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W. A. NOSIK
MULTIPLE CHAMBER CONTAINER

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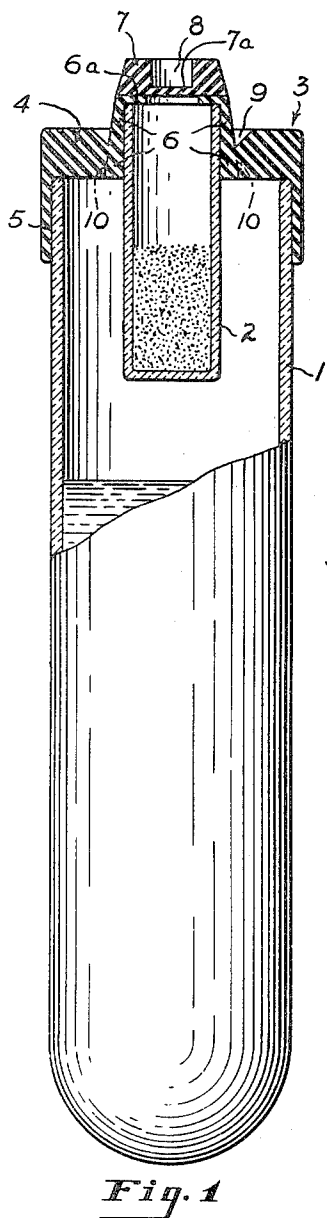


Fig. 1

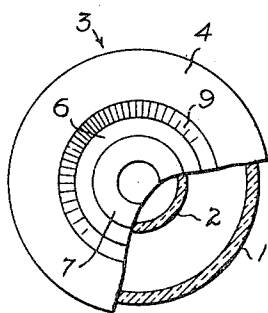


Fig. 2

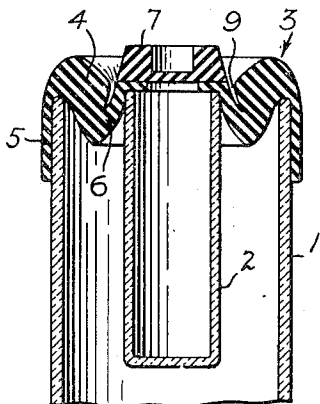


Fig. 3

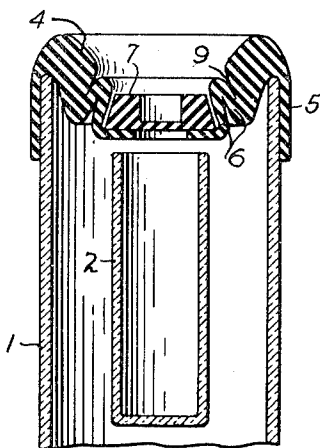


Fig. 4

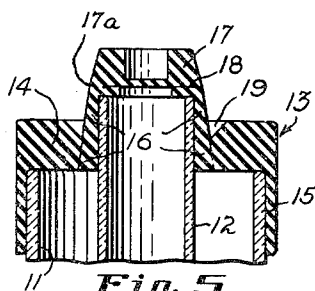


Fig. 5

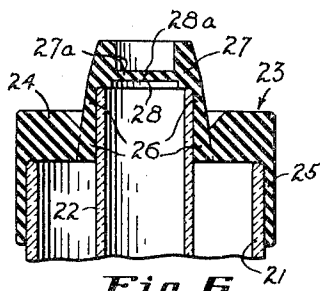


Fig. 6

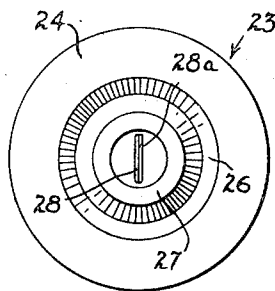


Fig. 7

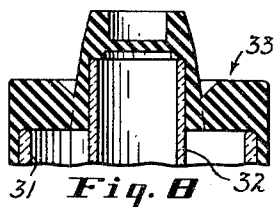


Fig. 8

INVENTOR.
W. A. Nosik
BY Ray A. Lehr
ATTORNEY

UNITED STATES PATENT OFFICE

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MULTIPLE CHAMBER CONTAINER

William A. Nosik, Cleveland Heights, Ohio

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9 Claims. (Cl. 128—272)

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This invention relates to multiple chamber container structures comprising an outer container, a smaller container therein and closure means common to both containers.

It is an object of the invention to provide an improved multiple container unit of the type indicated having the chambers of the outer and inner containers normally closed but adapted to be thrown into communication with each other without opening the larger container.

A further object of the invention is to provide a container of the character last referred to which is simply constructed, susceptible of low cost manufacture and which functions uniformly and reliably, under convenient manual manipulation, to effect communication between the inner and outer chambers.

Another object of the invention is to provide a multiple chamber container structure which can easily be assembled, sterilized, filled and closed.

Other objects of the invention more or less incidental or ancillary to those stated above will be apparent from the description to follow.

With the stated objects in view the invention consists in certain forms, arrangements and combinations of parts hereinafter set forth and claimed, reference being had to the accompanying drawing which shows several preferred embodiments of the invention.

In the drawing,

Fig. 1 is a side view partly in elevation and partly in central vertical section of a container structure embodying the invention, the device being shown considerably larger than full scale in the interest of clarity.

Fig. 2 is a plan view of the device shown in Fig. 1 with some parts broken away and some parts shown in section to facilitate the disclosure.

Fig. 3 is a central sectional view corresponding to the upper part of Fig. 1 but showing the relative positions of the parts in an intermediate stage of the manual manipulation of the device to effect disengagement of the inner container from the common closure of the device.

Fig. 4 is a sectional view similar to Fig. 3 but showing a later stage of the manipulation referred to in connection with Fig. 3.

Figs. 5 and 6 are fragmentary central vertical sections showing container structures generally similar to that shown in Fig. 1 but with somewhat modified forms of closure means.

Fig. 7 is a plan view of the modified structure shown in Fig. 6.

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Fig. 8 also is a fragmentary sectional view showing still another modified form of the closure means.

Referring in detail to the constructions illustrated in the drawings and first to that shown in Figs. 1 to 4, 1 designates an outer container of glass or some equivalent material and 2 is a smaller container, also of glass or equivalent material, disposed centrally within the container 1. Both containers 1 and 2 are shown of test tube form but may take various other forms permitting relative arrangement such as that shown in Fig. 1.

The two containers are fitted with a common closure means generally designated by the numeral 3 and preferably formed of some elastic material such as rubber or other equivalent substance. The closure 3 comprises an annular portion 4 which overlies the access opening of the outer container, a depending skirt 5 which snugly engages the outside of the container 1 adjacent its access opening and a cap-shaped structure comprising a side wall 6 which has its lower part integrally joined to the inner part of the annulus 4 and extends above the latter to surround and snugly fit the upper outside surface of the inner container 2 which is disposed with its upper end projecting outward beyond the end of the container 1. The cap structure further comprises an inturned flange 6a and a circular top member 7 which is separately formed but attached to the side walls of the cap or the inturned flange 6a thereof by cement or vulcanization. The top part 7 of the cap is relatively thick but is formed with a central depression 8 leaving only a relatively thin circular wall portion 7a overlying the access aperture of the inner container 2.

The annular part 4 of the closure is made quite thick and the closure structure is formed with a circular depression 9 surrounding the side wall 6 of the cap portion of the closure. From a functional standpoint the inner side of the annulus 4 may be considered as terminating in a circular zone indicated by the dotted lines 10, 10 in Fig. 1. Correspondingly the side wall 6 of the cap portion of the closure may be considered as extending downward to the bottom surface of the annulus 4. With the closure constructed in this manner the annular part 4 thereof, because of its great thickness, has great resistance to stretch in comparison with the much thinner side wall 6 of the cap section of the closure. The reason for this will presently appear.

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A dual-chamber container of the class in question can be used for the packaging of a wide variety of materials where it is desirable to maintain the different materials separate from each other prior to their use; however, such containers are especially useful for the packaging of pharmaceutical preparations and especially medicinal drugs that are to be administered in solution form, as by intravenous injection. Usually it is desirable, if not mandatory, that the solution be freshly prepared when administered and it is essential that the solution be sterile. As the present invention is peculiarly adapted for the packaging of such pharmaceuticals or drugs, the operation and use of the improved container will now be described in that connection.

In the assembly and filling of the container structure a sterilized outer chamber 1 is first charged with a suitable amount of a sterile solvent, usually distilled water or saline solution. Then a closure 3 without the top section 7 attached and an inner container 2, both having been sterilized, are assembled by insertion of the container in the closure. This assembly is then applied to the open end of the outer container 1, such application being facilitated by turning the thin skirt part 5 of the closure up around the annulus 4 so that when the annulus is rested upon the open end of container 1 it is easy to force the skirt downward into snug engagement with the outside of the container wall. Alternatively, the parts may be assembled to the point described in the unsterile state and the thus-far completed assembly then sterilized.

Next the sterile drug or substance eventually to be mixed with the solvent in the outer container is introduced, usually in the dry state, into the inner container 2 and a sterile top member 7 is then cemented or vulcanized in position to effect tight closure of the inner container.

The elastic material of the closure 3 insures liquid-tight joints between the skirt 5 and the outer container 1 and between the cap wall 3 and the inner container 2. Furthermore, the relatively thick annular section 4 of the closure 3 gives the closure structure relatively great stability so that the parts of the structure are satisfactorily maintained in their proper relative positions in their packing and shipment.

When it is desired to make use of the contents of the package or container it may be grasped in one hand with the thumb overlying the central part 7 of the closure structure so that downward pressure on the part 7 can readily be applied. Such pressure forces the inner container 2 and the central parts of the closure inward in relation to the outer container 1. The effect of this relative movement of the parts is illustrated in Fig. 3 and it will be seen that the side wall 6 of the cap section of the closure and particularly the lower part of the side wall is forced radially outward away from the wall of the inner container 2 so that, at the stage shown in Fig. 3, the inner container is engaged and held by the wall 6 only in a small zone at the top of the said container. This peculiar action is due primarily to the relatively rigid and stretch-resisting annular portion 4 of the closure. Thus as downward pressure is applied through the wall 6 to the inner portion of the annulus 4 the latter tends to take a substantially conical form without stretching on radial lines so that the thinner wall 6 is stretched circumferentially to conform to the form of the annulus 4 with resultant spread-

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ing of the wall 6 in the manner indicated in Fig. 3, the channel 9 in the top of the closure permitting this action without interference between the parts 4 and 5 of the structure.

As the downward movement of the central part of the closure is continued beyond the stage shown in Fig. 3 the spread form of the wall 6 permits the upper part of the wall to telescope within the lower part thereof as shown in Fig. 4 so that the inner container 2 is completely freed from engagement with the closure member and is projected freely into the interior of the outer container 1 so that the interiors of the two chambers are thrown into communication with each other. The manipulator, still grasping the container structure in his hand, may now shake the container to effect thorough solution of the drug, whereupon the solution is ready for use. Assuming the drug is to be administered hypodermically, the user first renders the cap part of the closure 3 aseptic and then, grasping the syringe in his other hand, forces the needle through the thin part 7a of the top section 7 of the closure and is able to draw the fresh sterile solution into the syringe.

From the foregoing description it will be apparent that the improved dual container is of simple construction and susceptible of easy and cheap manufacture; that it lends itself to easy filling or loading under sterile conditions, can be manipulated to effect mingling of the contents with the greatest ease and convenience and, because of its peculiar construction, can be relied upon to function uniformly and reliably.

The closure part of the structure shown in Figs. 1 to 4 can be modified in various particulars, especially as to the provision for the loading of the interior container, and one modified form of construction is shown in Fig. 5. Here the outer and inner containers 11 and 12 are like those shown in Fig. 1 and the closure 13 is generally similar to that shown in Fig. 1, comprising an annular part 14, skirt 15, central cap walls 16 and top cap portion 17. However, in this case the top portion 17 is formed as an integral part of the closure 13 and afterwards partially severed on the line 18 leaving an unsevered section 17a which serves as a hinge permitting the part 17 to be turned upward for the introduction of material into the inner container 12. After the loading of the container 12 the part 17 may be cemented in closed position. The closure is recessed at 19 as in the first described construction and the functioning of the device is in other respects similar to the structure first described.

It will be apparent that instead of molding the part 17 fully integrally attached to the remainder of the closure and then partially severing it on the line 18, the finished construction may be obtained by fitting the mold with a suitable septum so that the part 17 will be formed integral with the remainder of the closure only at the hinge part 17a.

Figs. 6 and 7 illustrate a further modification of the closure member of the container. Here the outer and inner containers 21, 22 are formed as before and the closure 23 is formed in one piece comprising the annular part 24, skirt 25, cap wall 26 and top 27. In this case, however, the thin wall 27a is formed with a diametral slit 28 through which a filling tube can be forced to load the inner container 22. Preferably the wall 27a is molded with a slight top depression 28a to facilitate application of sealing cement after the loading.

When the material to be packaged in the inner

container is of such a nature that it will not be injured by sterilizing temperatures it can be introduced into the inner container before the latter is attached to the closure and for such uses the container structure can be formed as shown in Fig. 8 where the outer and inner containers 31 and 32 are fitted with an integrally formed closure 33 similar to that shown in Fig. 1 except that the central cap portion of the structure has all of its parts fully integral as initially formed.

It is to be understood that the invention is not limited to the specific forms of construction which have been shown and described but can be embodied in various other equivalent structures within the proper bounds of the appended claims.

What is claimed is:

1. In a multiple container structure, the combination with an outer container having an opening affording access to the interior thereof and a smaller container also formed with an access aperture and normally disposed within the outer container with its apertured portion projecting outward through the access opening of the outer container, of a closure common to the two containers comprising an annular part highly resistant to stretch overlying the access opening of the outer container, an elastic skirt depending from the periphery of the annular portion and having a liquid tight engagement with the outside surface of the outer container and a central cap having a top portion overlying and closing the access aperture of the inner receptacle and an elastic side wall portion embracing the outside surface of the inner receptacle with a liquid tight engagement, the said side wall portion of the cap being joined to the inner side of the said annular part and being substantially less resistant to stretch than the latter, whereby downward pressure applied to the top portion of the closure cap draws the side wall of the cap out of contact with the inner receptacle and disengages the latter from the closure.

2. A multiple container structure as claimed in claim 1 in which the top of the cap portion of the closure is a separately formed part, whereby it can be secured to the remainder of the closure to close the inner receptacle after the latter is attached to the closure.

3. A multiple container structure as claimed in claim 1 in which the closure constitutes an integral structure and the top of the cap portion is formed with a filling slit which can be sealed shut after the inner receptacle is attached to the closure.

4. A closure for at least two containers wherein one container is appreciably smaller than and is received within the other and both containers have access apertures that can be positioned in adjacent relation, said closure comprising a relatively thick annular elastic member having a dependent skirt associated therewith for sealing engagement with the access aperture of the outer of the containers, said elastic member having an elongate relatively thin walled hollow protruding elastic section associated therewith intermediate the margins thereof, with the outer end of such section being sealed, said section being adapted to engage with and seal the access aperture of the inner of said containers, said closure having a recess formed in its outer surface at the connection

between said elastic member and said elastic section to facilitate distortion of said section and discharge of the inner of said containers.

5. A closure for at least two containers wherein one container is appreciably smaller than and is received within the other and both containers have access apertures that can be positioned in adjacent relation, said closure comprising a relatively thick annular elastic member having a dependent skirt associated therewith for sealing engagement with the access aperture of the outer of the containers, said elastic member having an elongate relatively thin walled hollow protruding elastic section associated therewith intermediate the margins thereof, said section being adapted to engage with the access aperture of the inner of said containers, said closure having a recess formed in its outer surface at the connection between said elastic member and said elastic section to facilitate distortion of said section by pressing said section inwardly of the closure.

6. A closure as in claim 5 wherein a separate cap is provided for the outer end of said elastic section.

7. A closure as in claim 5 wherein said recess is of V-shape in section and is continuous.

8. A closure for at least two containers having a common top or cap wherein one container is received within the other and one container contains a solute whereas the other container contains a solvent solution, including an elastic member adapted to be positioned in sealing engagement with the outer of the containers, and having a continuous substantially annular weakened portion provided in the outer surface thereof, the inner surface of such member within the confines of said weakened portion being recessed to engage with the inner of said containers and to be disengaged from the inner container by an inwardly directed distorting force exerted on the closure and distorting same axially inwardly of the outer container.

9. In combination, an outer container, an inner container, both of said containers having open ends positioned adjacent each other, and a common closure for said containers, said closure comprising an elastic member in sealing engagement with the open end of said outer container, a portion of the inner surface of said member being recessed and being engaged with and closing the open end of said inner container in the normal position of the said closure, said member having a groove of sufficient depth and extent formed therein radially outwardly of said recess to facilitate inward movement of the recessed portion of said member to permit relaxation of the engagement of said recess with said inner container.

WILLIAM A. NOSIK.

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