Oct. 25, 1955 W. A. NOSIK 2,721,552

MULTIPLE CHAMBER CONTAINER

Filed March 29, 1954

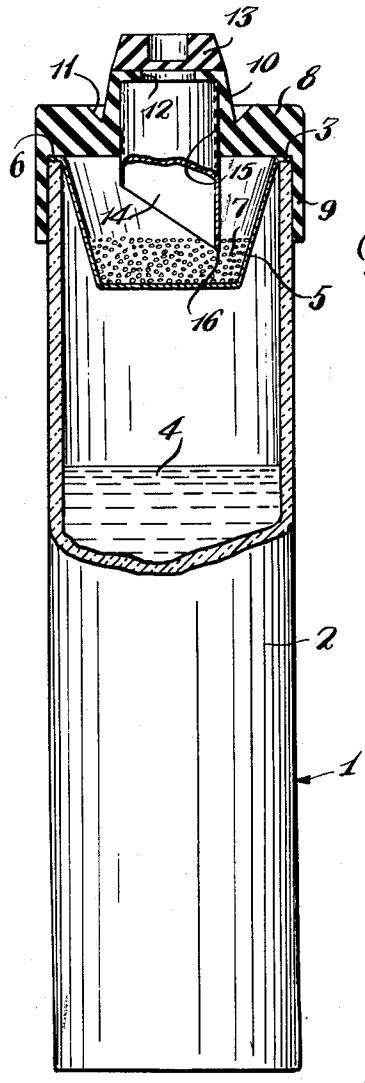


FIG. 1

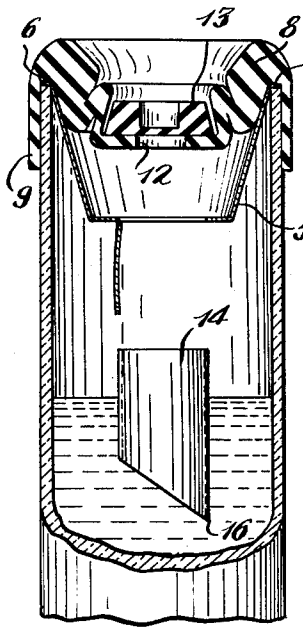


FIG. 2

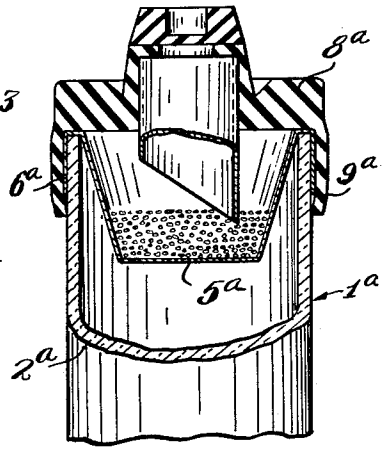


FIG. 3

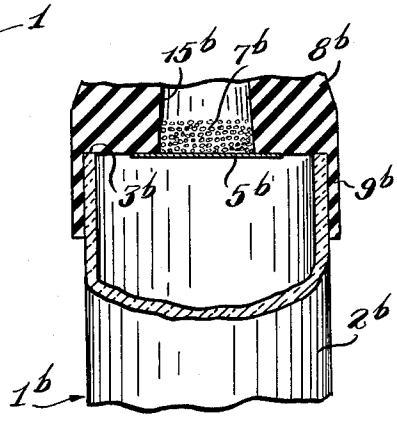


FIG. 4

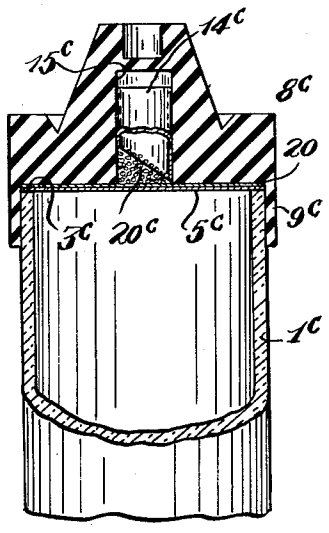


FIG. 5

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United States Patent Office 2,721,552 Patented Oct. 25, 1955

2,721,552

MULTIPLE CHAMBER CONTAINER

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Application March 29, 1954, Serial No. 419,379

4 Claims. (Cl. 128—272)

This invention relates to multiple chamber containers, and especially to containers which, for example, are adapted to receive a sterile liquid in one chamber thereof and to receive a medicament in a second chamber thereof. The container is adapted to release the medicament into the dispersing liquid by changing the multiple chamber container into a unitary sealed container when the medicament is to be used, and the resultant material can be withdrawn, for example, from the unitary container by a hypodermic needle.

The present invention relates to the general type of container and closure disclosed in and covered by my previous Patent No. 2,495,942, issued January 31, 1950. Such container comprised an outer enclosure member, and a deformable closure or cap member was engaged with the outer container and formed a sealed unit therewith. A second chamber forming member was releasably engaged by the deformable closure member in the patented container and provided therewith a second compartment in which the medicament could be initially carried for release when the closure member was depressed or deformed at the time of use of the contents of the original multiple chamber container.

One difficulty in making multiple chamber containers of the class referred to is that it is extremely important that the chambers in the container be initially tightly and effectively sealed from each other and that the rupture or breaking of one chamber in the container to make a unitary container therefrom does not in any manner harm or break the seal of the unitary resultant container. It also is important that the contents of the various chambers in the container be easily loaded therein, and that the contents of the container be available for withdrawal therefrom without effecting the original sterile nature of the contents of the multiple chamber container, if medicants, or similar materials are received therein. The two chambers must be totally and permanently sealed both from the atmosphere and from each other.

Inasmuch as containers of the type referred to are made and used in large quantities, it is likewise necessary that the multiple chamber containers be produced at relatively low cost and be adaptable to large scale manufacture by conventional apparatus, insofar as is possible.

The general object of the present invention is to provide a new and improved multiple chamber container wherein a breakable diaphragm is used in combination with one portion of the container for providing multiple chambers in the container.

Another object of the invention is to make a multiple chamber container wherein all components of the container are made from the same plastic material and where the different portions of the container can be readily sealed with relation to each other, for example, by application of heat thereto.

Another object of the invention is to make a multiple container from a minimum number of parts and wherein one portion of a chamber wall in the container is

made from an easily broken plastic diaphragm which can be ruptured by application of external pressure to a deformable closure member which forms one chamber in the container with the breakable diaphragm of the container.

Yet another object of the invention is to make a multiple chamber container having a positive action for forcing a piercing or breaking member through a diaphragm initially dividing the container into two compartments.

A further object is to make a container from a tubular member, a deformable closure member, and a diaphragm member all of which are made from a plastic material, such as polyethylene.

The foregoing and other objects and advantages of the invention may be made more apparent as the specification proceeds.

For a better understanding of the invention, reference should be had to the accompanying drawings wherein:

Fig. 1 is an elevation, partially broken away and shown in vertical section of one currently preferred embodiment of the principles of the invention;

Fig. 2 is a section similar to Fig. 1 only with the deformable closure member of the container shown in its depressed position and with the container made into a unitary chamber container;

Fig. 3 is a fragmentary vertical section through a modified embodiment of the container of Fig. 1;

Fig. 4 is yet a further fragmentary vertical section of another modification of the multiple chamber container of the invention; and

Fig. 5 is a fragmentary vertical section of yet a further embodiment of the invention.

When referring to corresponding parts in the accompanying drawings and the following specification, similar numerals will be used to facilitate comparison between these parts in the drawings and specification.

The present invention in general relates to a multiple chamber container comprising a receptacle which has an opening therein affording access to the interior of such receptacle, an elastic deformable closure member is in sealed engagement with the outer receptacle adjacent the access opening therein and extending away therefrom, and a thin easily broken diaphragm is sealed across intermediate portions of the receptacle and the elastic deformable closure member or diaphragm to divide the container into two compartments or chambers, a portion of the deformable closure member being movable towards the receptacle to break the diaphragm to form one unitary chamber from the original multiple chambered container.

One important feature of the invention resides in forming all of the components of the multiple chamber container from the same plastic material and one example of such plastic material is polyethylene. Polyethylene is a high melting point wax and substantially rigid members, flexible members, and membranes or diaphragms can be formed from such material and the various parts made therefrom can be readily sealed in engagement with each other to provide closed receptacles, containers or chambers therefrom. Other similar plastic materials may be used in making the container of the invention.

Reference now should be had to the details of the structure shown in the drawings, and a multiple chambered container is indicated as a whole by the numeral **1**. This container **1** includes a receptacle **2** which in this instance is shown as more or less of a test tube, or tubular shaped member having an access opening, or an open end **3** provided at what is shown to be the upper portion of such receptacle **2**. The receptacle **2** is shown as receiving, for example, a sterile liquid such as water **4** therein and

after such material has been placed in the receptacle 2, then a cup shaped membrane or diaphragm 5, which has an edge flange 6 thereon, is placed in telescopic engagement with the receptacle 2 with the flange 6 engaging the edge of the access opening 3. This flange 6 may be suitably sealed to the receptacle 2 by application of heat in a proper manner to the assembled cup and receptacle. Inasmuch as a second receptacle is to be formed in association with the diaphragm 5, the second material, which may be a solid medicament 7, may be positioned in the cup 5, which medicament 7 is to be thereafter mixed with the liquid 4 in the receptacle 2 for use at a later time.

A second chamber is formed in the container 1 by means of an elastic deformable closure member 8 that has a dependent flange 9 thereon in telescopic or overlapping engagement with the upper end of the receptacle 2 to engage the closure member 8 with the receptacle. Usually such flange 9 would be in sealed engagement with the peripheral portion of the receptacle 2 adjacent the access opening 3 therein. The closure member 8 has a boss 10 extending upwardly therefrom and a recess or other type of relieved portion 11 is provided around the base of the boss 10 to provide a weakened zone in the closure member 8 to permit deflection of such closure member in towards receptacle 2, as hereinafter described. If desired, the upper end of the boss 10 may be apertured as at 12 and a sealing cap 13 is shown in sealed engagement with such hole or aperture 12 in the boss 10 to close the opening therethrough. Thus the medicament material 7 can be inserted into the cup 5 through the hole 12 after the closure member 8 has been assembled with the receptacle 2, if desired.

A positive acting means is provided in the container 1 to change it from a multiple chambered container over to a unitary chambered container when it is desired to mix the material 7 with the liquid 4. Thus Figs. 1 and 2 of the drawings clearly show that a tubular piercing member 14 is in removable engagement with a bore 15 provided in the boss 10. Usually this bore 15 is of such a diameter with relation to the diameter of the piercing member 14 that the member 14 can be readily but snugly engaged with the bore 15 and be retained in engagement therewith when the closure member 8 is positioned as shown in Fig. 1. This bore 15 in the boss 10, with the recess 11, provides a center portion in the closure member 8 that can be readily deflected axially of the container 1 so that a pointed lower end 16 provided on the piercing member 14 can be manually forced through the diaphragm 5 and tear a section therefrom, as indicated in Fig. 2. Hence the contents initially retained by the diaphragm 5 in one chamber will automatically be available for mixture with the liquid 4, as indicated in Fig. 2. Normally when the closure member 8 has been manually or otherwise forced axially towards the receptacle 2, as indicated in Fig. 2, the piercing member 14 will be completely released by the bore 15 and the closure member 8 so that such piercing member can fall down into the receptacle 2 after the diaphragm 5 has been punctured and aid in mixing the material 7 and liquid 4 when the receptacle 2 is shaken.

It will be noted that the flange 9 of the closure member 8 and its sealed engagement with the receptacle 2 has not been broken or even stressed noticeably by the puncturing and releasing action effected by axial inward movement of the center portion of the closure member 8. Hence the multi-chambered container of the invention has been altered over into a unitary chamber so that any originally sterile materials received within the container 1 will still be maintained in their sterile condition although in a mixture ready for use at any desired time. Normally the different materials received in the container 1 would only be mixed immediately prior to use thereof. A conventional hypodermic needle or similar instrument can readily be forced through the cap 13 on the boss 10 and be brought into engagement with the contents of the receptacle 2 to withdraw them therefrom for use.

Fig. 3 of the drawings shows a modified container 1*a* of the invention wherein a cup-shaped diaphragm 5*a* is provided with an elongated doubled back flange 6*a* extending down along the periphery of the receptacle 2*a* provided in this embodiment of the invention. A closure 8*a* is provided and is engaged with the receptacle 2*a* and preferably overlaps the axially extending portion of the flange 6*a*, as indicated in the drawings. Thus the flanges 6*a* and 9*a* of the diaphragm member 5*a* and that of the closure member 8*a*, respectively, can be sealed to each other and to the receptacle 2*a* at one sealing operation, if desired.

In Fig. 4, a further modification of the invention is shown and is referred to as a container 1*b*. In such instance, a test tube type of a receptacle 2*b* is provided and has a flange 9*b* of a closure 8*b* suitably secured and sealed thereto. A breakable diaphragm 5*b* is suitably sealed to a lower and inner portion of the closure 8*b* to cover the lower end of a bore 15*b* therein. The upper portion of the closure 8*b* is of the same general construction as the closure 8 so that when such closure 8*b* is axially moved in the container towards the receptacle 2*b* and forced to overlap such receptacle on the inner surface thereof, the diaphragm 5*b* would be ruptured by the tensional forces applied thereto, or else the seal of such diaphragm to the closure member would be broken over a wide area thereof so that medicament material 7*b* received in the bore of the closure would be released therefrom for mixture with the liquid material or other material received in the receptacle 2*b*. It will be realized that in some instances the diaphragm 5*b* might be made to extend directly across an access opening 3*b* provided in the receptacle 2*b* and be torn from engagement therewith, or be broken by axially inward movement of the base portion of the closure member 8 or perforating member when it is desired to mix the contents of the initially separate contents of the container 1*b*.

A container 1*c* is shown in Fig. 5 and in such instance, it will be noted that a unitary type of a closure member 8*c* is provided and preferably has a dependent flange 9*c* that is in sealed engagement with the tubular part of the container 1*c*. In this embodiment of the invention, a diaphragm or membrane 5*c* is positioned over an access opening 3*c* of such receptacle and normally would be in sealed engagement therewith. A second diaphragm 20 is in suitable sealed engagement with a lower portion of the closure 8*c* and the medicament material 7*c* is held in position by such upper diaphragm 20. Usually a piercing member, such as a tube 14*c*, is received in a bore 15*c* provided in the closure 8*c*. Thus again part of the closure 8*c* can be moved or forced axially inwardly of the receptacle 2*c* and both the diaphragms 5*c* and 20 will be positively broken by longitudinal movement of the piercing member 14*c* and the contents of the two chambers initially provided in the container 1*c* can easily be mixed with each other.

The punch or piercing members used in the containers may be sealed to the closure member in the container to prevent the presence of a loose member within the container when used.

From the foregoing, it will be seen that a substantially rigid container is provided with a deformable closure member in each embodiment of the invention and that associated therewith is some type of a thin, easily broken diaphragm that separates the initial chamber formed by the closure and receptacle into two chambers. Usually some positive type of a breaking or piercing member would also be provided to insure that the diaphragm in the container would be broken when desired. All of these various components of the containers of the invention are made from similar plastic materials and the different components thereof preferably would be heat sealed or fused into engagement with each other by any known electrical

type sealing apparatus, or operation to provide the desired air-tight, liquid or water-tight antiseptic positioning of the contents of the container. In some instances, suitable cements may be used for providing the desired seals for the different components forming the containers of the invention. These containers are of substantially standard construction and can be relatively inexpensively made, filled and processed in large quantities. The material forming the container usually is of such a nature as can stand sterilization of the contents of the container even after they are inserted into the plastic containers of the invention.

From the foregoing, it is contended that the various objects of the invention have been achieved.

While several complete embodiments of the invention have been disclosed herein, it will be appreciated that modification of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. A multiple chambered container comprising a receptacle having an opening affording access to the interior thereof, a thin rupturable diaphragm sealed across said access opening to said outer receptacle to form a chamber therewith, an elastic deformable closure member engaging said outer receptacle at said access opening therein and forming with said outer receptacle and said diaphragm a second chamber in the container, said closure member having a center bore extending thereinto from its inner end and having a boss protruding from its outer surface, said closure member having a weakened zone at the base of said boss to facilitate inward deflection of said boss, and a piercing member engaged with the bore of said closure member and extending therefrom for contacting and piercing said diaphragm when said boss of said closure member is deformed towards said first chamber.

2. An all plastic multiple chamber container comprising a receptacle having an access opening therein, a cup shaped thin sheet member having a flange in sealed engagement across said access opening to form a chamber with said receptacle, a deformable closure having a dependent flange in sealed engagement with the said receptacle and extending therefrom at the access opening therein to form with said sheet member a second chamber, and a piercing member positioned adjacent said sheet member and releasably carried by said closure, said piercing member being positioned in said second chamber, a center portion of said closure being movable independently of said dependent closure flange towards said first chamber by pressure applied thereto to force said piercing member through said sheet member and form a unitary sealed chamber from said two first named chambers.

3. An all plastic multiple chamber container comprising a receptacle having an access opening therein, a thin sheet member in sealed engagement with and extending across said access opening to form a chamber with said receptacle, a deformable closure in sealed engagement with the said chamber and extending therefrom at the access opening therein to form with a portion of said chamber a second chamber, and a tubular piercing member with a pointed end adjacent said sheet member releasably carried by said closure and positioned thereby in said second chamber, a portion of said closure being movable towards said first chamber by pressure applied thereto to force said piercing member through said sheet member and form a unitary sealed chamber from said two first-named chambers.

4. An all plastic multiple chamber container comprising a tube having one open end, a diaphragm in sealed engagement with said tube and covering said open end to form a chamber with said tube, a deformable closure in sealed engagement with said tube and extending therefrom at the open end thereof to form a second chamber with said tube and diaphragm, and a piercing member with a pointed end adjacent said diaphragm releasably carried by said closure and positioned thereby in said second chamber, a portion of said closure being movable towards said first chamber by pressure applied thereto to force said piercing member through said diaphragm without damage to the seal between said closure and tube, deformation of said closure towards said tube releasing said piercing member from engagement with said closure.

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