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FLUID RECEPTACLE

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Fig. 1.

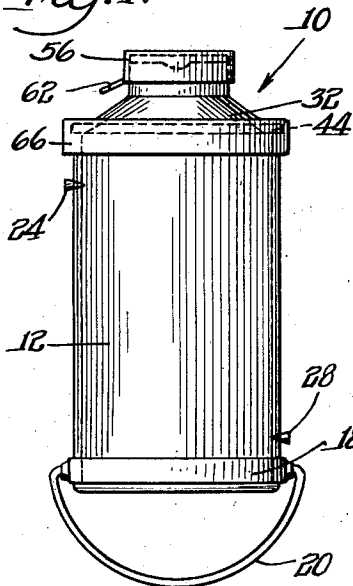


Fig. 2.

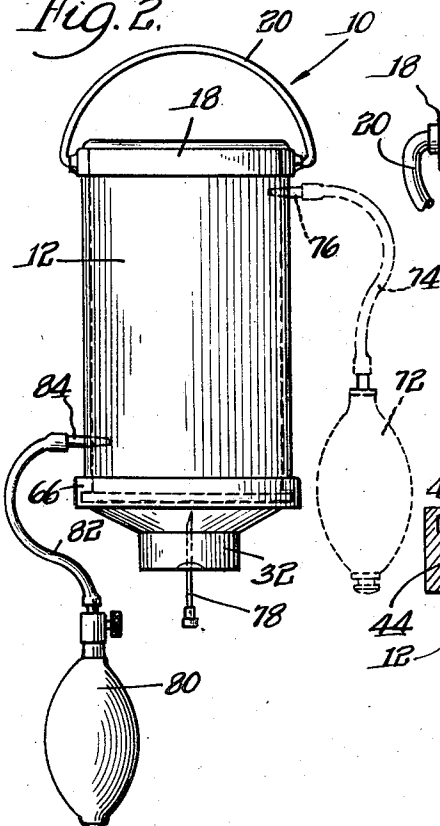


Fig. 3.

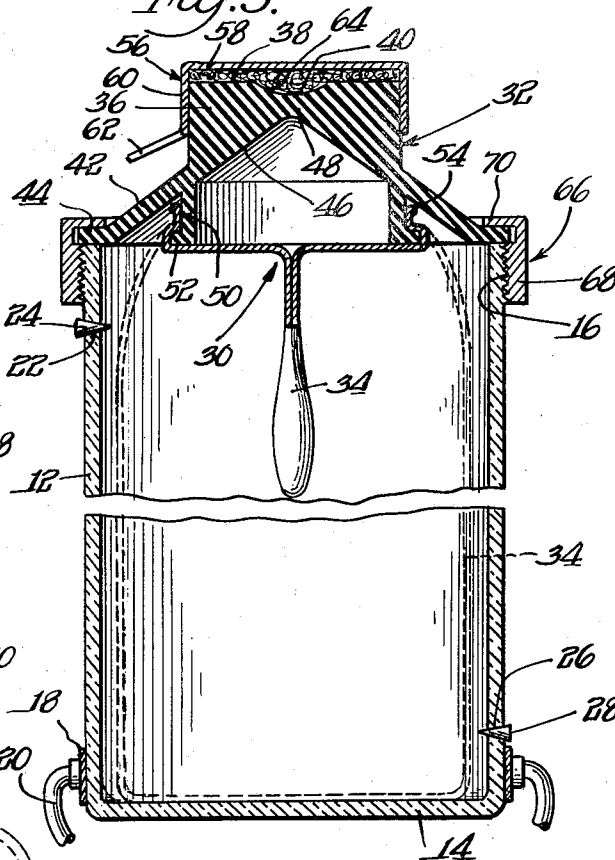
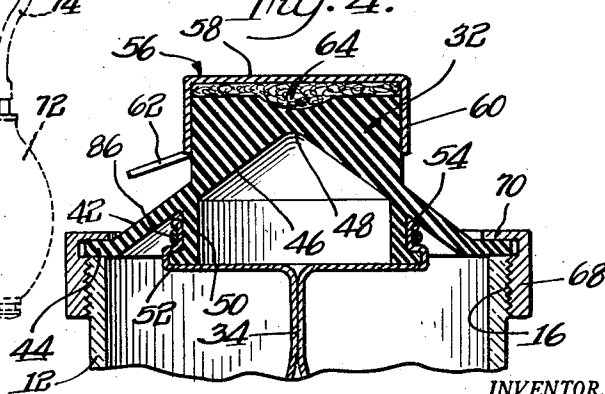


Fig. 4.



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FLUID RECEPTACLE

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4 Claims. (Cl. 128—272)

This invention relates to fluid receptacles, and more particularly to disposable fluid receptacles which are internally aseptic.

The present invention is particularly adapted for use in collecting, storing and dispensing fluids which deteriorate very quickly when exposed to the atmosphere. A common example of such a material which must be handled in an aseptic manner and in the absence of air is blood. Since the present invention has particular utility when utilized in the storing and collection of blood, the present invention will be described in conjunction therewith, but it is to be understood that the invention has wider applications which will be apparent to those skilled in the art.

Heretofore, particularly in connection with blood transfusions, containers, such as glass jars, have been employed to receive the blood. After the blood has been withdrawn, these jars must be thoroughly cleaned and sterilized before they are used again. It has not been uncommon to experience considerable difficulty in properly cleansing these jars. Furthermore, jars of this type represent considerable bulk, and accordingly shipping costs are a major item of expense in their use. In addition, the breakable nature of the containers increases shipping costs due to the special packaging that must be used. The space occupied by a supply of such jars is large as compared with the space that would be occupied by collapsible containers.

Accordingly, it is an object of the present invention to provide improved containers for receiving and storing fluids, such as blood, which deteriorate very quickly when exposed to the atmosphere.

Another object of the invention is to provide a container for collecting and storing readily deteriorative fluid, including a sealed elastic fluid-receiving section made of inexpensive disposable material and having a readily accessible self-sealing section adapted to be punctured by a needle.

Still another object of the invention is to provide an improved substantially rigid outer container to be used with an elastic inner container which is sealed and internally aseptic.

Yet another object of the invention is to provide a readily collapsible and elastic inner container which is sealed and internally aseptic, the inner container being capable of storage in a small space during shipment and storage at the point of use.

A further object of the invention is to provide an improved cap or self-sealing section for use with hermetically sealed and internally aseptic containers.

These and other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawing. In the drawing wherein like reference numerals have been used to indicate like parts throughout:

Fig. 1 is a side elevational view of a fluid receptacle embodying the principles of the present invention;

Fig. 2 is a side elevational view similar to Fig. 1

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and showing the fluid receptacle in the inverted fluid distributing position;

Fig. 3 is an enlarged partial view in central vertical section of the receptacle shown in Fig. 1; and

Fig. 4 is a partial view similar to Fig. 3 and showing a modified form of the invention.

Referring now to the drawing and particularly to Figs. 1 through 3 there is shown a fluid receptacle made in accordance with and embodying the principles of the present invention, the receptacle generally being designated by the numeral 10. Receptacle 10 includes an outer container 12 which is preferably rigid. Any suitable material possessing the necessary strength and rigidity can be utilized in fabricating container 12. Examples of suitable materials of construction are glass, plastics, metals, and the like. A transparent or translucent material is a preferred material of construction for the outer container 12.

In the form of the invention shown in the drawing, container 12 is cylindrically shaped and closed at one end by a wall 14 and open at the other end as may be best seen in Figure 3. Adjacent the upper end and the outer wall of container 12 are formed a plurality of screw threads 16 which are adapted to cooperate with complementary shaped screw threads. Affixed to the outer container adjacent the lower end as viewed in Figs. 1 and 3 is a support band 18 which completely encircles and grips the outer container 12. Pivotaly attached to band 18 is a bail or handle 20 which may be used suspending the outer container in operative position. Formed in a wall of container 12 adjacent the screw threads 16 is a tapered hole designated by the numeral 22. The hole 22 is bored or otherwise formed in the container wall, the smaller end of the hole being positioned radially inwardly. This construction permits ready insertion and removal of a complementarily tapered plug 24 or other suitable fitting. On the opposite side of container 12 and immediately above band 18 is formed another tapered hole 26 similar to tapered hole 22 and having the smaller opening of the hole directed radially inwardly. A suitable plug 28 is provided to seal hole 26 when desired. The purpose and use of holes 22 and 26 will be more fully described hereinafter.

Positioned within the outer container 12 is an inner container generally designated by the numeral 30 and including a cap 32 and a fluid-retaining body portion or bag 34. Cap 32 is made of a resilient rubber-like material and has a substantially cylindrical body 36 which possesses an appreciable thickness. The top surface 38 is substantially flat and is provided with a circular depression 40 in the center thereof for purposes set forth hereinafter.

Extending peripherally around body 36 is a first flange 42. As may be best seen in Fig. 3, flange 42 is directed outwardly and away from body 36 at an angle of about 45°. The thickness of flange 42 is such that flange 42 retains its shape when the outer container 12 is evacuated and flange 42 must withstand atmospheric pressure. Extending radially outwardly from flange 42 is a sealing flange 44, flange 44 extending in a direction substantially perpendicular to the axis of body portion 36. As is best seen in Fig. 3, the outer diameter of flange 44 is equal to or slightly greater than the external diameter of outer container 12 whereby flange 44 can be sealed against the upper edge of container 12.

Body portion 36 has formed on the lower side thereof a cone-shaped depression defined by the surface 46, surface 46 in effect being a continuation of the inner wall of flange 42. The apex of the surface 46 is rounded as at 48 and is spaced away from the deepest portion of depression 40. The thickness of body 36 between depression 40 and apex 48 is the portion through which a

needle such as a hypodermic needle is inserted when ejecting fluid into bag 34 or withdrawing fluid therefrom. The thickness at this point must be such that the rubber-like material from which cap 32 is formed will be self-sealing when the needle is withdrawn. The necessary thickness of the material will depend on the type of material from which cap 32 is formed. Depression 40 tends to guide the needle toward apex 48 and also aids in maintaining this area sterile and antiseptic as will be discussed more fully hereinafter.

Depending downwardly from body 36 is another flange 50 which is substantially cylindrical in shape to surround the area of the self-sealing section. The walls of flange 50 are substantially parallel to the longitudinal axis of body 36. The inner diameter of flange 50 is substantially equal to or slightly less than the outer diameter of body 36 and this flange is spaced inwardly from the outer receptacle. Extending radially outwardly from the lower edge of flange 50 is a retaining flange 52. It is flange 52 that aids in retaining bag 34 in operative relationship with the cap 32. More specifically, the bag 34 has an opening that is surrounded by a lip 54, the lip 54 being adapted to be pulled over retaining flange 52 up onto the outer wall of flange 50 to support the bag therefrom independently of the outer receptacle. Any suitable means such as an adhesive or vulcanization can be utilized to form a seal between bag 34 and the flanges 50 and 52 of cap 32. This seal must be air-tight and capable of withstanding the mechanical stresses that will be imposed thereon when bag 34 is filled with fluid.

The inner container or bag 34 is made of an elastic material such as rubber or a suitable elastic plastic. The inner portions of cap 32 and the inside of bag 34 are aseptic, this condition being achieved by any suitable treatment such as applying aseptic materials to the inner surface of these parts. During the manufacture, the inner container 34 and associated parts are evacuated to remove as large a proportion of air as possible therefrom. This aids in preserving the material such as blood collected therein and results in the contracted condition of inner bag 34 as shown in the drawings. When fluid is inserted into inner container 34, it expands to the position shown in dotted lines in Fig. 3 due to its elasticity.

If the material to be collected and stored in container 34 is blood, a quantity of suitable anti-coagulant may be inserted within bag 34 during manufacture thereof. An example of a suitable anti-coagulant is a 100 cc. solution containing 1.5 grams of dextrose, 1.4 grams of sodium citrate, and 0.5 gram of citric acid.

The upper surface of body 36 is covered with a closure member 56 including a circular top 58 having a diameter slightly greater than the diameter of body 36 and a depending flange 60 extending around top 58. The internal diameter of flange 60 is slightly less than the external diameter of body 36 whereby closure member 56 fits tightly upon body 36. An outwardly extending handle 62 is provided at one point on the lower edge of flange 60 and serves as a means for quickly removing member 58 from body 36. Placed in the upper portion of closure member 56 is a body 64 of absorbent material. The thickness of material 64 is greater in the center thereof in order to fill the depression 40 in cap 32. Distributed throughout the body of material 64 is a quantity of antiseptic compound such as merthiolate which will render the surfaces with which it comes in contact aseptic. Preferably the antiseptic compound is mixed with glycerine or modified glycerine. Since the material 64 is highly absorbent, it will retain a relatively large quantity of aseptic compound for a long period of time.

When it is desired to use the container to receive a fluid such as blood, the cap 32 is placed in position on the outer container 12 as shown in the drawings. More specifically, the flange 44 is positioned upon the upper edge of container 12 with the inner container 34 positioned within outer container 12. An annular clamping

member 66 is provided to clamp flange 44 against container 12. Member 66 includes an annular body 68 having a length greater than the length of the threaded portion 16 on container 12 and provided with threads shaped complementarily to thread 16. Formed on the upper end of body 68 is an inwardly directed flange 70 which is adapted to overlap the flange 44 and upper edge of container 12. When clamping member 66 is screwed downwardly with flange 44 positioned between flange 70 and the upper end of container 12, an air-tight seal is made between flange 44 and the upper edge of container 12 thereby sealing container 12 at this point. Next, the closure member 56 is removed by grasping handle 62 and pulling upwardly. This removes the closure member 56 and the associated body of absorbent material 64. The aseptic compound in material 64 renders the top of cap 32 aseptic, the surface of depression 40 in particular being aseptic since the increased thickness of material 64 provides a large quantity of aseptic compound at this point. The usual hypodermic needle is pushed through cap 32 in the vicinity of depression 40 and inserted until it extends into the inner aperture of cap 32. Connection is then made between the hypodermic needle and a source of fluid such as the arm of a blood donor. If the blood is to be collected under gravity, one or both of the plugs 24 and 28 is removed. If it is desired to collect the blood under vacuum, plug 24 is placed in position and a vacuum bulb such as bulb 72 in Fig. 2 is attached by means of a flexible hose 74 and a tapered fitting 76 to the aperture 26. The space between inner container 34 and outer container 12 can be evacuated partially by operation of bulb 72. As the blood is collected in container 34, this container expands the amount necessary and, if desired, can expand to fill inner container 12. After the blood has been collected, the hypodermic needle is removed from cap 32 and the material of cap 32 contracts and collapses to close and seal the aperture formed by the passage of the needle therethrough. The closure member 56 is then placed in position and the aseptic compound in material 64 renders the top of cap 32 aseptic again. The blood may be stored in this condition in the usual manner.

When it is desired to administer the blood as during a transfusion, closure member 56 is again removed by grasping handle 62 and pulling upwardly. An aseptic surface is secured in and around depression 40 and, accordingly, this area is in condition to receive a hypodermic needle in an aseptic manner. A hypodermic needle such as needle 78 in Fig. 2 is inserted through cap 32, and the container is preferably inverted as shown in Fig. 2. If the blood is to be administered by gravity, one or both of the plugs 24 and 28 are removed. On the other hand, if it is desired to utilize positive pressure, plug 28 is retained in operative position and a pressure bulb 80 is connected by means of a flexible line 82 and a tapered fitting 84 to aperture 22. Due to the air-tight seal between flange 44 and the upper edge of container 12, a positive pressure can be built up in the space between container 12 and inner container 34. This positive pressure is particularly useful if the blood must be administered quickly as in cases of severe shock.

A modified manner of attaching the elastic inner container 34 to the cap 32 is illustrated in Fig. 4 of the drawing. In this form of the invention, upper edge 54 of inner container 34 is snapped over flanges 52 and 50. A heavy rubber band 86 having a normal diameter substantially less than the outside diameter of flange 50 is positioned as shown in Fig. 4 to grasp the inner container 34 in operative position upon flange 50. No adhesive or other additional sealing means is utilized in this form of the invention, the entire sealing action being achieved by the elasticity of the upper end of inner container 34 and the rubber band 86.

It will be seen that there has been provided improved means for storing fluids that have a tendency to de-

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teriorate quickly when exposed to the atmosphere. As a specific example of such a material, blood has been utilized as an example. By using the present invention the fluid is protected from exposure to the atmosphere by using a hermetically sealed and substantially evacuated inner container. This is made possible by utilizing a cap 32 which though resilient and rubber-like retains its shape when under vacuum and by using an elastic inner container 34. The inner container and associated cap form a compact parcel for shipment and storage with the accompanying economy. The inner container and its associated parts are easily disposable yet are not breakable during storage and handling. Aseptic conditions are maintained internally of the inner container and on the surface of the cap which is to receive a hypodermic needle. Improved means is also provided for mounting the inner container within a rigid outer container in an air-tight manner.

Although certain specific examples of the invention have been shown for purposes of illustration, it is to be understood that various changes and modifications can be made therein without departing from the spirit and scope of the invention. Accordingly, the invention is to be limited only as set forth in the following claims.

The invention is hereby claimed as follows:

1. In a container, the combination of an open ended outer receptacle, an inner receptacle and a cap for sealing both of said receptacles, said cap including a rubber-like self-sealing body adapted to be punctured by a sharp instrument such as a needle, a flange depending from and surrounding the area of said self-sealing section adapted to be punctured by a needle and spaced inwardly from said outer receptacle, a second flange laterally

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offset with respect to said self-sealing section adapted for engagement with said outer receptacle, and said inner receptacle comprising an elastic bag attached over said first mentioned flange and supported thereby independently of said outer receptacle, said self-sealing section, bag, outer receptacle and said flanges cooperating to form a hermetically sealed container.

2. A container as claimed in claim 1 wherein said first mentioned flange depending from said self-sealing section is provided with a peripheral flange for holding said inner receptacle.

3. A container as claimed in claim 1 wherein said outer receptacle is provided with a clamping ring adjacent the open end thereof for clamping said last mentioned flange against the top surface of said outer receptacle.

4. A container as claimed in claim 1 wherein said second mentioned flange extends radially outwardly and downwardly from said self-sealing section.

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