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BLOOD ADMINISTRATION METHOD

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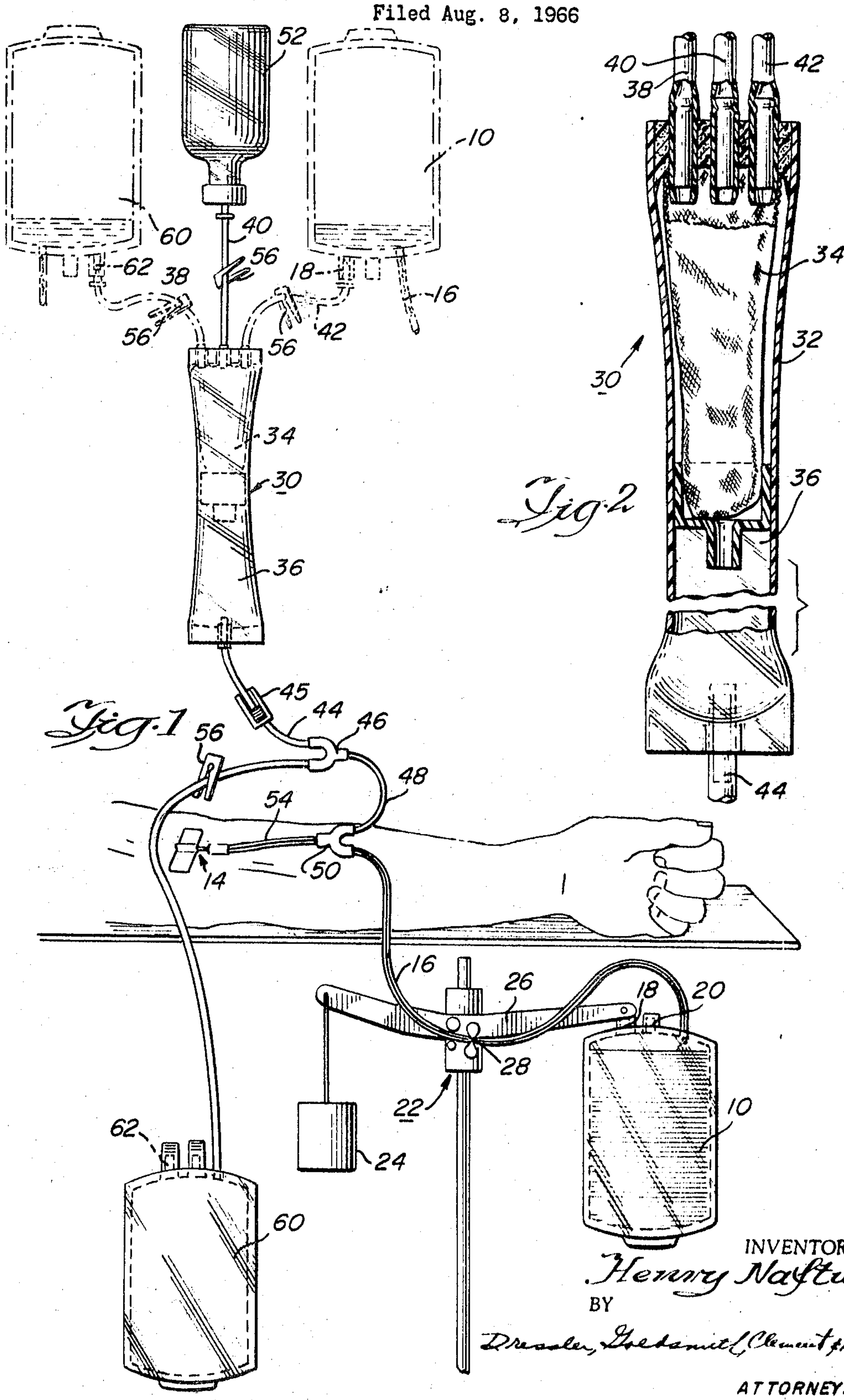

Fig. 1

Fig. 2

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BLOOD ADMINISTRATION METHOD

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ABSTRACT OF THE DISCLOSURE

A method for collecting blood plasma. A first quantity of whole blood is withdrawn from a donor and centrifuged to separate the red cells. The red cells are administered back to the same donor through a blood flow tube. A second quantity of whole blood is withdrawn from the donor, centrifuged to separate the red cells and the red cells are thereafter administered back to the same donor through the blood flow tube. The containers containing the first quantity of blood and second quantity of blood are each connected to a different inlet of the same blood flow tube.

This invention relates to a novel intravenous administration method, and more particularly to an intravenous administration method having contamination prevention features.

Recent plasmapheresis techniques involve withdrawal of whole blood from the donor followed by return to the donor of the red blood cell content of the withdrawn blood. These techniques enable the withdrawal of one liter of whole blood from the average person every three days, in contrast to prior techniques in which it was necessary to wait eight weeks before 500 ml. of whole blood could be withdrawn from the average person.

The new technique usually involves the withdrawal of a liter of whole blood from the donor in two 500 ml. portions. As a first step, 500 ml. of whole blood is withdrawn and mixed with an anticoagulant in a blood bag or other container, generally of a disposable type. The blood-filled container is then centrifuged to force the red cells to the bottom of the container and the plasma is extracted and fed to a plasma receptacle. The container with only the red cells remaining therein is then connected to a blood flow tube having a blood flow path including passage through a filter and a drip chamber, and from the blood flow tube a tube is connected back to the vein of the donor. Hence the red cells are returned to the donor via the flow tube.

During the interval of time in which the blood is not being taken from the donor, a small amount of saline solution is allowed to flow into his vein via the blood flow tube. A tube leading from the saline solution is connected to the same side of the blood flow tube to which the blood container is connected.

After the red cells are returned to the donor, another unit (500 ml.) of blood is collected from the donor into a second blood container. The second blood container is centrifuged, the plasma is removed and the second blood container is connected to the blood flow tube so that the red cells can be returned to the donor.

With the use of prior art blood administration equipment, the second blood container is connected to the blood flow tube by detaching the first blood container therefrom and inserting in its place the second blood container. It is seen that with prior art administration equipment, the second blood container, which has a sterile outlet, is connected to a flow tube inlet which has already received a flow of blood. The problem of contamination is present, and this problem has been recognized and solved by the present invention.

In accordance with the present invention there is provided a blood flow tube having three inlet ports or tubes, whereby one of the tubes can be connected to a saline solution container, another inlet tube can be connected to the first blood container and the third inlet port or tube can be utilized for receiving the flow of red cells from the second blood container. By means of the present invention, the need to remove the first blood container connections in order to connect the blood flow tube to the second blood container is obviated, and a sterile and more effective recipient set is provided.

A more detailed explanation of the invention is provided in the following description and is illustrated in the accompanying drawing, in which:

FIGURE 1 is a diagrammatic view of a blood collection and administration system, with the collection components shown in full lines and the administration components illustrated in phantom; and

FIGURE 2 is an enlarged, fragmentary, sectional elevation of a blood flow tube in accordance with the teachings of the present invention.

With reference to FIGURE 1, it is seen that a first blood bag **10** is in position to receive blood from the arm **12** of a donor. As soon as the phlebotomy is performed at **14**, the blood will flow into bag **10** via tube **16**. Blood bag **10** is a conventional type, formed of a transparent plastic which is disposed of after use. The bag **10** contains 50 ml. 4% sodium citrate solution for collection and plasmapheresis of 500 ml. of whole blood.

The tubing **16** is also formed of plastic, and outlet ports **18** and **20** are provided for allowing separate removal of blood plasma and the red cells respectively, as will be explained in more detail below. The tubing **16** is threaded through a conventional donor's scale **22** having a weight **24** which allows the blood to flow through tube **16** until 500 ml. is collected in bag **10**. At that time, the arm **26** will pivot in a clockwise direction (with respect to FIGURE 1) causing the tube **16** to be clamped at **28**.

When the blood bag **10** is filled, the tube **16** is heat sealed and the bag is placed in a conventional blood bag centrifuge in order to force the red cells to the bottom of the bag. After the blood is centrifuged, the plasma is removed by conventional plasma extraction techniques. The red cells remaining in the blood bag **10** are then returned to the donor in the following manner.

Generally, blood administration techniques require filtering and regulation of the blood flowing to the recipient. To achieve proper filtering and flow regulation, a blood flow tube **30** is provided. The flow tube **30** is preferably formed of a transparent plastic material such as polyethylene, vinyl plastics, etc., and as shown most clearly in FIGURE 2, includes a tube **32** enclosing a plastic filter **34** and defining a drip chamber **36**. Inlet tubes **38**, **40** and **42**, and outlet tube **44**, are connected to the tube **32** by suitable connecting means. A preferred connection system is disclosed in U.S. Patent No. 2,914,181, issued Nov. 24, 1959. The outlet tube **44** having a manual flow control valve **45** connected thereto, is attached to a Y-connector **46** from which a tube **48** bridges Y-connector **46** and another Y-connector **50**, to which tube **16** is attached.

After the phlebotomy and during the period of time that blood is not being collected from a donor, it is conventional to allow a small amount of saline solution to flow into the vein in order to prevent clotting at the needle and to help replace a portion of the blood volume given by the donor. Inlet tube **40** is connected to the bottle **52** containing the saline solution, which solution flows to the donor via tube **40**, blood flow tube **30**, tube **44**, tube **48**, and tube **54**.

To obtain the flow of red cells back to the donor, the inlet tube **42** is connected to the port **18** of blood bag **10**, so that the blood will flow together with the saline solution through the filter **34**, drip chamber **36** and the tubing to the donor's vein. Clamps **56** are connected to the tubing at strategic locations, in order to control the flow within the respective tube.

After the red cells have been returned to the donor, another unit (500 ml.) of blood can be collected in a second blood bag **60**, which is threaded in the donor's scale **22** in the same manner as the blood bag **10** was threaded. The process is repeated and after (1) the blood is collected and centrifuged, and (2) the plasma is extracted from the container **60**, the red cells remaining in the blood bag **60** are returned to the donor. To this end, the inlet tube **38** is connected to the outlet port **62** of the blood bag **60** so that the red cells can flow back to the donor via tube **38**, blood flow tube **30**, and tubes **44**, **48** and **54**.

It is readily seen that there is no need to remove the tube **42** from port **18** of blood bag **10** and to utilize the non-sterile tube **42** with the second blood bag **60**. In contrast thereto, a separate inlet tube is connected to the blood flow tube **30** in accordance with the teachings of the present invention, thereby providing a cooperation between the elements that achieves a very sterile and effective operation.

The present invention is not limited in use to plasmaphersis techniques, and it is also useful in connection with the administration of blood whenever it is desired to administer three liquids (including blood) intravenously. For example, each of the three tubes **38**, **40** and **42** could be connected to a separate blood bag if the administration of three units of blood were desired. Or in other circumstances, only one of the blood flow tube inlet tubes could be connected to a blood bag and the other two tubes could be connected to different liquids which are to be given intravenously.

Although an illustrative embodiment of the invention has been shown, it is to be understood that various substitutions and modifications can be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. An intravenous administration method which comprises the continuous steps of: connecting to the vein of the recipient the outlet of a blood flow tube having a filter and drip chamber; connecting a first inlet at one end of said tube to a first solution to be administered intravenously; connecting a second inlet at said one end of said tube to a second solution to be administered intravenously; connecting a third inlet at said one end of said tube to a third solution to be administered intravenously; regulating the flow of said solutions to the vein of the recipient; and administering said three solutions intravenously but initiating the administration of at least one of the solutions subsequent to completion of the administration of one of the other solutions.

2. A method for collecting blood plasma which comprises the continuous steps of: withdrawing a first quantity of whole blood from a donor into a first container containing an anticoagulant; thereafter centrifuging said first container to force the red cells to the bottom thereof; thereafter extracting the plasma from said first container into a plasma receptacle; administering the red cells back to the donor by the steps of (a) connecting an outlet of a saline solution container to a first inlet of a blood flow tube having a filter, a drip chamber and an outlet connected to the vein of the donor, to allow flow of the saline solution to the vein; and (b) connecting an outlet of said first blood container to a second inlet of said blood blood flow tube to allow flow of the red cells to the vein; withdrawing a second quantity of whole blood from the donor into a second container containing an anticoagulant; thereafter centrifuging said second container to force the red cells to the bottom thereof; thereafter extracting the plasma from said second container into a plasma receptacle; administering the red cells back to the donor by connecting an outlet of said second blood container to a third inlet of said blood flow tube to allow flow of the red cells to the vein of the donor; and regulating the flow of the saline solution and the red cells to the vein of the donor.

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