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PARENTERAL FLUID ADMINISTRATION EQUIPMENT

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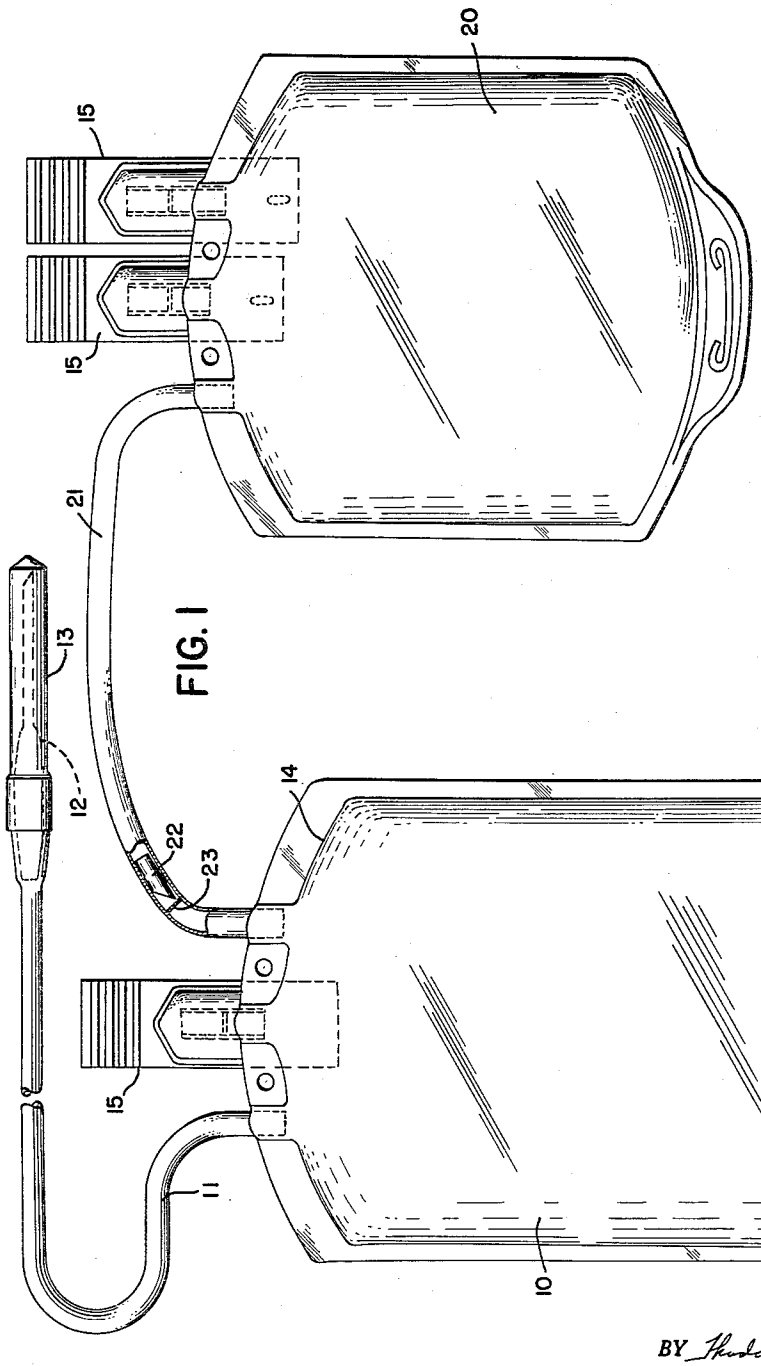

FIG. 1

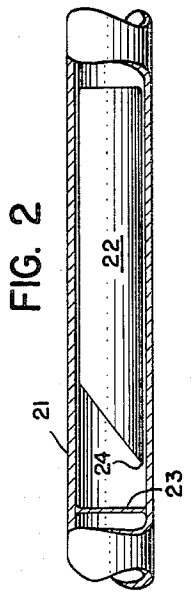

FIG. 2

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PARENTERAL FLUID ADMINISTRATION EQUIPMENT

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The present invention relates to parenteral fluid administration equipment. More particularly, it relates to an externally manipulable, internally located valve system especially useful in the parenteral fluid administration field.

Resilient tubing, such as plastic and rubber tubing finds wide usage in the parenteral fluid administration field. One such use is in the recently introduced multi-container blood collection and administration system, in which resilient tubing is used both as a conduit for the blood from the patient to a first blood collection chamber and as a conduit for blood from the first container to other containers or anti-coagulant from secondary to primary container. The multi-chambered blood systems among other functions permit the conservation of whole blood, for example, by allowing, if desired, the division of a single pint of blood into pediatric quantities to be used individually or by allowing, if desired, the holding of the whole blood unadulterated by long term anticoagulants in the first container for the maximum period of time and then transferring the blood to a second chamber containing anticoagulants to extend the storage period. The closed multi-container blood systems depend largely for their effectiveness upon the use of a positive "off" type valve or clamp which prevents the flow of the blood through the tubing from the first to the second container.

While many externally located valves or clamps may be used to more or less positively shut off the flow of fluids such as blood through the resilient tubing, the use of such valves is always accompanied by the risk of dislodgment, etc., and damage to the tubing itself.

It is therefore an object of the present invention to disclose a novel externally manipulable, internally located valve system for use in resilient tubing which is not accompanied by the aforesaid disadvantages.

It is further an object to disclose a closed multi-container blood system embodying the novel valve system of the present invention.

These and still other objects will become more apparent from the following description and drawing in which like reference characters denote like parts throughout the several views.

FIGURE 1 is an assembly view of a multi-container blood system showing the novel valve system of the present invention in pre-use condition.

FIGURE 2 is a sectional view in larger scale of the novel valve system.

In the exemplary form of the drawing, FIGURE 1, is shown a multi-container blood collecting and storing means having a flexible donor tube 11. The tube 11 provides at its outer end a phlebotomy needle 12 which is specially sharpened to minimize tissue trauma. The needle 12 is equipped with a protective sheath or cover 13 to protect against dulling and contamination.

The container 10 is preferably formed by juxtaposing sheets of thermoplastic material and heat sealing them along the edges. The donor tube 11 is sealed through the end 14 of the bag as is the port assembly and closure 15.

The multi-container blood system further comprises as a transfer or storage means, a second flexible container 20 which is similar in form and construction to container

10 and which is integrally joined thereto by connector tubing 21 of suitable length. In accordance with the present invention the tube 21 is provided with an internal cannula 22 of steel, plastic or the like which is proportioned to fit in and move easily within the connecting tube. The tube 21 is removably closed adjacent container 10 by a transverse membrane 23 which is removed by external manipulation of the cannula 22 which is seen as having a sharpened beveled or pointed end 24 for this purpose.

The cannula 22 is preferably coated or otherwise treated to present a hemorepellant surface. It may, if desired, also be provided with a flange or rounded butt end opposite its pointed end to make it more readily manipulable without damaging the tubing.

In FIGURE 2 the pointed cannula and puncturable transverse membrane are shown prior to use, enlarged and in greater detail.

In the obtaining and storage of the blood ultilizing the above described apparatus, the protective sheath is removed from the phlebotomy needle 12 and the vein of the donor punctured. The donation is then collected into the first container and collection ceased. If only a small portion of the blood is to be given initially or if after maximum storage without an anticoagulant or with a short term anticoagulant it is desired to add an anticoagulant to the blood, the cannula is manipulated as for example, by compressing the tubing adjacent the blunt end of the cannula and collapsing the tubing thus forcing the cannula into puncturing relationship with the diaphragm, at which time the blood may be allowed to flow from the first to the second container. The second container may, of course, be of different size and/or contain an anticoagulant if so desired.

The novel inline cannula-membrane valve system described in detail above in connection with parenteral fluid administration equipment may of course be advantageously used in other fields to overcome the problem of retaining completely separate two or more solutions and yet preserving the possibility of combining them simply and easily if so desired.

While an embodiment has been described in which a single tube with an integral transverse membrane and a steel cannula are employed, it is readily apparent that a membrane present at the junction of two lengths of tubing or a rigid or semi-rigid plastic cannula or the like may also be used without departing from the spirit or scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are as follows:

1. In parenteral fluid administration equipment a donor tube having needle means at one end and communicating with a flexible, collapsible, hemo-repellant blood container at the other end, a length of resilient tubing connecting said container to a second flexible, collapsible container to form a unitary system, a removable, transverse membrane positively closing said connecting tubing to the flow of fluid between said containers and a free moving membrane-removing, hollow cannula located wholly within said tubing, the cannula being completely unattached to said tubing and any part of said system, said cannula being proportioned to readily fit in and move within said tubing so that the cannula can be externally manipulated to remove said membrane without opening said tubing, said cannula being further manipulatable substantially out of said tubing into one of said containers.

2. In a multi-container closed system for handling blood comprising at least two flexible, collapsible, hemo-repellant sterile blood containers joined together by lengths of resilient connecting tubing, an improved re-

movable closing means for controlling flow between said containers which means provides initially for a complete and positive obstruction to flow through said tubing and between said containers, and upon removal for a substantially and unobstructed flow through said tubing, said means comprising a removable transverse membrane barrier positively closing said connecting tubing to flow and a free moving membrane piercing cannula proportioned to fit in and freely move within said tubing, said cannula being completely unattached to said tubing and any part of said system so that it can be manipulated from outside said tubing to substantially remove said membrane and then may be further manipulated substantially out of said tubing into one of said containers so that flow through said tubing is substantially unobstructed and non-turbulent.

3. In a multi-container system for the conditioning and handling of blood comprised of at least two flexible, collapsible, hemo-repellant sterile blood containers, each having a blood inlet and an outlet, a length of resilient tubing connecting said flexible containers, a transverse membrane positively closing said tubing to flow and preventing flow between the containers joined by said tubing and a free moving membrane removing member located wholly within said tubing, said membrane removing member being completely unattached to said tubing and being so proportioned as to fit in and move freely within said tubing so that it can be externally manipulated without opening said tubing to remove said membrane and may further be manipulated substantially out of said tubing into one of said containers so that flow through said tubing and between said containers is substantially unobstructed and non-turbulent.

4. In a multi-container closed system for the storage and handling of blood, which system comprises at least two flexible, collapsible hemo-repellant containers joined together by a length of resilient connecting tubing, at least one of said containers containing a substance which it is desired to isolate in said container, an improved means for preventing flow through said tubing and among said containers, and isolating said substance in said container, the improved means of preventing flow providing for positive closing of said tubing to flow, and comprising a removable transverse membrane completely closing said connecting tubing to fluid flow and a free moving, membrane piercing hollow cannula located wholly within said tubing, the cannula being completely unattached to said tubing and any part of said system, said cannula being proportioned to readily fit in and freely move within said tubing so that the cannula can be externally manipulated from without said system to substantially remove said membrane as an obstacle to fluid flow without opening said closed system and thus allow for the introduction into another container of the system of the previously isolated substance.

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