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INFUSION FLOW CONTROL VALVE

Original Filed June 25, 1957

FIG. 1

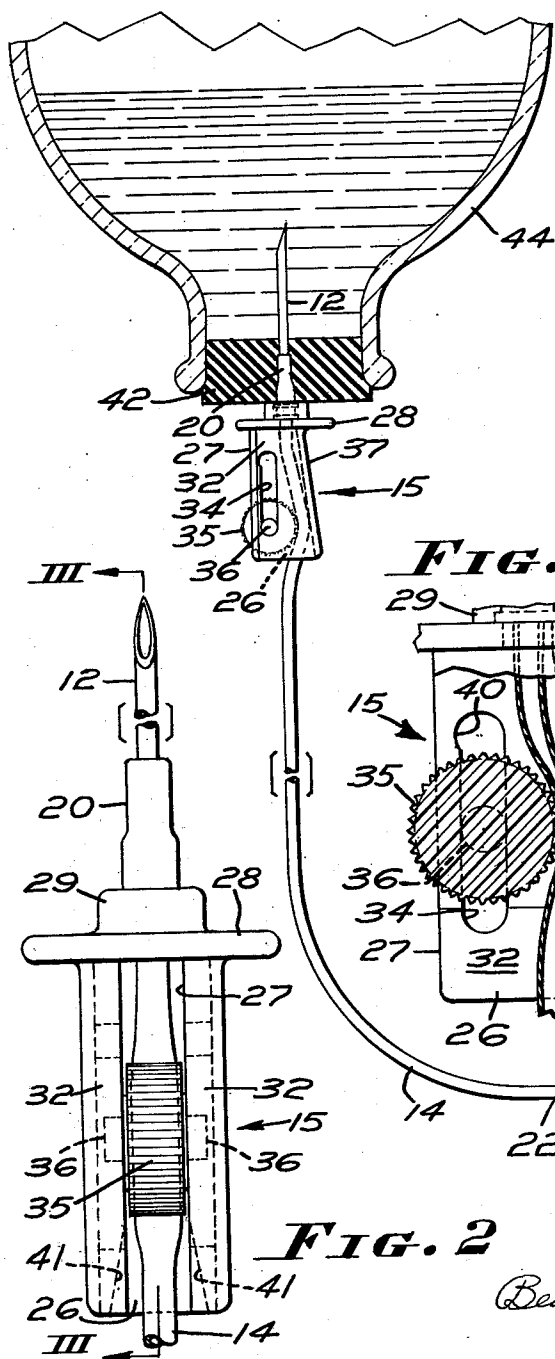


FIG. 3

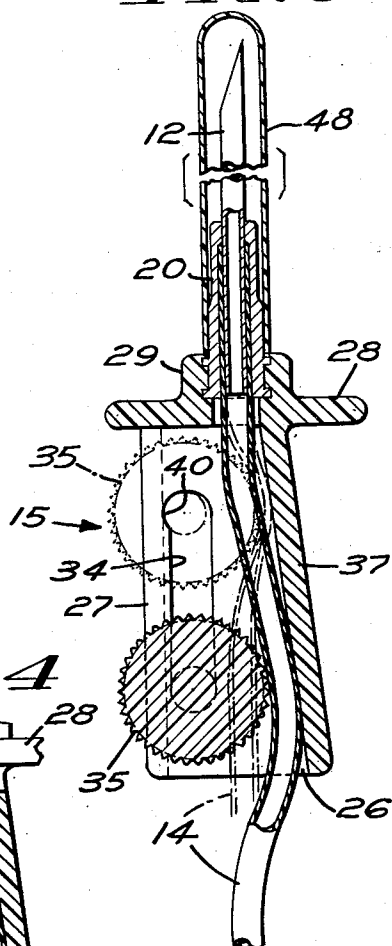
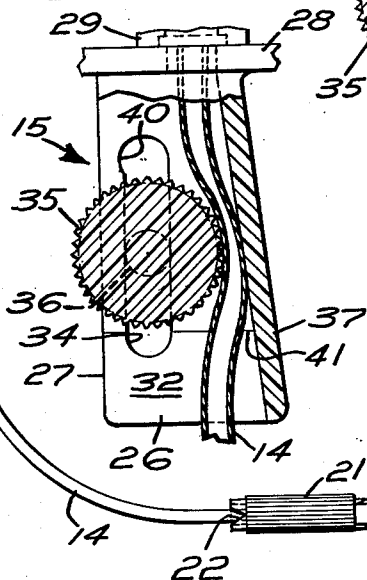


FIG. 4



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INFUSION FLOW CONTROL VALVE

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Continuation of application Ser. No. 667,769, June 25, 1957. This application Dec. 12, 1963, Ser. No. 335,455
2 Claims. (Cl. 128—214)

This invention relates to blood-taking apparatus such as for use in the making of blood donations to blood-banks or the like, and more particularly to an improved disposable, sterile, pyrogen-free and non-toxic flow controlling conduit device for conveying blood from the donor to the conventional blood-bank bottle or other blood receiving device. This application is a continuation of application Serial No. 667,769, filed June 25, 1957, now abandoned.

In order to obtain optimum quality blood-bank supplies and to minimize the cost of taking blood for that purpose and to expedite the procedure for the convenience of the blood donors, it is desirable to have a disposable inexpensive blood-taking apparatus which embodies in sterile condition all necessary elements including flexible tubing, bottle and infusion canules and flow control means, required for making the connection from the donor's vein to the blood receiving bottle. The present invention provides an improved combined bottle needle, handle, and flow control valve such as to facilitate manipulation of the needle and operation of the valve and to minimize the cost of such apparatus.

Accordingly, one object of the present invention is to provide an improved blood-taking device.

Another object of the invention is to provide a blood-taking device as aforesaid having an improved valve means which is more readily manipulated between valve open and closed positions.

A further object of the invention is to provide an improved blood-taking apparatus having a novel combination bottle needle handle and flow control device in which the flow control device tends to automatically assume and maintain a closed position during bottle stopper insertion of the needle.

Another object of the invention is to provide an improved bottle needle handle and flow control device as aforesaid which is operably efficient yet inexpensive to manufacture.

Other objects and advantages of the invention will be apparent from the following description and claims, and from the drawing in which:

FIG. 1 is a view of a preferred embodiment of the improved blood-taking device of the invention in use;

FIG. 2 is a side elevational view of the bottle needle, valve and handle components of the device of FIG. 1, on an enlarged scale;

FIG. 3 is a sectional view of the parts taken along line III—III of FIG. 3 and showing alternative valve open and closed positions; and

FIG. 4 is a fragmentary sectional view similar to FIG. 3 but showing the valve of the apparatus in partly closed or throttling position.

Referring more particularly to the drawing, a blood-taking device embodying the invention is illustrated in FIG. 1 as comprising an intravenous blood-taking canule or needle 10 and a blood receiving bottle needle 12, together with interconnecting conduit means including a continuous flexible tubing 14 and a flow control valve indicated generally at 15. As shown in FIG. 3 of the drawing, the respective ends of the tubing 14 are fitted over the stem ends of the respective needles 10—12 and are clamped in place thereon by overlying sleeve members

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18, 20, which are swaged thereon to form a fluid tight conduit from one needle to the other. In addition, the infusion needle sleeve 18 carries an externally knurled hub 21 for manual gripping and guiding of the needle. The distal end of the hub 21 is notched as indicated at 22 to provide a visual and touch-sensitive index to the attitude of the bevel on the point of needle 10.

As illustrated, the valve 15 comprises a generally U-shaped transparent plastic body portion open at one end as indicated at 26 and at one side as indicated at 27 and closed at its other end by means of a flanged hub portion 28 which is bored to accommodate passage therethrough of the tubing 14. The flange 28 is formed with a hub portion 29 which is molded about flanges extending from the sleeve 20 to firmly lock the valve device 15 to the sleeve.

The side walls 32—32 of the valve body are longitudinally slotted in parallel relation as indicated at 34—34 to accommodate in rolling relation the valve device roller 35 having stub shafts 36—36 extending from opposite sides thereof into the corresponding slots 34—34. The back wall portion 37 of the valve body member is sloped as clearly show in FIGS. 1, 3, 4 relative to the slots 34—34.

Thus, it will be seen that the journal slots 34—34 will permit rolling reciprocation of the roller 35 in the body portion within the limits defined by the slots 34, and that when the roller is in its uppermost position as viewed in FIGS. 3—4, it will operate to constrict the tubing 14 thereby rendering the valve means in "closed" position. The resilient resistance of the tubing to constriction operates to prevent accidental displacement of the roller to and from either "open" or "closed" position. To this end the tubing 14 is preferably made of a moderately firm material, such as acetate or polyvinyl; and a slight dwell as indicated at 40 is preferably provided at the "closed" end of each slot 34 to permit the stub shafts 36—36 to seat down in "closed" position, thereby providing a kind of "snap" action for the valve device. As indicated at 41—41 (FIGS. 2, 4) the side portions 32—32 are chamfered to facilitate assembly of the device. Thus, the roller 35 may be snap-fitted into operative position by forcing the ends of the stub-shafts 36—36 to cam against and spread the sloping side portions until they snap into the slots 34—34.

Preliminary to use, the blood-taking apparatus embodying the invention is supplied in sterile condition. For this purpose closed sterility protective covers as indicated at 46 and 48 are slip-fitted in air-tight manner over the respective hubs 18, 20, with their open end portions embracing in air-sealing relation the sleeves 18, 20, respectively; and with their ends abutting the enlarged hub portions 21, 29, respectively. The covers 46, 48 as well as the tubing 14 are fabricated of material which is permeable to a gaseous sterilizing agent such as formaldehyde or ethylene oxide. For example, the covers and tubing may be fabricated of polyvinyl, polystyrene, polyethylene, rubber or the like. Then, the entire apparatus is placed within a sterilizing chamber, and the needles and the fluid conduit system are rendered sterile by causing the sterilizing agent to permeate the tubing and covers; the air-tight connections of the covers and the tubing operating subsequently to maintain such sterility until the apparatus is used. This method eliminates necessity for the use of a cotton plug or other bacteria-retentive filter or the like in the covers during the sterilizing operation, and subsequent sealing of the covers behind the plug, such as in accord with previously conventional practice. Also this method facilitates the sterilizing procedure and assembly for sterilization; and eliminates possibility of

trapping bacteria after sterilization between the plugs and the sealed ends, as in the case of the prior art.

To operate, the technician grasps the valve body with his fore-finger against the back wall 37 and his thumb against the roller 35, and thereupon rolls the valve to closed position and then inserts the blood delivery needle 12 through the stopper 42 of the blood receiving bottle 44, the flange 28 providing a comfortable abutment for application of finger pressure for forcing the needle through the resistant bottle stopper.

The blood-taking needle 10 is then inserted in the vein of the donor, and the roller 35 is manipulated to "open" position by rolling the thumb thereagainst, whereupon the pressure differential between the donor's vein and the previously evacuated bottle 44 causes blood to flow through the tubing 14 into the receiving bottle. To prevent vein collapse and maximize donor comfort, the rate of flow of blood from the donor to the bottle may be minutely controlled with ease by the technician, by regulation of the position of the control heel 35. When the desired amount of blood has been taken, or when the halting of the flow through the tubing 14 is desired for any reason, the operator simply rolls the valve to its tubing constricting or "closed" position, whereby the passageway through the tubing will be closed and the needles withdrawn without danger of contamination of the contents of the bottle and without danger of introduction of air or any other manner into the donor's vein.

It will be appreciated that the combination needle handle and flow control valve of the invention may be readily formed from molded plastic parts inexpensively, and thus it is practicable that the blood-taking device may be disposed of after one-time use. This obviates dangers of cross-contamination or lack of sterility in the blood conduit passageways, which sometimes occurs where it is attempted to recondition and resterilize similar "reusable" apparatus.

In addition to effecting manufacturing economies, it will be seen that the combining of the tube seal and handle structures of the needle 12 with the flow control valve device facilitates convenient and rapid execution of the blood taking operation. While in the embodiment of the invention illustrated the valve equipped needle 12 is shown connected to a blood-receiving device, it will be understood that the placement of the needles and/or the flow of blood or the like could be reversed, and that one or both of the needles could be replaced with other conduit means.

From the foregoing it will be appreciated that the invention provides an inexpensive disposable blood trans-

fer device which provides maximum safety and convenience in use; and that while only one form of the invention has been shown and described in detail it will be appreciated that the invention is not so limited but may be otherwise embodied within the spirit of the invention and the scope of the appended claims.

I claim:

1. In a blood-taking apparatus, a hollow needle having a flexible tube connected thereto, a sleeve member fixed to the stem of the needle, and a flow control valve device embracing said tube, said valve device comprising a generally U-shaped body having slightly flexible spaced parallel side walls and an end portion bored to comprise a mounting hub receiving one end of said sleeve member in cantilever mounted relation therein, said side walls being formed with funnel shaped grooves at the outer ends of said walls leading toward parallel slots there-through adapted to journal therein oppositely extending stub shafts of a roller device for longitudinal rolling thereof within said body, said body having a back wall portion inclined relative to said slots and located and dimensioned to freely accommodate therebetween said tube when said roller is in one position relative to said body and to tightly constrict said tube when said roller is shifted to a second position relative to said body.

2. A flow control valve device for embracing a flexible tube comprising a generally U-shaped body having slightly flexible spaced parallel side walls, said side walls being formed with funnel-shaped grooves at the outer ends of said side walls leading toward parallel slots therethrough adapted to journal therein oppositely extending stub shafts of a roller device for longitudinal rolling thereof within said body, said body having a back wall portion inclined relative to said slots, and located and dimensioned to freely accommodate therebetween a flexible tube when said roller is in one position relative to said body and to tightly constrict such tube when said roller is shifted to a second position relative to said body.

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