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3,005,455

CONTAINER CLOSURE

Filed June 24, 1955

2 Sheets-Sheet 1

Fig. 1.

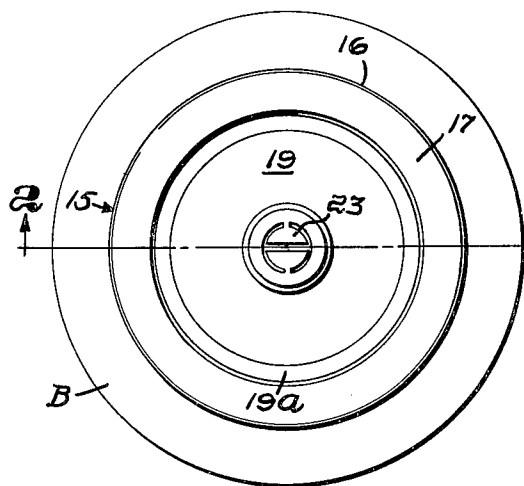


Fig. 2.

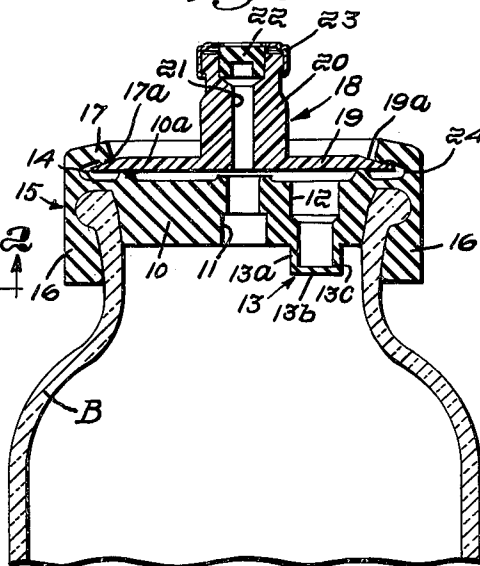


Fig. 3.

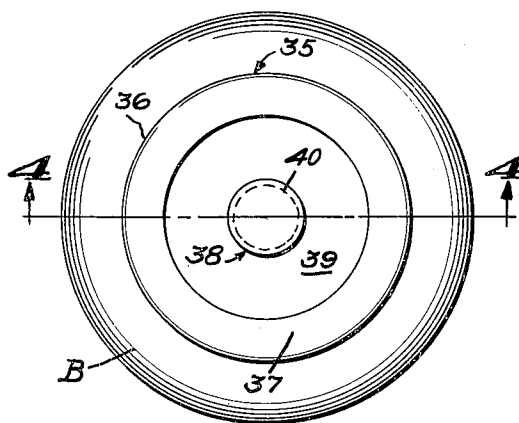


Fig. 4.

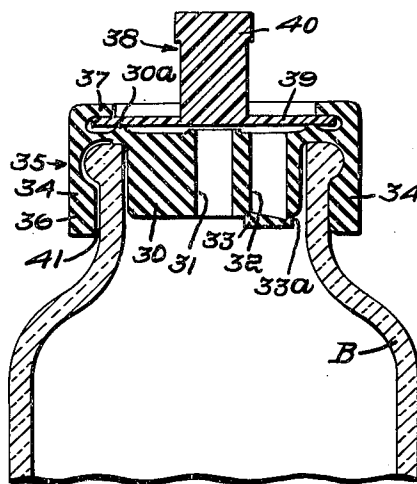
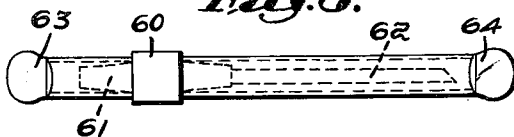


Fig. 5.



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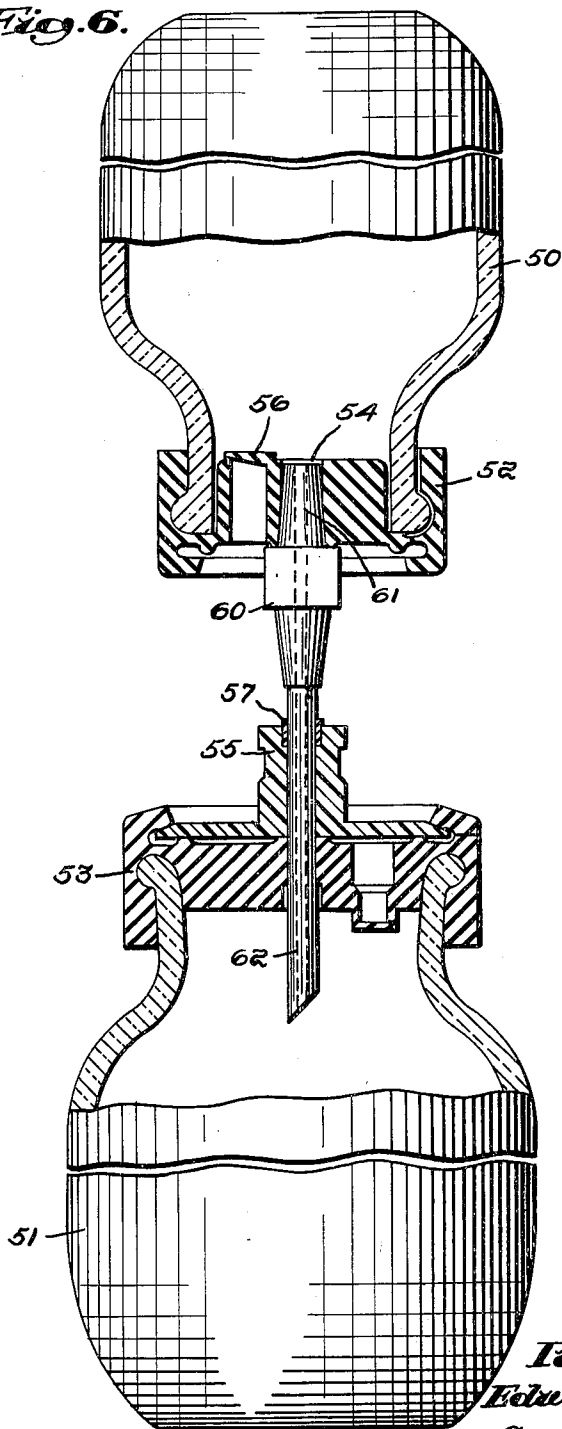
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Fig. 6.



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CONTAINER CLOSURE

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8 Claims. (Cl. 128—272)

This invention relates generally to apparatus for sealing or closing fluid containers, and more particularly to closure or stopper devices such as adapted to the dispensing as well as to the sealing of fluid from and in such containers. The closure of the invention is intended and adapted particularly for use with medical and other fluids which are required to be stored and also dispensed in sterile condition. The invention aims generally to provide an improved container closure providing novelty for the automatic venting of the container subject to positive container pressure, as during sterilization, and subject also to container vacuum, as during dispensing, while preserving the container fluids sterile sealed against contamination in handling and storage. The further object of the invention is to provide fluid handling apparatus specially formed and fitted for the safe compounding or combining of component fluids in and as a sterile mixture. The invention aims still further to provide a container closure affording the mixing of a specialized solution into and conjointly with the dispensing or administering of such solution out of a fluid container. The invention will be better understood from a consideration of the following specification taken in conjunction with the accompanying drawings in which:

FIG. 1 is a top plan of a closure of the invention;

FIG. 2 is a section along the line 2—2 of FIG. 1 and showing the closure installed on a container;

FIG. 3 is a top plan of a modified form of the closure;

FIG. 4 is a section along the line 4—4 of FIG. 3 and showing the FIG. 3 closure installed on a container;

FIG. 5 shows a fluid conduit or container coupler device as employed with the invention apparatus; and

FIG. 6 is an elevation, partly in section, of a container pair fitted with the invention closures and coupled for fluid mixing.

In medical and hospital practice parenteral, intravenous and the like medical fluids or liquids are commonly readied and stored in closed containers from which they may be supplied for administering directly to a patient. These containers or bottles are required to be kept sterile and hermetically sealed at least during storage and desirably also during such fluid administering.

The present invention improves upon the prior fluid handling and administering practice by providing novelty for the combining or compounding of specialized mixtures and solutions, as just prior to or coincident with the fluid administering, in desired sterile preserving manner. More particularly, full or fractional volumes from one or more component or concentrate bottles may be added or combined in a mixture or solution bottle without mess or drip and without violating content sterility.

Our invention provides also an improved closure apparatus novelty promoting the described handling or combining of medical fluids in accordance with accepted hospital techniques. The stopper of the invention is described more particularly as uniquely adapting or coupling fluid containers for safe sterile administering or combining of their solutions. Our novel closure will be understood further to incorporate self-venting, self-sealing features permitting the safe sterilization of as well as the sterile administering from a container stoppered by the same.

The invention closure or stopper comprises in the embodiment of FIGS. 1 and 2 a rubber or other elastic bush-

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ing having a central annulus or waist 10 which may be tapered or otherwise shaped or proportioned for seating or seizing in the opening or mouth of the container or bottle B. The bushing waist 10 is apertured to provide an access or filling and dispensing passage or opening 11 and spaced therefrom a primary inlet or venting passage or opening 12.

In accordance with the invention the bushing 10 may be variously fitted for vacuum or negative pressure operable closure of the vent opening 12, as herein by the valve 13 yieldably biased against the same and defined more particularly as a cup-shaped projection integrally dependent from waist 10 and characterized by a thin vertical side wall 13a supporting and capped by lateral bottom wall 13b. A lateral slit 13c is cut through a substantial portion of the periphery of the valve 13 and in the plane of the side-bottom wall juncture, whereby bottom wall 13b is defined as a flap depressible from the normal vent closing position shown.

The upper face or margin of the bushing waist 10 is seen to mount a lateral or radial projection or web 14 adapted for engagement over the container rim, as shown. Medially supported from this web 14 is a vertical sleeve 15 defining downwardly a skirt 16 for clamping about the neck of the bottle B and upwardly a coupler or coupling element or projection 17. The coupling projection 17 is herein shown to comprise more particularly a waist enclosing flange or lip spaced and projecting inwardly over the web 14 and mounting at its under face a sealing ring 17a.

In accordance with the invention the bushing 10 is closed and the container B sealed by a plastic or other rigid cover or cap 18 herein defined as a lateral supporting or base portion 19 and centrally thereof a vertical manipulating or stem portion 20. The base 19 is seen to be shaped and proportioned, as with a bevel 19a, for releasably clamping under bushing lip 17, and more particularly for sealing engagement between lip ring 17a and a like waist mounted sealing ring 10a projecting opposite said lip ring 17a and about bushing openings 11, 12.

The FIGS. 1 and 2 closure or stopper cap comprises further a vertical opening 21 extending through base and stem portions 19, 20 and adapted to align with the bushing access opening 11, as shown. This cap opening 21 is closed at its upper end by an elastic plug 22 undercut or otherwise formed to define a partible or puncturable wall or diaphragm. The diaphragm 22 is seen to be sterile-sealed by a conventional tear tab 23 engaged in known manner over the stem 20.

Further in accordance with the invention, our improved closure is novelty fitted for venting the container automatically responsive to the build up of positive pressures, as during sterilization, and then sealing the container automatically upon the development of negative pressure, as in the subsequent cooling of the same. As herein embodied this positive pressure sensitive vent valve means comprises a slit 24 cut through bushing sleeve 15 at the base of lip 17 and radially outward of cap base 19. The valve slit 24 will be understood to be formed by the cutting or parting of, but not the removal of material from the sleeve 15, and hence normally to be closed as shown. The opening or parting of the valve or slit 24 is thus seen to require the distension of sleeve 15, as by the lifting or forcing of the cap 18 from the bushing 10.

The stopper bushing may be installed before or after filling or charging the container or bottle B with the desired quantity of medical or other fluid or solution. The filled container is closed and sealed by the installation of the cap 18 which may be grasped by the stem 20 and manipulated so as to snap the base 19 in place under bushing lip 17, as shown. The bottle, fluid and closure

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are then subjected to desired sterilization. As already noted, the expansion of the container fluids or gases under sterilization heat will develop a positive container pressure sufficient to lift or force cap base 19 from its sealing seat 10a, whereby the excess container pressure is dissipated through vent valve 24. The instantaneous automatic closing of slit 24 is seen to be accomplished by the return of cap 18 to its seat or ring 10a under the clamping action of lip 17, whereby the container is closed against air ingress, and the container fluids are preserved in sterile, vacuum-sealed condition.

The closure of the invention is quickly and easily manipulated for discharging the contents of the bottle B. The usual dispensing, as through a fluid administering set, merely requires the snapping or rocking of the cap 18 free of its engagement under bushing lip 17. The desired fluid conducting or administering means are then fitted or seated at bushing opening 11 and the bottle B inverted or otherwise arranged for gravity or other flow of its fluid charge or solution. Such dispensing flow will be understood to be permitted by the check valve 13 which, while normally closing vent opening 12, opens automatically subject or sensitive to a differential or negative pressure across or at the flap 13b.

It will be appreciated also that the bottle B may be filled through the bushing 10 and more particularly through either of the passages 11, 12. Where the access passage 11 is employed for filling, the valve 13 may be opened as by inserting an adaptor or the like through the passage 12 and dispensing flap 13b, to permit required fluid or air egress. It should be noted in this connection that check valve 13 is specially formed to permit its retraction as necessarily incident to the deflecting of flap 13b as just described. More particularly, the valve side wall 13a, which acts as a resilient hinge, projects outwardly or downwardly of the main body of the bushing 10 so as freely to permit such lateral displacement or folding retraction of the same as accompanies the similar shifting of the bottom wall 13b.

Further in accordance with the invention, the FIGS. 1 and 2 stopper is adapted novelly for introduction of additional fluid into the vacuum sealed container B without violating the sterility of its contents. Such fluid addition merely requires the removal of the tear tab 23 and the piercing of the diaphragm 21 by a syringe, needle or the like pointed fluid conduit means.

It will be understood that various forms and constructions of the stopper elements, and more particularly the cap and positive and negative pressure-sensitive vent means are comprehended by the invention. Considering now more particularly FIGS. 3 and 4, our invention stopper is there shown to comprise a bushing having a waist 30 shaped and proportioned for a loose or clearance fit in the mouth of the bottle B, as shown. The stopper bushing has spaced vertical access and vent openings 31 and 32 therethrough, and about vent opening 32 an annular or other integrally dependent projection 33 constituted as a negative pressure sensitive check valve by a lateral slit 33a cut through a substantial portion of the same and in the plane of its junction with the bushing main body. Integrally and radially extensive of the bushing 30 is a web 34 and medially supported therefrom a vertical collar or sleeve 35 incorporating a skirt 36 and an upstanding intumed coupler flange or lip 37.

The FIGS. 3 and 4 closure comprises further a solid, unitary cap 38 comprising a flat base 39 and centrally thereof an upstanding manipulating stem 40. The cap is seen to be clamped between the lip 37 and an annular or other bushing rib or seat 30a projecting about the openings 31, 32. The stopper is fitted for self-venting by a groove 41 formed in the under face of skirt 36, and extending upwardly over the lip of the bottle and inwardly part way across web 34, and stopping short of or out-

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side the inner wall of the bottle mouth, or as clearly shown in FIG. 4.

The operation of the FIGS. 3 and 4 closure will be understood to be generally similar to that already described for the FIGS. 1 and 2 embodiment. Thus the loose fitting waist 30 is seen as readily lifted, as by sterilization pressures, to permit venting of the bottles through groove 41. It should here be noted that the several stopper cap and vent forms may be variously combined without departing from the scope and spirit of the invention, and not only by the substitution but also by the addition of the parts. Thus the invention stopper may be provided with plural positive pressure vent means, as by adding a valve slit like that shown at 24, FIG. 2 to the FIGS. 3 and 4 form.

The improved fluid handling and administering techniques made possible by the invention apparatus are illustrated in FIG. 6. As already noted the stopper can in both its embodiments be employed for simple administration of the contents of the bottle by merely tipping and removing the cap. It may, however, be desired to compound more complex solutions, as by adding a small bottle of, say, a desired concentrate to a large bottle of, say, dextrose. This may be accomplished under the invention by coupling the bottles through fluid conduit means of the type and in the manner now to be described. The solution compounding apparatus of FIG. 6 is seen to comprise a small bottle 50 fitted with a stopper 52 of the FIGS. 3, 4 type, with cap removed, and a large bottle 51 plugged by a stopper 53 of the FIGS. 1 and 2 type, and with cap in sealing position. The bottles 50, 51 are seen to be coupled or connected by fluid conduit means fitted at one end for sealed seating in the access passage 54 of stopper 52 and at the other for insertion through the stopper 53.

Such means may comprise any suitable tubular adaptor or fluid conduit means such as a hypodermic needle 60, FIG. 5, commonly formed at its opposite ends with a seating hub 61 and a stem or cannula 62 terminating in a piercing or puncturing point, as shown. The needle 60 may be kept sterile-sealed by plastic sealing sheaths 63, 64 drawn over and seized to the hub and cannula respectively. In assembling the apparatus of FIG. 6 the sheath 63 is first removed from needle 60, and the needle 60 is then applied to the stopper so as to seize and seat hub 61 in access opening 54, as shown. The sterile tear tab is then removed from cap 55 of stopper 53 and the needle cannula 62 forced through diaphragm 57 and downwardly into bottle-sealing position, as shown. It will be appreciated that the vacuum present over the solution in the large bottle 51 will draw in the fluid supplied from the small or concentrate bottle 50, and that the necessary venting of air into the small bottle is permitted by the operation of the automatic vent valve 56. It will be understood further that the fluid volume thus transferred may be controlled or determined by the removal of the needle 60 after the desired amount has been transferred, and that several component fluids or solutions may be combined as desired by repeating the process just described. Again, all or less than all of the contents of one or more than one component bottle may be combined to compound any desired mixture or specialized solution.

Our improved technique for tailoring solutions to the varying needs of individual patients will be seen therefore to reduce substantially the storage requirements of hospital supply rooms and the like.

It will be appreciated also that the invention apparatus is adapted for tandem hookup, wherein two or more containers may be connected as for dispensing, combined or adding their contents, for and during fluid administering. Thus a first bottle may be fitted with a stopper and administering set coupled at the stopper access opening, and a second, stopper-fitted bottle may be connected to the first by a transfer set having its one

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end installed at the access opening of the second bottle stopper and its other end received through the vent opening of the first bottle stopper. It will be appreciated that with the described arrangement the fluid being administered is preserved sterile-sealed, and its flow is permitted by the self-venting of the system, and more particularly of the second bottle stopper, similarly as with the apparatus of FIG. 6.

Our invention is not limited to the particular embodiments thereof illustrated and desired herein, and we set forth its scope in our following claims.

We claim:

1. A self-sealing closure for a container having an open mouth comprising in combination an elastic bushing adapted to plug the container mouth and having access and venting passages, valve means on said bushing and normally closing the venting passage, said valve means automatically operable to open said venting passage subject to differential pressure thereat, and a separable cap sealing the access passage and formed with a passage aligned with said access passage and closed by a puncturable diaphragm.

2. A self-venting closure for a container having a mouth comprising a stopper adapted to be applied to said mouth and having an opening, a cap over said opening, a coupler on said stopper and surrounding and sealingly engaged over said cap, and a normally closed vent valve on said coupler, said valve opening subject to the forcing of said cap from said opening.

3. A closure according to claim 2 wherein said coupler comprises an integral elastic flange and said valve is defined by a slit through said flange.

4. A container closure comprising a cap and a bushing, said bushing having access and venting openings and formed also with an elastic lip surrounding and yieldably clamping said cap over said openings, said lip formed outwardly of said cap with a slit parted by the forcing of the cap from said openings.

5. A container closure according to claim 4, and vacuum sensitive valve means normally closing the venting opening.

6. A container closure comprising an elastic bushing having an access opening and a lip projecting about said opening, and a cap having a mounting portion clamped

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under said lip and a manipulating portion supported over said opening, said manipulating portion formed with a through passage aligned with the opening and closed by a pierceable plug.

7. A container closure comprising an elastic bushing having an access opening and mounting a coupling element surrounding said opening, a cap having a mounting base clamped under said element and a manipulating stem supported over said opening and formed with a through passage, a puncturable diaphragm closing said passage, and a tear tab over said diaphragm.

8. A closure for a fluid container having an open mouth comprising a bushing adapted to be seated in the container mouth and having access and venting openings, a valve normally closing the venting opening, said valve opening automatically subject to a negative pressure in a container in whose mouth said bushing is seated, a cap over the access opening, bushing carried means releasably clamping said cap to said access opening, said means automatically shifting to permit the lifting of said cap from said opening subject to a positive pressure in a container in whose mouth said bushing is seated, and a normally closed valve in said cap clamping means, said valve opening automatically upon said shifting of said means to permit the lifting of said cap.

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