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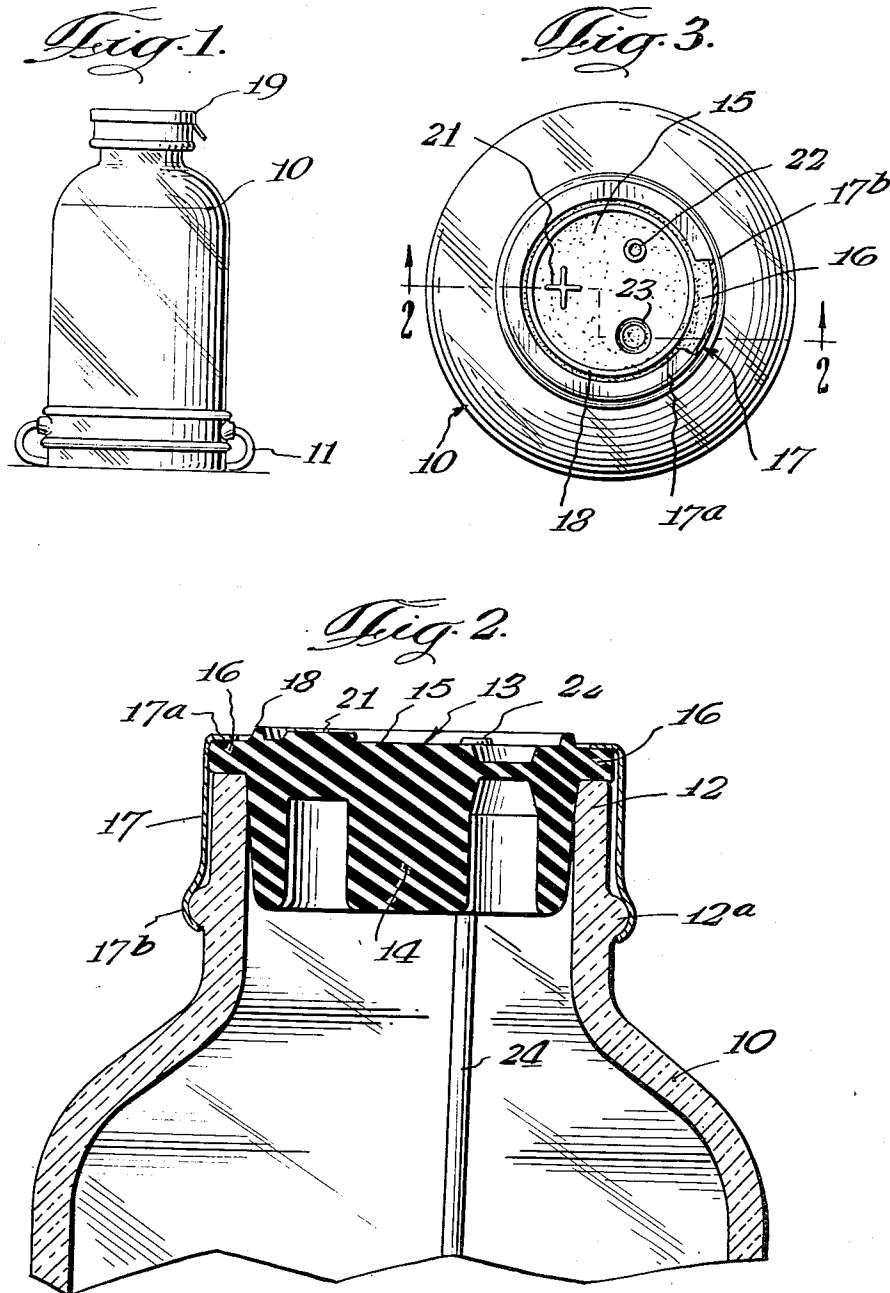
R. W. BARTON

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BLOOD BOTTLE CLOSURE

Filed April 15, 1954

2 Sheets-Sheet 1



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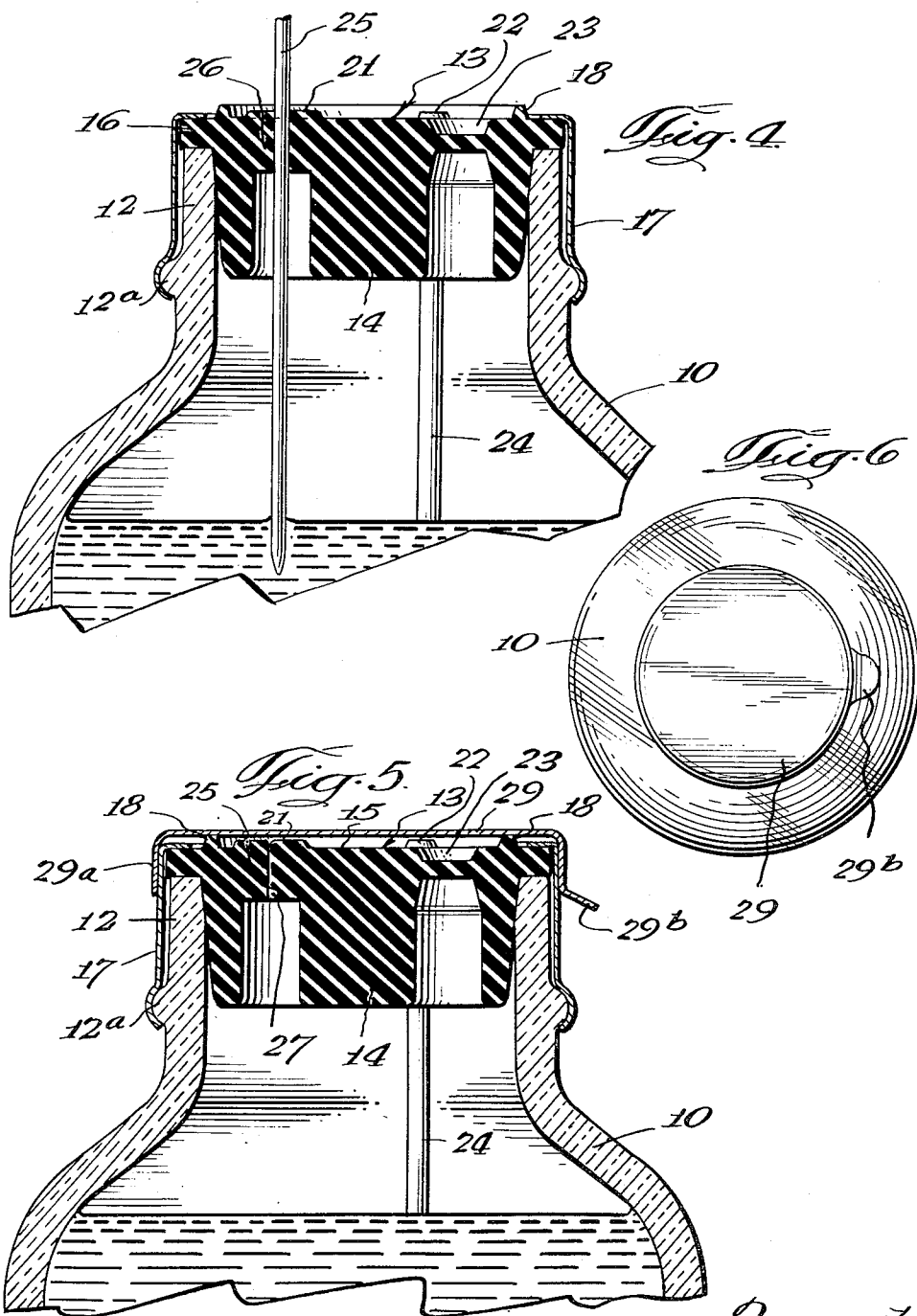
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BLOOD BOTTLE CLOSURE

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1 Claim. (Cl. 215—37)

This invention relates to a stopper and more particularly to a stopper designed as a closure member for a blood bottle.

Organizations which collect and store blood, as in blood banks, have long been faced with the problem of preventing contamination of the blood during storage. Briefly, this problem arises from the fact that blood is introduced into an evacuated container by means of a needle inserted through a resilient stopper provided in the container. Theoretically, the resilient stopper is self-sealing when the needle is withdrawn, but in practice it has been found that this self-sealing action is not always adequate to prevent subsequent contamination.

I have devised and disclose and claim herein a novel stopper and seal arrangement, particularly designed for use with blood collection bottles by means of which a foolproof seal may be effected. In addition, my stopper and seal arrangement maintains the upper surface of the stopper in a sterile condition, eliminating any need for sterilizing it before the bottle is opened for use.

One feature of my invention is the provision of a closure for a container comprising a stopper having a peripheral portion adapted to be engaged by stopper retaining means and having an annular portion spaced from the peripheral portion and adapted for sealed engagement with a removable and replaceable cover member. A further feature is the provision of a stopper of resilient material, having a plug portion adapted to enter the neck of the container and a top portion including an outwardly extending peripheral flange adapted to overlie the neck of the container and an upstanding peripheral ring spaced inwardly of the flange.

Another feature is the provision of a container comprising a receptacle having an opening therein, a stopper for the opening having a peripheral portion and having an annular portion spaced from the peripheral portion, with stopper retaining means in engagement with the receptacle and the peripheral portion of the stopper; and removable and replaceable cover means in sealed engagement with the annular portion of the stopper. Yet a further feature is that the stopper is provided with a peripheral outwardly extending flange overlying the neck of the receptacle and an upstanding annular ring spaced inwardly from the flange; a stopper retaining ring engages the flange of the stopper and the neck of the bottle while a removable and replaceable dust cap overlies the stopper and is retained in sealed contact with the upstanding ring of the stopper by frictional engagement with the stopper retaining ring.

Further features and advantages of my invention will readily be apparent from the following specification and from the drawings, in which:

Figure 1 is a side elevation view of a container of the type used for blood collection and storage;

Figure 2 is an enlarged vertical section taken along line 2—2 of Figure 3;

Figure 3 is an enlarged top plan view of the container

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of Figure 1 with the dust cap removed and a portion of the stopper retaining ring broken away;

Figure 4 is a view similar to Figure 2 with a needle inserted through the stopper;

Figure 5 is a view similar to Figure 2 showing the container after the needle has been removed and the dust cap put in place; and

Figure 6 is a top plan view of Figure 5.

Many organizations, such as hospitals and the Red Cross collect blood from donors and store it until it is used for giving transfusions or for the preparation of blood plasma or the like. The present practice is to collect the blood directly from the donor in an evacuated sterile bottle containing an anticoagulant solution. The blood is introduced into the bottle by a hollow needle inserted through a resilient rubber stopper and is drawn in by the vacuum in the bottle. After the bottle has been filled, the needle is removed from the stopper and, under present practices, the resiliency of the stopper is depended on to seal the opening left by the needle.

The blood, as it enters the bottle, is substantially at body temperature (37° C.). After filling, the bottles are usually refrigerated at a temperature of 4° or 5° C., until it is desired to use the blood. As the blood containers are generally not completely filled but an air space is left therein, when the filled container is refrigerated, the drop in temperature will cause a decrease in the pressure of the air therein, which is already less than atmospheric air pressure, creating a substantial vacuum in the interior of the container. In the event that a perfect seal is not formed when the needle is withdrawn from the stopper, this vacuum will have a tendency to draw impurities into the bottle, contaminating the blood therein. These impurities may take the form of dust or other particles in the air or moisture or liquid condensation of the refrigerator.

Reference will now be made to the drawings which illustrate my novel stopper and cap arrangement by which this problem is solved. In Figure 1, reference numeral 10 indicates a container or bottle in which blood may be collected and provided with a bail 11 from which the bottle may be suspended in an inverted position when the blood is drained therefrom. The bottle 10 (Figure 2) which may be of glass or other suitable material, has a neck portion 12 which is provided with an annular rib 12a spaced below the top thereof. The open neck 12 of the bottle 10 is closed by a resilient stopper 13, which may be of rubber or a suitable plastic material, and which has a plug portion 14 which is tightly fitted into the neck 12 of the bottle, in sealed engagement therewith. The stopper has a surface portion 15 which is provided with a peripheral outwardly extending flange 16 overlying the neck 12 of the bottle. A retaining ring 17 has an intumed flange 17a which grippingly engages the peripheral flange 16 of the stopper, and further has a portion 17b which engages rib 12a on the neck of the bottle, holding the stopper in the bottle.

The top surface 15 of the stopper 13 is also provided with an upstanding annular rib 18 which is spaced inwardly from the flange 16 so that it does not interfere with flange 17a of the stopper retaining ring. The upstanding annular rib 18 preferably has a truncated conical cross-section with a top surface of appreciable extent. Normally, the empty blood collection bottle as supplied to the hospitals is provided with a readily removable dust cap 19 (Figure 1) which fits down over the stopper retaining ring and forms a seal with upstanding ring 18 preventing contamination of the upper surface 15 of the stopper during handling before use.

In addition, the upper surface 15 of the stopper carries indicia, as the indicia 21, 22 and 23 in the form of a cross, a small ring and a depression indicating, respec-

tively, the proper point for filling the container, the air tube 24 and the proper point for connection of an outlet tube.

In Figure 4, the bottle 10 and stopper 13 are illustrated with a filling needle 25 inserted through the thick membrane 26 of the stopper underlying the filling point indicia 21. In Figure 4, the bottle 10 has been filled to its normal capacity and the needle 25 is about to be removed.

In Figure 5, needle 25 has been removed, leaving a perforation 27 in the heavy membrane 26 of stopper 13. It is this perforation that sometimes is not perfectly sealed upon withdrawal of the needle. In accordance with my invention, a second cup-shaped dust cap 29 is provided, which may be packed in sterile wrappings along with bottle 10 when it is supplied to the hospital or other organization. Following the removal of needle 25 from stopper 13, the upper surface 15 of the stopper should be cleaned with a bactericidal fluid and dust cap 29 forced down over the stopper retaining member 17 so that an air-tight seal is effected between the flat top surface of upstanding annular ring 18 and the dust cap. The dust cap 29 is held in place maintaining this sealed connection by the friction present between the depending flange 29a of the dust cap and stopper retaining ring 17. A tab 29b is provided for removing the dust cap when it is desired to use the contents of the bottle.

Experiments have shown that this arrangement effects an air-tight seal between the upstanding ring 18 and dust cap 29. By the use of this invention it is possible to seal the closure of the blood bottle effectively and simply and to prevent contamination of the blood collected therein even though the needle perforation in the stopper does not seal adequately by itself.

Generally, with blood containers of this type as they are presently known, it is necessary to clean and sterilize the top of the stopper before making connections to the stopper for an outlet tube and air inlet. This is an unhandy procedure to follow, particularly under emergency conditions, as in Army field work. With the sealing arrangement of this invention, no such steps are necessary as the top of the stopper is maintained in a sterile condition by dust cap 29.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore, in

the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claim.

I claim:

- 5 A container of the character described for the reception and storage of a quantity of blood from a donor comprising: a bottle having a neck portion defining an opening therein; a stopper of resilient material for said opening, said stopper having an imperforate plug portion which is
- 10 in sealed engagement with the neck portion of said bottle, the plug portion having a generally flat upper surface and being of a perforable, resealing material, adapted for insertion of a needle therethrough to fill said bottle with blood, an outwardly extending flange portion extending
- 15 from said plug portion, overlying the neck portion of the bottle, and an upstanding peripheral ring of resilient material on said upper surface surrounding said plug portion and lying inside said flange portion, the plug portion
- 20 within said upstanding ring being of substantial extent and including a blood outlet and an air inlet; a metallic stopper retaining ring engaging the flange portion of said stopper and the neck portion of said bottle securing the stopper in place, said retaining ring terminating short of
- 25 said upstanding ring and the ring extending above the top of the retaining ring; and a cup-shaped metallic cap overlying said stopper and having a depending skirt in frictional metal-to-metal engagement with said retaining ring, holding said metallic cap in sealed engagement with
- 30 said upstanding resilient ring.

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