

[54] SAFETY CLOSURE

[75] Inventor: Dewey B. Dykes, Ballwin, Mo.

[73] Assignee: Conserv Resources Inc., Ballwin, Mo.

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Primary Examiner—Robert B. Reeves

Assistant Examiner—Joseph J. Rolla

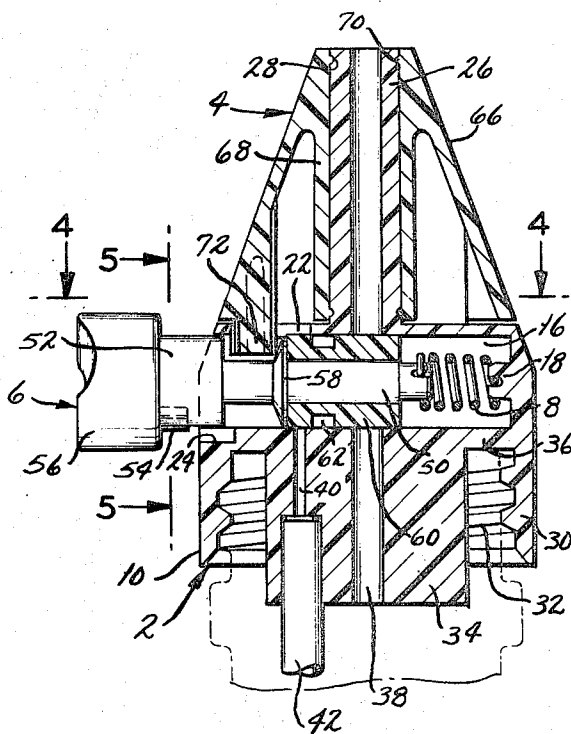
Attorney, Agent, or Firm—Gravely, Lieder & Woodruff

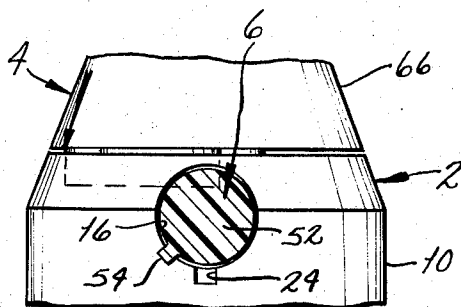
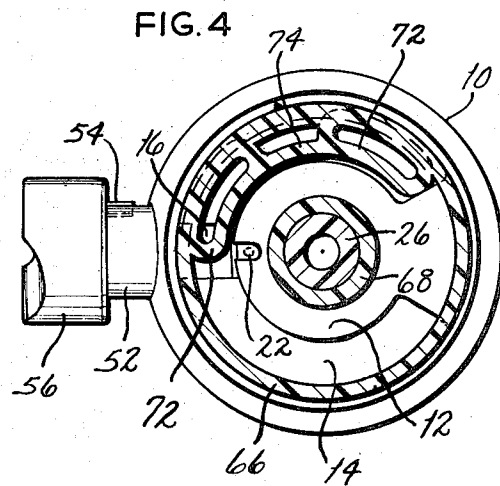
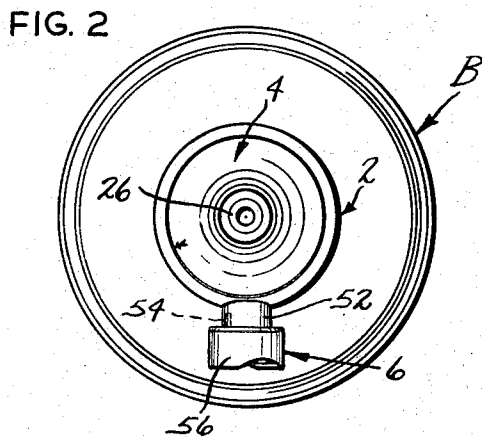
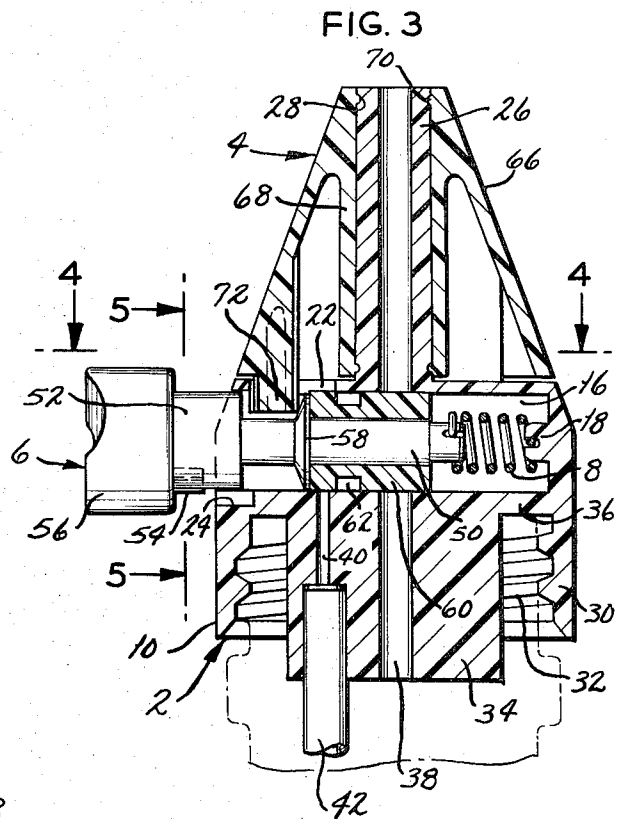
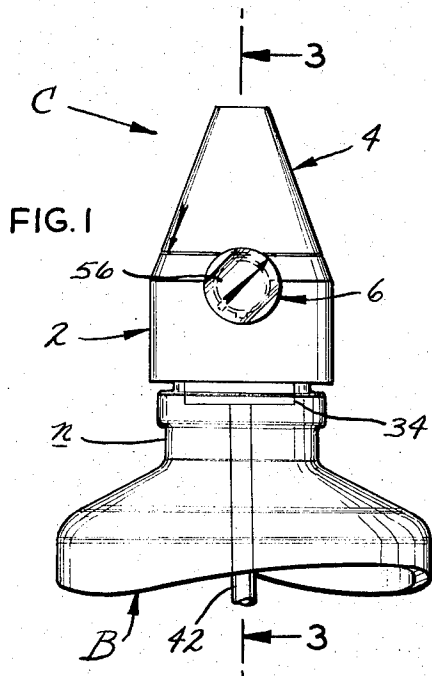
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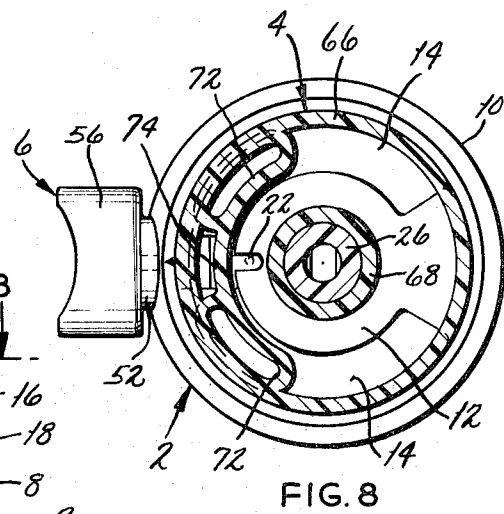
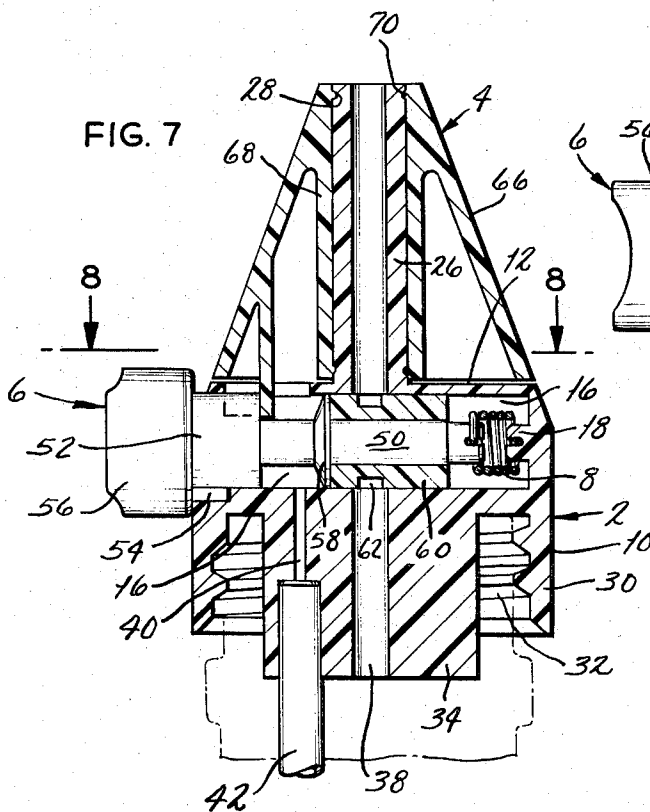
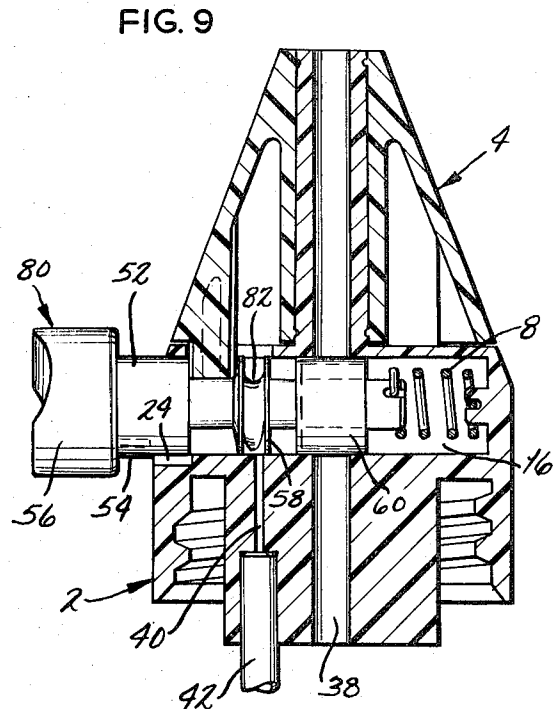
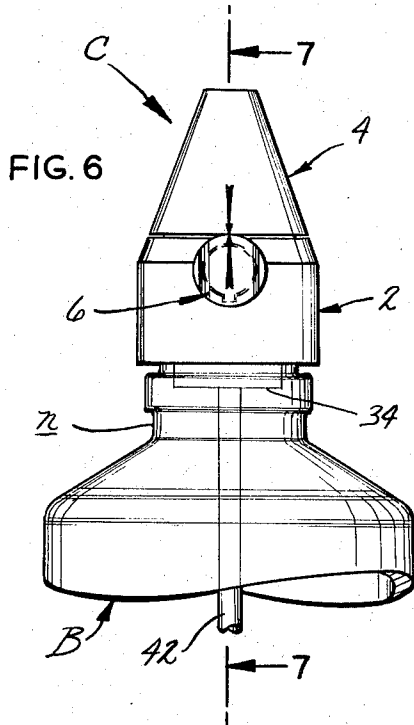
ABSTRACT

A safety closure for a liquid container has a base provided with a dispensing channel which is opened and closed by a spool-type valve element movable axially in the base. A rotatable cover locks the valve element in its closed position. Both the valve element and cover must be turned to prescribed angular positions before the valve element can be moved axially to its open position.

4 Claims, 9 Drawing Figures







# 1 SAFETY CLOSURE

## BACKGROUND OF THE INVENTION

This invention relates to closures and more particularly to safety closures for containers in which liquids or viscous substances are kept.

Many liquids used in the household are extremely toxic, particularly to young children. Among these liquids are furniture polish, drain cleaners, insecticides, rubbing alcohol, and common solvents such as paint thinner and benzene. Many of the liquids found in the household are hazardous substances as defined by the Federal Hazardous Substance Act (115 USC 1261), are economic poisons as defined by the Federal Insecticide, Fungicide and Rodenticide Act (7 USC 135 (a)) or are foods, drugs or cosmetics as defined by the Federal Food Drug and Cosmetic Act (21 USC 321). Consequently, the containers for these household liquids must be kept tightly sealed and away from the grasp of young children. Children, however, have a capacity of getting into cabinets and places which are normally forbidden to them and for further opening liquid containers and spilling the contents or even drinking the contents. Moreover, these containers while normally inaccessible to children, often become available when used by a parent. For example, sometimes the parent's attention is distracted, such as by the ring of the telephone or door bell, and the child is left unattended near an open container.

## SUMMARY OF THE INVENTION

One of the principal objects of the present invention is to provide a safety closure for containers of liquids or viscous substances, which closure is extremely difficult for older children to operate and practically impossible for younger children to operate. Another object is to provide a closure which automatically closes when left unattended. A further object is to provide a closure having a double locking capacity. An additional object is to provide a safety closure which has a minimum number of parts and is easily assembled. Still another object is to provide a closure of the type stated which may be injection molded from plastic and other materials. Yet another object is to provide a safety closure which is attractive in appearance. These and other objects and advantages will become apparent hereinafter.

The present invention is embodied in a safety closure including a base having a dispensing channel; a valve element in the base movable between open and closed positions wherein the dispensing channel is respectively open and blocked; and a locking member which moves between locking and release positions and prevents the valve element from moving axially to its open position when in the locking position.

## DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the specification and wherein like numerals and letters refer to like parts wherever they occur:

FIG. 1 is a side elevational view of a safety closure constructed in accordance with and embodying the present invention, the closure being in its closed and locked condition;

FIG. 2 is a top plan view of the safety closure;

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

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FIGS. 4 and 5 are sectional views taken along lines 4—4 and 5—5 respectively, of FIG. 3;

FIG. 6 is a side elevational view showing the closure in its open position;

FIG. 7 is a sectional view taken along line 7—7 of FIG. 6;

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7; and

FIG. 9 is a sectional view showing the closure with a modified valve stem.

## DETAILED DESCRIPTION

Referring now to the drawings (FIGS. 1 & 2), C designates a closure for a bottle or other container B in which a liquid or viscous substance is contained. The container B has a neck N provided with screw threads. The closure C engages these threads and is thereby secured to the container B such that it closes the neck and prevents liquid from flowing through it, although the closure C may be attached to the container B by other types of connections or it may even be formed integral with the container B. The closure C has four basic parts; namely, a body or base 2, a cover 4 which fits over the base 2, a valve stem 6 which fits into the base 2 and functions as a valve element therein, and a spring 8 (FIG. 3) which urges the stem 6 to a closed and locked position.

The base 2 is preferably a unitary structure molded from a plastic which is compatible with the liquid. It has a generally cylindrical side face 10 and a flat upper face 12, the latter being interrupted by an arcuate groove 14 (FIG. 4) which opens upwardly. Immediately below the groove 14 the base 2 is provided with a cross bore 16 (FIG. 3), one end of which is closed, while the other end opens outwardly through the side face 10. The bore 16 is positioned such that its closed end is beneath the space between the ends of the groove 14, and projected into the closed end of the bore 16 is a spring mounting stud 18 which is sized to tightly fit into the spring 8 and thereby retain the spring 8. The bore 16 itself is sized to receive the valve stem 6 which slides inwardly and outwardly therein. While the cross bore 16 is positioned generally below the arcuate groove 14, the upper portion of the bore 16 does intersect the groove 14 midway between the ends of the groove 14. Thus, the groove 14 opens into the cross bore 16 near the outwardly opening end of the cross bore 16. At the intersection of the arcuate groove 14 and the cross bore 16, the bore 16 is provided with a vent aperture 22 which is projected inwardly from the groove 16 toward the center of the base 2. The vent aperture 22 provides communication between the top of the base and the cross bore 16. Directly below the intersection of the groove 14 and cross bore 16, the base 2 is provided with a slot 24 which opens upwardly into the cross bore 16 and outwardly through the side face 10.

Projecting upwardly from the flat upper face 12 is a hollow dispensing spindle 26 (FIGS. 3 & 4) which is centered with respect to arcuate groove 14 and the cylindrical side face 10. The interior of the spindle 26 opens into the cross bore 16 midway between the ends of that cross bore 16. Near its ends the spindle 26 is provided with an outwardly opening annular groove 28.

The base 2 is further provided with a downwardly extending skirt 30 (FIG. 3), the exterior surface of which is part of the cylindrical side face 10. On its inwardly presented face, the skirt 30 has threads 32 which are

sized to engage the threads on the neck N of the container B. The skirt 30 surrounds a cylindrical boss 34, the two being separated at a shoulder 36. The boss 34 has a center dispensing bore 38 which extends completely through it, and this bore at its upper end opens into the cross bore directly opposite from the dispensing spindle 26. In addition, the boss 34 is further provided with a vent bore 40 is enlarged at its lower end where it receives a vent tube 42 which extends to the bottom of the container B. However, where the viscosity of the liquid is low the vent tube 42 is unnecessary. If the container B is used for liquids of high viscosity, the vent tube 42 should have a check valve (not shown) at its lower end.

The valve stem 6 is molded as a unitary structure from a suitable plastic. The stem 6 includes (FIG. 3) a stem shaft 50, the end of which aligns with the spring mounting stud 18 and is likewise sized to fit tightly into the spring 8. The spring 8 fits between the stem shaft 50 and the mounting stud 18, and is normally compressed to urge the stem 6 outwardly. The stem moves between open and closed positions, and in both positions it is urged outwardly by the spring 8. The opposed ends of the stem shaft 50 and mounting stud 18 are notched to positively attach the spring 8 to them such that the spring 8 is prevented from rotating relative to either one of them. Thus, if the stem 6 is turned out of its normal angular position, the spring 8 will be placed in torsion and will tend to restore the stem 6 to its initial angular position.

At its opposite end the stem shaft 50 merges into a cylindrical guide portion 52 (FIGS. 3-5) which fits loosely in the bore 16 so as not to impede axial movement of the stem 6 within the bore 16. The guide portion 52 has a rib 54 (FIG. 5) projecting from it, but not extended its entire length, and this rib is sized to fit into the slot 24 along the bottom of the cross bore 16. The guide portion 52 in turn merges into an operating knob 56 which is larger than the cross bore 16 and hence is always disposed beyond the cylindrical side face 10 on the base 2. The exposed end face on the operating knob 56 is concave and provided with an arrow or some other form of indicia which when pointed directly upwardly indicates that the rib 54 on the stem 6 aligns with the slot 24 in the base. Of course, when the slot 24 and rib 54 align, the base 2 will not interfere with the rib 54 and thereby prevent the stem 6 from advancing further into the base 2. Beyond the end face of the guide portion 52 the shaft 50 has a retaining flange 58 (FIG. 3) formed integral with it. This flange is slightly smaller in diameter than the guide portion 52 and the face thereof which is presented toward the guide portion 52 is beveled.

Fitted over the portion of the stem shaft 50 located beyond the retaining flange 58 is a valve spool 60 having an annular groove 62 in it. The spool 60 is molded from a suitable plastic and fits within the cross bore 16 such that the stem 4 shifts axially under the force exerted on it by the spring 8. Nevertheless, it is large enough to block the dispensing and vent bores 38 and 40 when positioned over them.

When the valve stem 6 is in its closed position (FIG. 3), which is its outermost position, a portion of the valve spool 60 overlies and blocks the opposed ends of the dispensing bore 38 and the hollow spindle 26, while another portion overlies the vent bore 40. The annular groove 62, in that case is between the dispensing bore

38 and vent bore 40. When the stem 6 is in its open position (FIG. 7), the annular groove 62 is located opposite to the ends of the dispensing bore 38 and the hollow spindle 26 and permits liquid to flow from the former to the latter. Moreover, the retaining flange 58 is disposed inwardly beyond the vent bore 40 when the stem 6 is open so that the interior of the container B is vented through the vent bore 40 and tube 42 connected with it. The stem 6 will only move between its open and closed positions when the rib 54 aligns with the slot 24.

The cover 4 is molded from a suitable plastic and has a conical outer wall 66 (FIG. 3) and an interior sleeve 68 which merge near the upper end of that cover 4. The sleeve 68 receives the dispensing spindle 26 and has inwardly directed ribs 70 which snap into the annular grooves 28 at the ends of the spindle 26. The ribs 70 lock the cover 4 on the base 2, yet leave it free to rotate relative thereto. The outer wall 66 extends down to the flat top face 12 of the base 2, and its outer surface forms a continuation of the side face 12 on the base 2.

Molded integral with the conical outer wall 60 along the inside surface thereof are a pair of blocking elements 72 (FIGS. 3 & 4) which are spaced circumferentially from one another and are bridged by a retaining element 74. The blocking elements 72 and the retaining element 74 align with arcuate groove 14 in the base 2 and project downwardly past the lower edge of the conical outer wall 66 and into the groove 14. The blocking elements 72 are about as wide as the groove 62 and when the cover 4 is turned such that either one of them overlies the cross bore 16 (FIG. 4), the element 72 so positioned will project into the cross bore 16 and further into the space between the guide portion 52 and the flange 58 of the stem 6. Hence, the stem 6 cannot be moved inwardly or outwardly. The retaining element 74 is substantially thinner than the blocking elements 72 on either side of it and is on its inner face flush with the inner faces of the blocking elements 72. When the cover 4 is turned such that the retaining element 74 overlies the cross bore 16 (FIG. 8), the retaining element 72 will extend into the cross bore 16 and likewise into the space between the guide portion 52 and the retaining flange 58. The spring 8 urges the retaining flange 58 against the retaining element 74, but since the retaining element 72 is substantially narrower than the space between the guide portion 52 and the retaining flange 58, the stem 6 can be pushed inwardly against the force exerted by the spring 8. When the retaining flange 58 is against the retaining element 74 or the blocking elements 72, the stem 6 of which it forms a part is in its closed position (FIG. 3) but when the retaining element 74 overlies the cross bore 16 and the stem 6 is pushed inwardly until the guide portion 52 thereon abuts the retaining flange 58, then the stem 6 is in its open position (FIG. 7). Of course, the stem 6 cannot be pushed inwardly when either of the blocking elements 72 overlies the cross bore 16 since those elements are wide enough to fill the space between the guide portion 52 and retaining flange 58 and thus leave no room for movement.

The arcuate length of the two blocking elements 72 and the intervening retaining element 74 is less than the arcuate length of the groove 14 so that the cover 4 can rotate a limited amount on the spindle 26. Moreover, the relative positioning between the two blocking elements 72 is such that one is against the end of the arcuate groove 14, the other overlies the cross bore 16 and

prevents movement of the stem 6 therein and vice-versa (FIG. 4).

The cover 4 has an arrow or some other indicia which when directly over the axis of the stem 6 indicates that the retaining element 74 overlies the cross bore 16 and the stem 6 can be pushed inwardly.

### OPERATION

The container B is stored with its closure C in the double locked condition. In that condition, the arrow on the cover is displaced to the side of the stem 6 and the arrow on the operating knob 56 of the stem 6 is pointed in some direction other than directly upwardly (FIG. 1). With its arrow displaced to the side of the stem 6, the cover 4 is in a locked position wherein its locking elements 72 project into the space between the guide portion 52 and the retaining flange 58 of the stem 6, thus preventing movement of the stem 6 inwardly to its open position (FIGS. 3 & 4). On the other hand, when the stem 6 has its arrow pointed in some direction other than directly upwardly, the rib 54 does not align with the slot 24 and the stem 6 cannot be pushed into the bore 16 (FIG. 5). Thus, if the cover 4 is turned to bring the arrow thereon directly over the stem 6 in which case the retaining element 74 and not one of the blocking elements 72, will overlie the cross bore 16, the stem 6 still cannot be pushed inwardly since the rib 54 will not fit into the bore 16. The spring 8 pushes the stem 6 outwardly to its closed position and turns the stem 6 so that the rib 54 does not align with the slot 24. When the stem 6 is in its closed position, the spool 60 thereon overlies and blocks both the dispensing bore 38 and the vent bore 40.

To open the closure C, the cover 4 is turned to its release position, that is, until the arrow thereon is centered over the stem 6. This places the retaining element 74 over the cross bore 16 so no immediate impediment exists in front of the guide portion 52 (FIG. 8). Next, the operating knob 56 is turned to bring its arrow opposite the arrow on the cover 4. In that case the arrow on the knob 56 points directly upwardly. Since the spring 8 is anchored to both the base 2 and the stem 6, the knob 56 must be turned against the restoring torsion exerted by the spring 8. Once the two arrows are aligned, the knob 56 is pushed inwardly. As the stem 6 moves through the cross bore 16 the rib 54 enters the slot 24 at the bottom of the cross bore 16. The movement continues until the guide portion 52 abuts against the retaining element 74 (FIG. 7). When this occurs, the stem 6 is in its open position and in that position the annular groove 62 in the spool 60 lies opposite the dispensing bore 38 and the hollow spindle 40, while the relieved portion between the retaining flange 58 and the guide portion lies opposite the vent bore 40. Therefore, when the container B is turned upside down, liquid flows through the dispensing bore 38, the annular groove 63 in the spool 60, and the hollow spindle 26 from which it leaves the closure C. Hence, the dispensing bore 38 and the hollow interior of the spindle 26 form a dispensing channel. The interior of the container B is vented through the tube 42, the vent bore 40, the relief between the guide portion 52 and the retaining flange 58, and the venting aperture 22 along the arcuate groove 14.

Once the knob 56 is released, the spring 8 pushes the stem 6 outwardly until its retaining flange 58 abuts against the retaining element 74. As the stem 6 moves

outwardly the rib 54 will clear the slot 24 and when this occurs the spring 8 further twists the stem 6 so that the rib 54 thereon no longer aligns with the slot 24. Thus, if the user is suddenly distracted and leaves the container B unattended, the closure C will automatically close and place itself in a condition where it cannot be easily opened. Of course, when the stem 6 is in its outer or closed position the spool 60 overlies both the dispensing and vent bores 38 and 40 and prevents liquid from leaving them.

If the container B is intentionally set aside, its cover 4 should be turned to place the closure C in its double locked condition (FIG. 1).

### MODIFICATION

It is possible to provide the closure C with a modified stem 80 (FIG. 9) which is very similar to the stem 6. The stem 80, however, is a unitary structure with the portion thereof which overlies the ends of the dispensing bore 38 and the hollow spindle 26 being hollow. Moreover, the portion which overlies the end of the vent bore 40 possesses an arcuate groove 82 which enables the container B to be vented when the stem 80 is in its closed position, and turned to a prescribed position.

This invention is intended to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A closure for a container for a fluent substance, comprising
  - a base having means to mount on the container and having a dispensing channel,
  - a valve element in the base movable between a closed position, wherein the valve element blocks the dispensing channel, and an open position, wherein the valve element allows the fluent substance to flow through the channel, and
  - a locking member mounted on the base and movable relative to the base and to the valve element between locking and release positions, the locking member allowing the valve element to move to its open position when in its release position and obstructing the valve element and retaining the valve element in the closed position when in the locking position,
- wherein the valve element includes a spool which blocks the dispensing channel when the valve element is in the closed position and the valve element moves axially with respect to the spool, and
- wherein the locking member and the valve element rotate about axes positioned at an angle relative to one another, and wherein both the locking member and the valve element must be turned to prescribed angular positions before the valve element can be moved axially to its open position.
2. A closure for a container adapted to hold fluent substances, said closure comprising: a base having means to mount on the container and having a dispensing channel and a cross bore intersecting the channel, the base further having a spindle and the channel being extended through the spindle; a valve element in the cross bore and movable axially therein between an open position wherein the valve element permits fluent substances to flow through the channel and a closed

position wherein the valve element blocks the channel; and a cover surrounding the spindle and rotatable between locked and release positions, the cover when in the locked position engaging the valve element and preventing the valve element from moving to its open position and when in the release position allowing the valve element to move to the open position.

3. A closure for a container adapted to hold fluid substances, comprising

a base having means to mount on the container and having a substantially vertical dispensing channel and a substantially horizontal cylindrical cross bore including an entrance at one side of the base and intersecting the dispensing channel,

a valve element in the cross bore having piston-like means therein and having outwardly-projecting manipulating means to twist the valve element and to press it axially inward in said cross bore and thereby to move its piston-like means from a closed position blocking the dispensing channel to an open position,

the valve element further having at the inward side of said manipulating means a projection of greater radial extent than the cross bore,

groove means in said cross bore entrance to receive said projection when in angular registration therewith and thereby define a single angular alignment for axial movement of the valve element, and

a compression spring having one end keyed to the closure base and the other end keyed to the valve element, whereby the manipulating means is normally positioned at a safety angle out of registration with said single angular alignment for axial movement and whereby the valve element cannot be pressed inward without first twisting to said single angular alignment, thereby building up torque

in the spring, and whereby on release of inward pressure said spring will first bias the valve element outward and then twist it back to such safety angle position.

4. A closure for a container adapted to hold fluid substances, comprising

a base having means to mount on the container, further having an upper surface including a depressed portion, a substantially vertical dispensing channel, and a substantially horizontal cross bore penetrating one side of the base and intersecting said depressed surface portion and further intersecting the dispensing channel,

a valve element in the cross bore having piston-like means therein and having outwardly-projecting manipulating means to press the valve element axially inward in said cross bore from a closed position, wherein the piston-like means blocks the dispensing channel, to an open position wherein said means is displaced axially to permit fluent substances to flow through the channel,

the valve element further having, between said manipulating means and said piston-like means, a portion of substantially smaller radial extent,

compression spring means operable between the closure base and the valve element to bias it outward, and

a cover element mounted on the base for angular movement about a substantially vertical axis and having a downward-extending blocking means within said depressed surface portion,

whereby angular movement of said cover element interposes said blocking means over said valve element portion of smaller radial extent, thereby to selectively prevent operation of the valve element.

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