° to project through and, respectively to be retracted from, said opening.

2. A dispensing cap, as claimed in claim 1, said container comprising a check valve movable axially of said second axis and a stanchion projecting upwardly, and cam means between said container and said spout operable for releasing said spout for axial movement in one extreme rotational position of the spout, whereby axial pressure exerted on said spout towards the container will open the valve and thereby establish interior communication between said spout and the container and, respectively, for restraining axial movement of said spout in a second extreme rotational position of said spout at an angle to said first extreme position, thereby to restrain the opening of said valve.

3. A dispensing cap, as claimed in claim 2, said cap having an aperture, said aperture being located in axial alignment with said valve stanchion in said one position of the spout and, respectively, located at a distance therefrom in said other spout position.

4. A dispensing cap, as claimed in claim 1, and a base member substantially immovable relative to said container and forming a closure for the interior of said con-

tainer, said cap surmounting said base member, and said spout being journaled in said base member.

5. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis though in the same plane as said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening.

6. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, and valve means formed inside said container with said projecting portion, and being operable to establish interior intercommunication between said spout and said container in one extreme position of said spout and, respectively, to interrupt said intercommunication in the other extreme position of said spout at an angle to said first extreme position, the valve closure position coinciding with the spout retracting position from the cap opening and, respectively, the valve opening position coinciding with the position wherein the spout projects through the opening in said cap member.

7. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, said spout defining throughout at least a portion of its length two elongated chambers substantially parallel to each other, both extending into the interior of said container and being operable to be opened and closed therein, the larger of said chambers serving to dispense non-gaseous contents of the container, the smaller of said chambers serving as an air-pressure equalizer between the interior and the exterior of said container, for facilitating dispensing.

8. A dispensing cap, as claimed in claim 7, the smaller of said chambers having an opening above and another opening below said base member to drain back when the valve is opened any liquid that may have been retained by capillary action in the small chamber.

9. A dispensing cap, as claimed in claim 5, said receiving means including substantially circular base member engaging means, said first axis of rotation of said cap substantially coinciding with the axis of said base member engaging means, and said second axis of rotation of said spout being eccentric thereof, whereby in one extreme position said spout will be within the confines of said cap and, respectively, in an other extreme position about 180 degrees off-set from said first extreme position, said spout will project through said opening beyond the confines of said cap.

10. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, said second axis of rotation of said spout being inclined relative to said first axis of rotation of said cap and base member, whereby in the projecting position the free end of the spout will form a smaller angle with said second axis than in the retracted position.

11. A dispensing cap, as claimed in claim 5, and a cover portion mounted on said base member and disposed in said cap and being operable to be positioned substantially in registry with said opening in the position of the cap wherein the spout is retracted from said opening, thereby to conceal from view the spout inside the cap.

12. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, said receiving means forming on said container a neck open on top, said base member including a plug portion projecting into the interior of said neck and engaging with its external surface the inner surface of said neck, said cap engaging the exterior of said neck.

13. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, said receiving means comprising a neck on said

container open on top and having an external annular bead, said cap having a corresponding internal annular groove engaging said bead in snap-fit relation, whereby said cap may not be forced off its position on the neck by forces applied to said cap during normal use.

14. A dispensing cap, as claimed in claim 5, said receiving means comprising a neck formed on said container open on top, said base member including a sleeve engaging the exterior of said neck.

15. A dispensing cap, for use in connection with a container having receiving means surrounding a container axis, said dispensing cap comprising a member operable to be connected with relation to said receiving means and including an apertured partition operable for releasably closing said container, and valve means including a valve seat formed on said partition and a spout comprising a valve member revolvably journaled in said aperture and having an internal passage operable when the valve is open to establish communication between the interior and the exterior of the container, said valve member being operable to be turned about an axis substantially parallel with said container axis between two extreme positions of valve closure and valve opening, respectively, said valve member having a lower portion including the termination of said passage and cooperating with said valve seat to close said passage in the valve closing position and respectively, to uncover said passage in the open valve position, whereby in the open valve position the contents of said container may be dispensed through said spout passage to the exterior of said container.

16. A dispensing cap, for use in connection with a container having receiving means, said dispensing cap comprising a member operable to be connected with relation to said receiving means and including an apertured partition operable for releasably closing said container, and valve means including a valve seat formed on said partition and a spout comprising a valve member revolvably journaled in said aperture and having an internal passage operable when the valve is open to establish communication between the interior and the exterior of the container, said valve member being operable to be turned between two extreme positions of valve closure and valve opening, respectively, said valve member having a lower portion including the termination of said passage and cooperating with said valve seat to close said passage in the valve closing position and respectively, to uncover said passage in the open valve position, whereby in the open valve position the contents of said container may be dispensed through said spout passage to the exterior of said container, said valve passage having an upper portion at an angle to the lower portion and extending to the exterior of the dispensing cap for dispensing the contents of the container when the valve is in the open position, said valve seat having a concave surface, said valve member having a convex surface matching and in sealing contact with said concave surface in the valve closing position and, respectively, out of contact with said concave surface in the open valve position, said lower passage portion terminating in said concave surface of said valve member, whereby in the valve closure position said passage will be sealed and, respectively, in the open valve position said valve passage will be unobstructed for dispensing the contents of said container.

17. A dispensing cap, as claimed in claim 1, and protective means connected to said cap normally at least partially closing said opening before the first use of the cap, the connection being sufficiently weak whereby during the first use of the dispensing cap said spout will break the protective means of the cap at said opening.

18. A dispensing cap, for use in connection with a container having receiving means, comprising a housing mounted with relation to said receiving means and including a base member substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and

being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion rotatable with the spout about said second axis and projecting into the interior of the container, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned in opposite directions, thereby to project the spout through and, respectively to retract it from, said opening, and a cover portion mounted on said base member and disposed on said cap and being operable to be positioned substantially in registry with said opening in the position of the cap wherein the spout is retracted from said opening, thereby to conceal from view the spout inside the cap, said cap having an edge, said spout being turnable between two extreme positions namely a position of projection and a closed position, said spout in the closed position making contact at one side with said edge behind said cover, said cam and cam follower means including a first cam operable to engage said one side of the spout to turn it into the projecting position, after a predetermined angular lost motion interval to place during that interval the opening in front of the spout.

19. A dispensing cap, as claimed in claim 18, said cam and cam follower including an edge portion formed on said opening engaging the opposite side of the spout to initiate the spout retraction movement, and a second cam engaging after a certain angular lost motion said opposite side of said spout during spout retraction until the other side of the spout, in the closed position, makes contact with said edge, thereby positively positioning the spout and the cap in the closed position.

20. The combination with a container having receiving means, of a dispensing cap comprising a base member mounted with relation to said receiving means and being substantially immovable relative to said container and forming a closure for the interior of said container, a cap surmounting said base member and being rotatable about a first axis relative to said container and having an opening, a spout journaled in said base member for rotation with relation to said container about a second axis off-set from said first axis, though in the same plane as said first axis and including a portion projecting into the interior of the container and rotating with the spout, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned, thereby to project the spout through and, respectively to retract it from, said opening.

21. The combination claimed in claim 20, and means intermediate said receiving means and said base member operable for connecting said base member to said receiving means.

22. The combination with a container having receiving means and an integral base member forming a closure for the interior of said container and having an aperture, a cap surmounting said base member and being rotatable about a first axis relative to said base member and having an opening, a spout journaled in the aperture of said base member for rotation with relation to said container about a second axis off-set from said first axis and including a portion projecting through said base member into the interior of said container and rotatable with said spout, and cam and cam follower means intermediate said cap and spout operable to rotate and to guide said spout when said cap is turned, thereby to project the spout through and, respectively to retract it from said opening.

23. A valve, comprising a valve seat having a passage and a hollow valve member disposed at least in part in said passage, the major portion of the part of said valve member comprising a tube having a bore constituting at least fifty percent of the cross sectional area of the tube and disposed in said passage having an outside diameter up to about 3½ percent larger than the inside diameter

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of said passage prior to the insertion of said valve member into said passage.

24. A valve, comprising a valve seat passage defining at least a portion of a cylinder, and a hollow valve member comprising a tube having a bore constituting at least fifty percent of the cross sectional area of the tube and disposed in said passage and being therein turnable between open and closed valve positions, said valve member tube having prior to its insertion into said passage a major cylindrical external contour of a major diameter sufficiently small to be pressed into said passage whereby its contour throughout the surface of said passage will be free from distortion and thereby fluid tightly and, respectively, sufficiently large as compared to the diameter of said passage to assure fluid tight sealing after insertion into the passage as said valve member tube after insertion will relax to a size at which the valve will be operable with conventional ease, said valve member having a cylindrical bottom portion of smaller external diameter than said major diameter and smaller than the internal diameter of said passage.

25. A dispenser cap, for use with a container, comprising a plug adapted to be mounted on said container and having a lower portion reaching into the container, a spout mounted on said plug and being turnable between open and closed positions, valve means disposed between said

plug and spout operable for closing the spout in the closed position and opening it for dispensing in the open position, said plug and spout defining a three-part continuous interruptible vent, a first part of said vent extending into said lower portion of said plug and communicating with the interior of the container and a second part adjacent thereto being formed between said plug and spout communicating with the exterior at a point between the ends of said vent, and a third part adjacent thereto establishing communication with the outside at the far end of said vent, and means formed on said plug and spout operable to interconnect said parts in the open position for completing the vent and to separate and seal them off from one another for interruption of the vent in the closed position.

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