

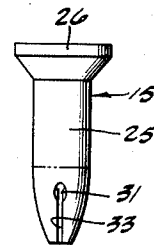
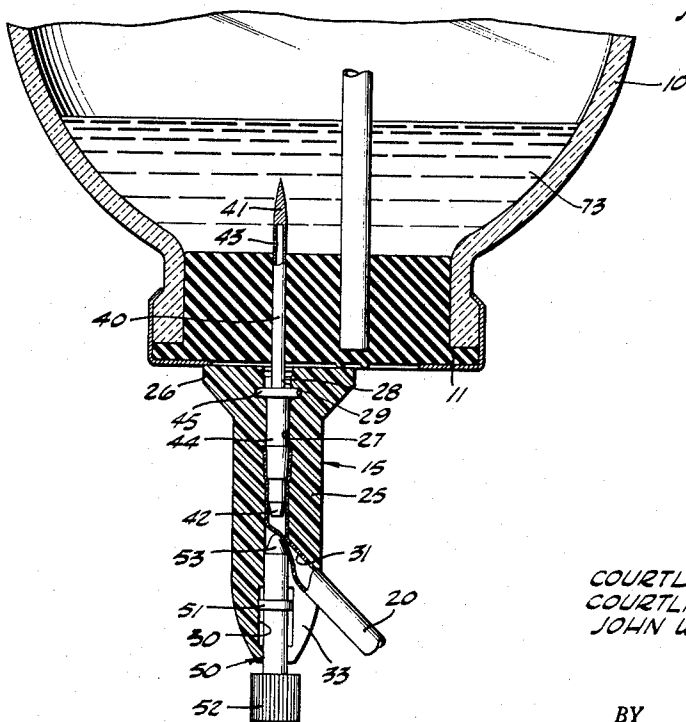
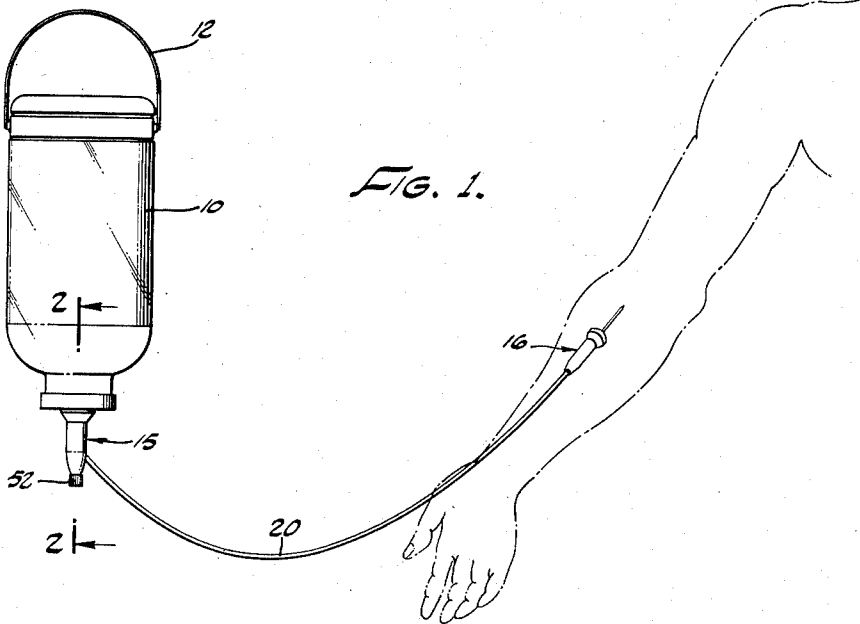
Dec. 9, 1958

C. H. BARR, SR., ET AL
BLOOD TRANSFUSION ASSEMBLY

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

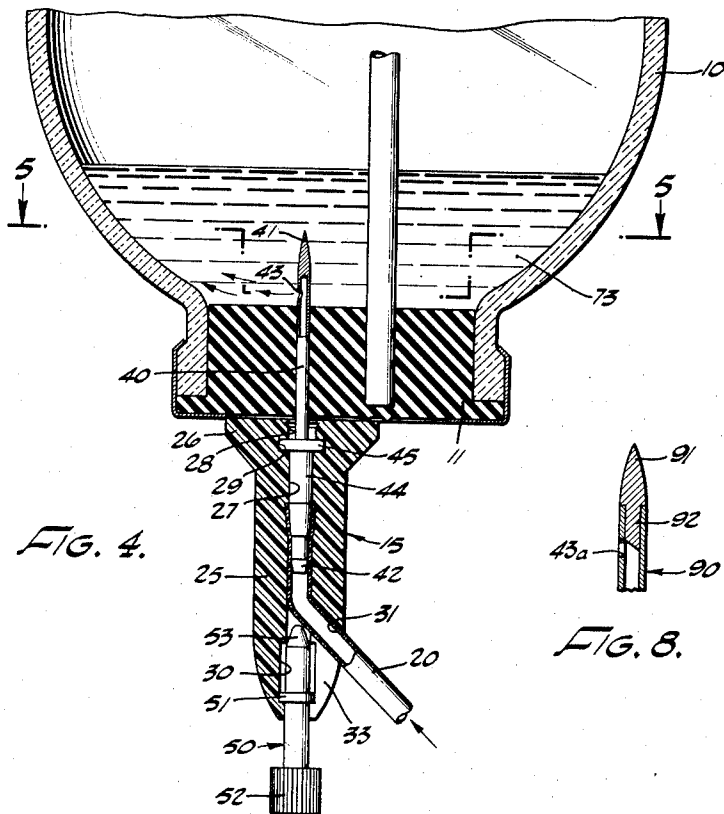


FIG. 4.

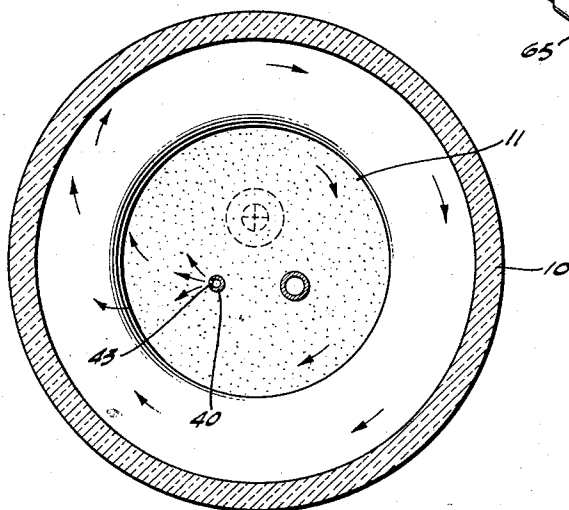


FIG. 5.

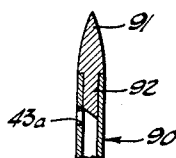


FIG. 8.

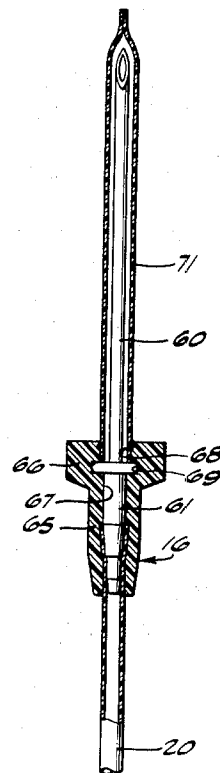


FIG. 6.

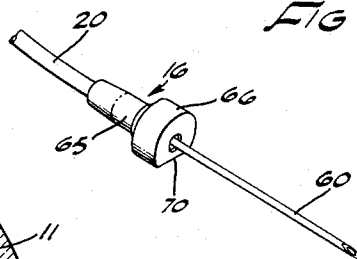


FIG. 7.

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BLOOD TRANSFUSION ASSEMBLY

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9 Claims. (Cl. 128—214)

This invention relates to apparatus for use in making blood transfusions and has particular reference to apparatus for the collection of blood from a donor thereof.

One of the principal objects of this invention is to provide novel and improved apparatus for making the required connection between the donor of blood and the flask in which the blood is received and for enabling the flow of blood therebetween to be controlled.

In making blood transfusions, the blood is first drawn under the action of a partial vacuum into a flask containing a small quantity of sodium citrate solution or the like for preventing the coagulation of the blood. In carrying out this operation it is necessary that the blood entering the flask be continually agitated in the anticoagulant solution and additionally it is highly desirable that the flow of blood from the vein of the donor into the flask be under control at all times for otherwise the rate at which the blood is taken from the donor might well be sufficient to collapse the donor's vein, thereby causing pain and injury and interrupting the flow of blood. Additionally, it sometimes happens that the hypodermic needle is accidentally pulled away from the vein of the donor, making it necessary to quickly shut off the connecting tubing until the needle is readjusted. Various types of apparatus for performing blood transfusions have been designed but heretofore such apparatus have not been entirely satisfactory for various reasons. Many of such apparatus are awkward to manipulate and require more than one operator for proper use. Certain equipment which has been designed to overcome this disadvantage is complicated in structure and expensive to produce in the large quantities required. Accordingly, another important object of this invention is to provide transfusion apparatus which is not subject to the disadvantages of those heretofore proposed and used.

Another object of this invention is to provide a novel valve structure in combination with blood transfusion apparatus.

A further object of this invention is to provide a novel blood transfusion assembly which is extremely simple in construction, yet highly effective in operation, and which is so economical to produce on a quantity basis that it can be marketed at a price which permits it to be used only once and then disposed of if desired.

Still another object of this invention is to provide, in combination with blood transfusion apparatus, a needle assembly which is designed to eliminate the need for manipulation of the blood collection vial to obtain agitation of the blood and anticoagulant solution.

Other objects and advantages of this invention it is believed will be readily apparent from the following detailed description of a preferred embodiment thereof when read in connection with the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of the apparatus of this invention, illustrated in assembled relation with a blood collection vial and in position for transfusion of blood.

Figure 2 is a sectional elevation taken substantially on the line 2—2 of Figure 1.

Figure 3 is a fragmental side elevation of the valve housing and needle holder.

Figure 4 is a view similar to Figure 2 but illustrating the valve in the open position.

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Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 4.

Figure 6 is an axial sectional view of the hypodermic needle subassembly.

Figure 7 is a perspective view of the hypodermic needle subassembly, with the needle cover removed.

Figure 8 is a fragmental axial sectional view of a modified form of stopper-piercing needle.

Referring now to the drawings, the apparatus of this invention is shown connected to a more or less conventional blood collection bottle or vial 10 which is provided with a stopper 11 and a bail 12 for hanging the vial in the inverted position shown. The apparatus comprises a valve and needle-holder assembly 15 at one end and a hypodermic needle and holder assembly 16 at the other end, the two assemblies being operably connected by means of a length of flexible tubing 20.

The assembly 15 includes a valve housing and needle holder 25 of elongated, generally cylindrical shape, having a flanged end 26 and a central bore 27. The housing 25, shown in the inverted position, is preferably molded of flexible plastic material and is provided with an enlarged counterbore 28 at the lower end thereof terminating in communication with an enlarged chamber 29. The bore 27 is further enlarged at the upper end thereof to provide the chamber 30 and an inclined bore 31 extends from the side of the housing into communication with the central bore 27. The housing between the upper end thereof and the bore 31 is provided with a longitudinal slot 33 which extends into communication with the bore 27 and chamber 30.

The stopper piercing needle assembly comprises a needle 40 having a pointed end 41, the other end 42 being bevelled. The needle differs from conventional hypodermic needles in that the pointed end is closed, only a side or radial opening 43 being provided. The needle is provided with a hub member 44 having a flanged end 45, the flange being seated in the chamber 29, thus preventing disassembly of the needle assembly from the housing 25. The diameter of the hub member is slightly greater than that of the bore 27 and the end of the hub member remote from the flange 45 is bevelled or tapered to receive the end of the flexible tube 20 so that the tube end is put under compression by the housing, thus preventing disassembly of the tube from the needle. As shown in the drawings, the tube extends outwardly from the housing through the inclined bore 31.

A valve element 50 is mounted for reciprocation in the bore 27, having a flange 51 intermediate the ends thereof operable in the chamber 30, the flange diameter being greater than that of the bore 27 so that disassembly of the valve element is prevented. The outer end of the valve element is provided with a fluted finger grip member 52 and the inner end is rounded as shown at 53.

The hypodermic needle and holder assembly 16 includes a hypodermic needle 60 having a flanged hub member 61 identical to the member 44. The needle holder 65 is molded of flexible plastic material, being provided with a flanged end 66, a central bore 67, a counterbore 68 and an enlarged chamber 69 for reception of the flanged hub member. The other end of the flexible tube 20 is stretched over the end of the needle and hub member and is held in place thereby and by the compression of the needle holder. The flanged end 66 of the needle holder is provided with a longitudinal flattened surface 70 to facilitate affixing the needle and holder assembly to the arm of the blood donor. A tubular needle cover 71 protects the needle while it is not in use, the cover end being pressed into the counterbore 68.

In use of the apparatus thus described, the collection vial 10 is hung in the inverted position shown, wherein the anticoagulant solution 73 gravitates to the neck of the vial and covering the needle 40. With the valve in the closed position shown in Figure 2, i. e., with the valve element 50 pushed inwardly so that the end 53 thereof pinches off the tubing 20, the needle 40 is inserted through the stopper 11 to the position shown. It will be understood by those skilled in the art that by eliminating the conventional end opening in the needle 40, all possibility of coring of the stopper is eliminated. The sharp point of the needle permits it to be forced through the stopper without the removal of any portion of the material thereof.

The needle 60 may then be inserted into the vein of the blood donor, as shown in Figure 1, and the valve element 50 is then withdrawn to open the valve (see Figure 4). Thereupon the donor's blood flows through the tubing 20 and thence out, through the side opening 43 in the needle 40, into the anticoagulant solution in the collection vial. Thus it will be understood that the placement of the needle opening in the side results in a second advantage in that the blood being collected is prevented from spurting upwardly through the anticoagulant solution and entering the evacuated portion of the vial, thus preventing hemolysis of the red blood cells through contact with the vacuum space. Additionally, as shown in Figures 4 and 5, the force of the blood flowing through the opening 43 is expended in a lateral direction, causing the blood to spin around in the anticoagulant until the total quantity of blood has been drawn, eliminating the usual necessity for shaking or rotation of the bottle to assure agitation of the blood and solution.

The valve assembly 15 provides a quick and positive control over the flow of blood through the tubing 20. The assembly is adapted to be manufactured on a quantity basis for extremely small cost since the parts are molded of plastic and they are designed to facilitate rapid assembly. Thus, the tube 20 is first affixed to the needle 40 and then pulled through the bore 27, the flexibility of the housing 25 permitting insertion of the needle and hub to the position shown. The tube is then pulled down through the slot 33 to the final position in the inclined bore 31. The valve element 50 is then inserted in place and the needle 60 and holder 65 secured to the other end of the tube 20 to complete the assembly.

A modified form of needle 90 is illustrated in Figure 8, identical to the needle 40 except that the pointed end is formed by means of a separate sharpened plug element 91 having a boss portion 92 driven into the open end of the needle. The end of the boss portion is biased as shown to divert the blood outwardly out through the opening 43a. This structure is less expensive to manufacture than the needle 40 and additionally presents no pocket in the end thereof which could collect blood and render the needle difficult to clean.

While we have fully described preferred embodiments of our invention, it is to be understood that we do not wish to be limited to the details herein set forth, but our invention is of the full scope of the appended claims. We claim:

1. In blood transfusion apparatus, the combination of a flexible tube, a hypodermic needle secured to one end of said tube in communication therewith, a valve assembly at the other end of said tube, said valve assembly including a housing having a central bore, said tube extending into said bore, a valve element reciprocable longitudinally in said bore and adapted to contact said tube to pinch the walls thereof together, and a hollow needle operably associated with said tube and valve assembly, said hollow needle having a closed, pointed end, the sole opening in said needle being in the side thereof.

2. Blood transfusion apparatus as defined in claim 1, wherein the closed pointed end of the hollow needle com-

prises a plug inserted in the end of said needle, the inner end of said plug being biased in a direction toward said opening.

3. In blood transfusion apparatus, the combination of a flexible tube, a hypodermic needle secured to one end of said tube in communication therewith, a valve assembly at the other end of said tube, said valve assembly including a housing having a central bore and an inclined bore communicating with said central bore, said tube extending into said inclined bore, a valve element reciprocable in said central bore and adapted to contact said tube to pinch the walls thereof together, and a hollow needle operably associated with said tube and valve assembly, said hollow needle having a closed, pointed end, the sole opening in said needle being in the side thereof.

4. In blood transfusion apparatus, a flexible tube, a valve assembly including a housing having a central bore and an inclined bore communicating with said central bore, said tube extending into said inclined bore, and a valve element reciprocable in said central bore and adapted to contact said tube to pinch the walls thereof together.

5. In blood transfusion apparatus, a flexible tube, a valve assembly including a housing having a central bore, said tube extending into said bore, a valve element reciprocable longitudinally in said bore and adapted to contact said tube to pinch the walls thereof together, and a hollow needle operably associated with said tube and valve assembly, said hollow needle having a closed, pointed end, the sole opening in said needle being in the side thereof.

6. Blood transfusion apparatus as defined in claim 5, wherein the closed pointed end of the hollow needle comprises a plug inserted in the end of said needle, the inner end of said plug being biased in a direction toward said opening.

7. In blood transfusion apparatus, a flexible tube, a valve assembly including a housing having a central bore, said tube extending into said bore, a valve element reciprocable longitudinally in said bore and adapted to contact said tube to pinch the walls thereof together, and a hollow needle extending in said central bore in communication with said tube, said hollow needle having a closed, pointed end, the sole opening in said needle being in the side thereof.

8. In blood transfusion apparatus, a flexible tube, a valve assembly including a housing having a central bore and an inclined bore communicating with said central bore, said tube extending into said inclined bore, a valve element reciprocable in said central bore and adapted to contact said tube to pinch the walls thereof together, and a hollow needle operably associated with said tube and valve assembly, said hollow needle having a closed, pointed end, the sole opening in said needle being in the side thereof.

9. In blood transfusion apparatus, a flexible tube, a valve assembly including a housing having a central bore, an inclined bore communicating with said central bore, and a radial slot extending from the end of said housing and communicating with said bores, said tube extending into said inclined bore, and a valve element reciprocable in said central bore and adapted to contact said tube to pinch the walls thereof together.

References Cited in the file of this patent

UNITED STATES PATENTS

806,746	Miller	Dec. 5, 1905
1,121,690	Timian	Dec. 22, 1914
2,208,550	Shapiro	July 16, 1940
2,512,569	Saffir	June 20, 1950
2,630,803	Baran	Mar. 10, 1953
2,689,563	Huber	Sept. 21, 1954
2,707,953	Ryan	May 10, 1955

FOREIGN PATENTS

528,471	Great Britain	Oct. 30, 1940
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