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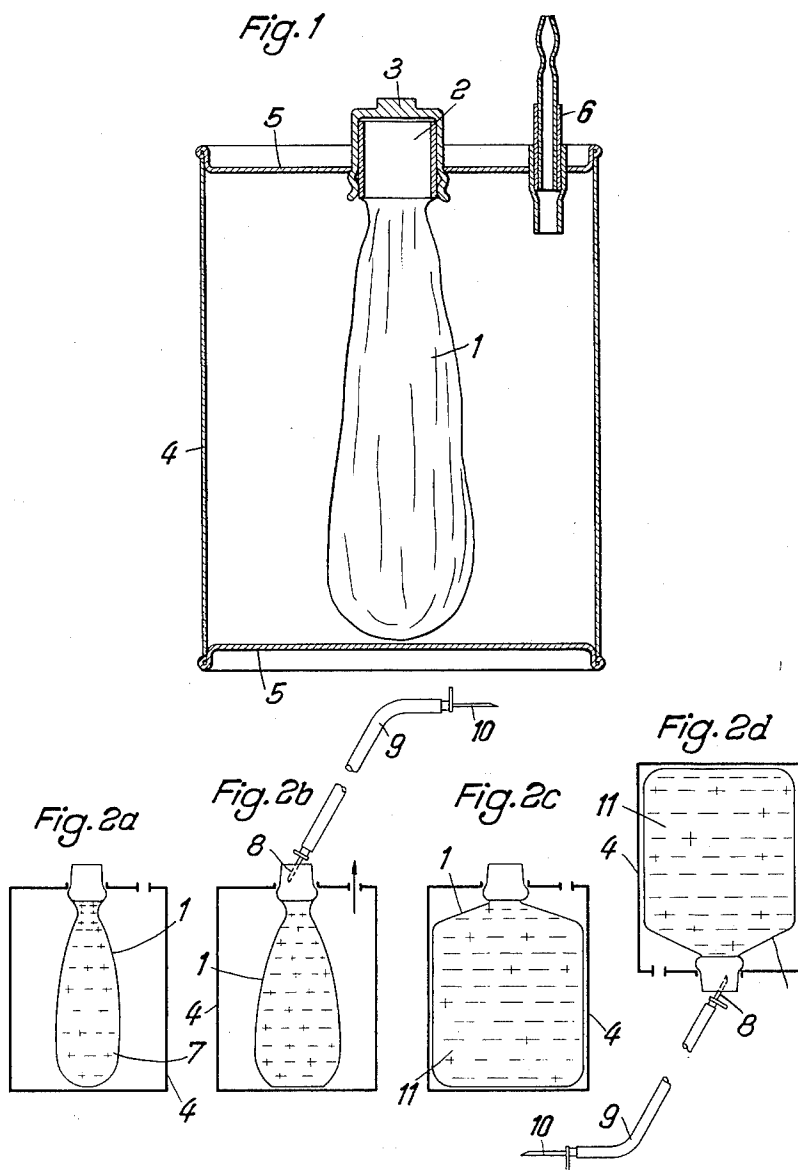
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CONTAINER FOR TAKING AND STORING OF BIOLOGICAL FLUIDS

Filed May 18, 1955

2 Sheets-Sheet 1



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Fig. 3a

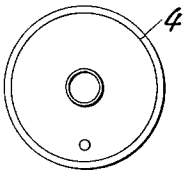


Fig. 3b

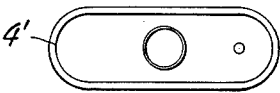


Fig. 4

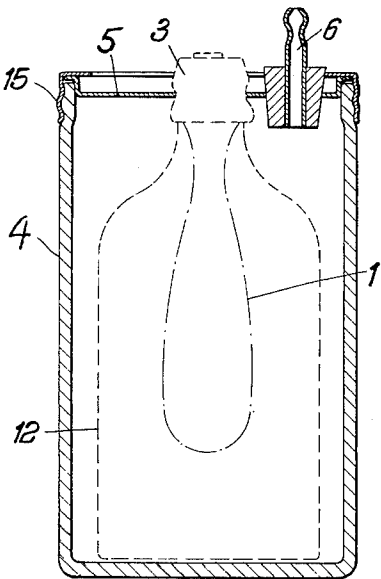
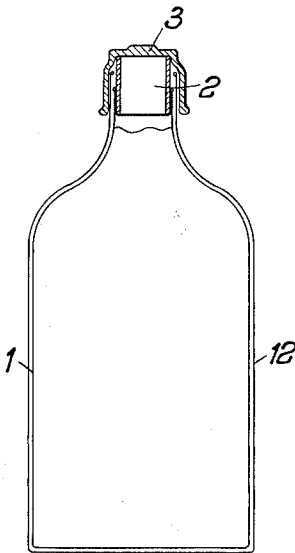


Fig. 5



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CONTAINER FOR TAKING AND STORING OF BIOLOGICAL FLUIDS

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8 Claims. (Cl. 128—276)

This invention relates to new and useful improvements in the taking and storing of biological fluids. The invention more particularly relates to a new device and method for taking and storing of biological fluids such as blood, blood-substitute solutions, infusion solutions, etc.

In accordance with conventional practices, blood is taken from donors and stored in sterilized glass bottles. Sterilized glass bottles are generally prepared to receive the blood by filling it with the necessary quantity of a stabilizer which prevents coagulation of the blood, as, for example, a sodium citrate solution, and heating it to about 120° C. The interior of the bottle is then connected to the interior of a vein of the donor by means of an infusion cannula system, i.e., a tube having a hollow hypodermic needle at each end. The blood is drawn relatively rapidly into the bottle by the vacuum produced upon cooling of the bottle.

In order to transfer the blood from the bottle to a patient, the procedure is reversed with the necessary pressure being established in the bottle by pumping air into the bottle through a second needle through a pierceable rubber closure which seals the bottle.

The use of conventional glass bottles in blood taking and storing, however, has considerable disadvantages. In the taking of the blood, the needle inserted in the vein of the donor is frequently obstructed by the collapse of the vein wall as the result of the strong suction in the bottle. Further, the rate of withdrawal cannot be uniformly and carefully controlled in the desired manner.

The glass bottles which are used for this purpose require a special construction and are therefore relatively costly. The same, due to economic considerations, must be reused several times. In order to reuse these bottles, a careful purification and sterilization must be effected with particular care being taken that all pyrogen is removed. Generally, this purification and sterilization may only be effected at specially equipped establishments, adding the cost of transportation and breakage to the over-all expense.

One object of this invention is a device for the taking and storing of blood which eliminates the above-mentioned disadvantages. This, and still further objects will become apparent from the following description, read in conjunction with the drawing, in which:

FIG. 1 is a vertical section of an embodiment of a device in accordance with the invention;

FIGS. 2a, 2b, 2c, 2d diagrammatically show the device of FIG. 1 in four different stages of use in the taking and transferring of blood;

FIG. 3a is a plan view of an embodiment of an apparatus in accordance with the invention;

FIG. 3b is a plan view of a further embodiment of a device in accordance with the invention;

FIG. 4 is a diagrammatic vertical section of a still further embodiment of a device in accordance with the invention; and

FIG. 5 is a diagrammatic side elevation partially in section of the protective casing of the device in FIG. 4.

The device in accordance with the invention has a thin, flexible, stretchable bag of rubber, plastic, or the like, which is provided with a tappable closure, preferably in the form of a tubular reinforced neck and a pierceable elastic plate, such as a rubber plate. The flexible bag is positioned in a substantially rigid fluid-tight container

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which is preferably transparent and has a gas-exhaust opening defined through one of its wall portions. The closure of the bag extends through a wall of the container in fluid-tight engagement therewith. Thus, the tubular, reinforced neck of the bag may extend through the gas-tight engagement with a hole in the cover of the container.

Referring to the embodiments shown in the drawing, as shown in FIG. 1, the bag 1 is of a thin, flexible, stretchable material such as rubber or plastic, and is positioned in the rigid fluid-tight transparent container 4. The bag 1, which is preferably of extremely thin transparent rubber or the like and which has the customary capacity of about 600 cc. is pulled over a tubular reinforcement neck 2 of glass, plastic, metal, or the like, which is closed by the pierceable rubber plate 3. The interior of the bag 2 is thus completely sealed and communication therewith can only be effected by piercing the rubber plate 3 with a hollow needle, as, for example, a hypodermic needle. The neck and closure portion of the bag 1 is similar in construction to closures of bottles and the like which are used to supply liquids for hypodermic needles.

The neck 2 extends through a hole in the cover plate 5 of the container 4, in fluid-tight engagement therewith with the plate 3 being positioned outside of the container. A gas-exhaust opening in the form of a nipple 6 is provided through the cover 5 of the container. A vacuum pump, such as a hand-vacuum pump may be connected by means of a rubber tube to the nipple 6 for evacuating the container 4 and thus expanding the stretchable bag 1. The container 4 itself may, for example, be constructed of glass or may, as shown, be constructed of a suitable transparent plastic, provided with reinforcements at its bottom and top sides. The container 4 may serve as an evacuating vessel for the filling of the bag 1 and at the same time as a protective container for the storage of the withdrawn blood.

In operation the bag 1 may be filled with, for example, 90 cc. of a 3% sodium citrate dextrose solution, as a blood stabilizer. The bag is substantially freed from air by evacuation and assembled in the container in the manner shown in FIGS. 1 and 2a and sterilized, as, for example, at a temperature of 120° C.

A conventional transfusion or infusion cannula may be used for the taking of the blood. The cannula consists of a sterile tube 9 with a hollow cannula needle, such as a hypodermic needle 8 attached to one end and a corresponding needle 10 attached to the other end. One of the needles is inserted in communication with the interior of the bag 1 by piercing the pierceable rubber plate 3. The other needle is inserted in the vein of the donor. The connection of the cannula to the device is shown in FIG. 2d. The nipple 6 is then connected to a vacuum pump such as a hand pump, and the container 4 is evacuated, causing an expansion of the bag 1 and a drawing of the blood into the bag 1. Withdrawal may be very carefully controlled by the regulation of the evacuation of the container 4 and the injurious irregular drawing out of the blood may be avoided. The blood is withdrawn until bag 1 fills the interior of the container 4 and rests against the sides thereof.

After the removal of the needle 8 and of the hand pump, the blood in the bag 1 may be maintained in the container 4 as shown in FIG. 2c for storage purposes.

In order to use the filled container as shown in FIG. 2c for transfusion purposes, the same is inverted and the needle 8 of the cannula inserted through the plate 3. Since the pump is removed from the nipple 6 and the nipple 6 itself may be removed merely leaving an opening to the interior of the container, the bag 1 may freely collapse without any back pressure or vacuum being formed. Thus, the flow of blood from the interior of the bag may be controlled merely by adjusting the height

of the container with respect to the patient. Alternately, if desired, the gas under pressure may be forced into the nipple 6 to control the transfusion rate.

After use, the blood bag 1 may be thrown away and the container 4 reused time and time again without any special precautionary or cleaning measures being necessary.

The container 4 may have a cylindrical shape as indicated in FIG. 3a, or may have any other desired shape, as, for example, a flattened shape as shown in FIG. 3b. In the case of such a flat shape, it is advisable to provide additional reinforcement if the jacket 4' is of plastic or of flexible material, as, for example, in the form of metal bands in order to prevent lateral crushing upon the evacuation.

In accordance with an embodiment of the invention a self-supporting protective casing, as, for example, a flexible, non-stretchable plastic material is provided surrounding the stretchable bag 1. Such an embodiment is shown in FIG. 4. In this embodiment the stretchable rubber bag 1 is permanently connected with the self-supporting but flexible protective casing 12, which are both connected to the common neck 2, as shown in FIG. 5. In all other respects the construction and operation are the same as described above in connection with the embodiment shown in FIG. 1. During the filling of the bag 1, however, the rubber bag 1 expands until it completely fills and rests against the inner wall of the self-supporting protective casing 12. After the completion of the filling, the blood bag 1, together with the protective casing can be removed from the container 4 by first removing the cover 5 of the container, which is sealed to the container at 15 and thereafter removing the neck portions 2 and 3 from the container cover 5. After removal, the container 4 may be used again without any special cleaning. The blood bag 1 in the protective casing 12 as shown in FIG. 5, may be used for the storage of the blood and for transfusion. The casing 12 is preferably not fluid-tight, so that the stretchable bag 1 may freely expand or contract therein without causing pressure or suction. This may be effected by providing small openings through the wall of the casing 12, etc.

After use, the bag 1, along with the casing 12, may be thrown away, or else for purposes of economy, the bag 1 may be removed from the casing 12 and the casing reused.

Due to the possibility of using the container 4 repeatedly in the embodiment shown in FIG. 4, it may be made of an extremely strong construction, as, for example, of heavy glass. The cover 5 of the container may be placed in fluid-tight engagement over the lower part, as, for example, by means of the closure ring 15.

As shown in FIG. 5, the stretchable bag 1 and the protective casing 12 are both pulled over the cylindrical reinforcement neck 2 of glass, metal, or the like. The closure 3 is in the form of a rubber cap, which sits over the reinforcement neck 2 on the outside of the bag 1 and protective casing 12, sealing the same together and

to the neck 2. The top of the closure is in the form of the flat, pierceable rubber plate 3.

While the invention has been described in detail with reference to the specific embodiments shown and described, various changes and modifications will become apparent to the artisan which fall within the spirit of the invention and the scope of the appended claims.

I claim:

1. Device for taking and storing biological fluids comprising a thin, flexible stretchable bag, having a substantially rigid tubular neck portion, a protective casing of flexible, but non-stretchable material positioned surrounding said bag, said bag and said protective casing being pulled over said substantially rigid neck portion and sealed thereto by tappable closure means, positioned over said neck portion, said casing being positioned surrounding said bag, so that between said bag and said casing a hollow space is formed which is substantially completely taken up when said bag is completely filled.

2. Device according to claim 1, in which said tappable closure means include a pierceable elastic plate.

3. Device according to claim 1, in which said bag is substantially free of air and contains a blood stabilizer.

4. Device according to claim 1, in which said flexible casing has a substantially transparent wall.

5. Device for taking and storing biological fluids comprising a thin, flexible, stretchable bag, having a substantially rigid tubular neck portion sealed with a pierceable elastic plate, a protective casing of flexible, but non-stretchable material, positioned surrounding said bag, said bag and said protective casing being pulled over said substantially rigid neck portion and sealed thereto in fluid-tight sealing engagement therewith by closure means having said pierceable elastic plate at its top, said casing being positioned to surround said bag, so that between said bag and said casing a hollow space is formed which is substantially completely taken up when said bag is completely filled.

6. Device according to claim 5, in which said bag and said protective casing are pulled over a substantially rigid, tubular neck reinforcement piece, and sealed thereto by a flexible elastic cap positioned over said reinforcement neck piece and having said pierceable elastic plate at its top.

7. Device according to claim 6, in which said casing is a substantially transparent material.

8. Device according to claim 7, in which said bag is substantially gas-free and contains a blood stabilizer.

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