This invention relates to a structurally and functionally improved medical assembly and unit. In its more specific aspects the invention provides a structure whereby a catheter or tubing may be manipulated in accordance with the desires of the attending or operating physician so that the operation, or treatment being performed may proceed with maximum expediency and minimum danger to the patient. The assembly provided, will for example be of primary utility in the case of cardiac catheterization.

As is well understood, by the medical profession, in such use considerable difficulty has been experienced in inserting the catheter in the vein through to the heart, where rotation of the parts was necessary. More particularly, that rotation frequently causes curling of the nylon catheter, and occasionally it was found that the base or proximal end of the instrument would crack due to the torsion strains which were present. In order to relieve this, the technique has been followed of loosening the proximal end from the injection device and rotating it. In such loosening, air may accidentally be permitted to enter through the bore of the catheter. Under these circumstances the continuous flow of anticoagulant fluid would be disrupted and the patient would be endangered.

By means of the present teachings, rotation of the catheter or other tubing is readily feasible without it being necessary to loosen or disconnect the proximal end of the same from the injection device.

A further object is that of furnishing a relatively simple structure which may be economically produced and which in use will not require the employment of any special technique or skill. Moreover, when included in an assembly, the unit may be frequently used, will be capable of ready and complete cleaning and sterilization and will function over long periods of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheet of drawing illustrating one practical embodiment of the invention, and in which:

Fig. 1 is an enlarged sectional side view taken along the line 1—1 in the direction of the arrows as indicated in Fig. 1; and,

Fig. 3 is a fragmentary side elevation of a portion of the parts as included in Fig. 1.

Referring primarily to Fig. 1, the numeral 5 indicates a cannula in the form of a catheter having a free end provided with an outlet opening 6. In a preferred grouping of apparatus embracing the present teachings, a tube 7 will be furnished connected to a container embracing, for example, a supply of anticoagulant liquid. A second tube 8 is connected to an oscilloscope to record blood pressure and heart action. Neither the latter instrument nor the container connected to tube 7 have been illustrated. It is also preferred that there be included in the grouping a provision for taking a blood specimen. This may include a syringe assembly as generally indicated at 9. If desired, a casing 10 housing a suitable needle valve structure may be interposed in tube 8 or the parts associated therewith.

A fitting assembly conveniently includes two three-way valves disposed within casings 11 and 12. From these casings, coupling units 13 extend to connect respectively with the syringes assembly 9 and the inner end of tube 8. Further couplings such as 14, 15 and 16 are preferably provided. These may be of the Luer, or any other proper type to provide a quick-detachable connection. These couplings may be separate elements or integral with parts of casings 11 or 12. In this manner, connections are provided which permit of a ready coupling and separation of the parts for cleaning, sterilization and storing. Similarly, an adapter generally designated under the numeral 17 may, by means of the coupling 16, be connected with casing 11 and by means of a coupling 18 be connected with the hub portion 19 of the cannula 5.

That adapter should permit of a ready swivelling action of the cannula with respect to the fitting assembly. At the same time however, there should be no danger of its parts permitting an entry of air into the lumen of the cannula. A preferred structure achieving this result has been illustrated in Fig. 2. As will be seen in that figure, and especially its right hand portion, the numeral 16 designates the generally cylindrical part of the coupling. Conveniently the outer edge of the same may be defined by radially extending ears of projections 20 while its forward end is continued in a non-cylindrical portion 21. This constitutes one part of a more or less conventional Luer coupling.

The second part of the same as shown in the left hand portion of Fig. 2 may include a collar 22 to receive the outer end of a coupling portion such as 16. The inner face of collar 22 is conventionally formed with screw threads (not shown) which are engageable by the projecting ears 20 of a coupling. Also in accordance with accepted construction, there may be formed adjacent the base of collar 22, slots 23; the collar being concentrically disposed with respect to and spaced from the outer face of a tip (not shown). While this type of coupling is definitely preferred, it will be understood that any acceptable form of connection may be employed between the adapter and its adjacent parts as well as otherwise within the assembly. That coupling, however, should permit of ready access for purposes of cleaning and sterilization.

Fixed with respect to portion 21 is a plug 24. The latter has secured to it a collar 25 which extends forwardly of it and terminates in an inwardly extending flange portion 26. A hub 27 is also fixedly secured to collar 22 and similarly mounts a cup shaped member 28 which extends within the space defined by collar 25 and has a diameter greater than that defined by the inner end of flange part 26. A projection 29 is conveniently integral with plug 24, and extends into cup member 28 to a point immediately adjacent its face. A ring 30 of packing material is interposed between the side wall of cup member 28 and the projecting portion 29. That material may conveniently be natural or synthetic rubber. The several parts of the adapter are formed with aligned passages providing in aggregate an axially extending bore 31.

As shown in Fig. 2, a slightly exaggerated spacing of the parts has been resorted to. In actual practice, the threads which are conveniently provided between plug 24 and collar 25 permit of the latter being telescoped or drawn over that plug to a greater extent. So shifting packing 30 will be slightly compressed between the base of cup member 28, the inner face of its side wall, the outer face of projecting portion 29 and the adjacent face of
the plug. Under that compression, the ring will therefore establish an effective liquid-tight seal preventing any escape of the fluid within bore 31 to a point beyond the side face of the adapter, or air from flowing inwardly into bore 31. At the same time, the user of the apparatus will have no difficulty in gripping the outer face of hub 27, and rotating it together with member 28 to turn these parts around the axis as defined by projection 29. With a cannula secured against movement with respect to hub 27, that instrument will be similarly turned.

So shifted, it is obvious that the outlet end of the cannula lumen as indicated at 6 will be similarly rotated. Under certain circumstances it may be desired to provide an indication of the amount of rotation. To achieve this result, and as shown in Fig. 3, hub 27 may provide on its outer face graduation marks 32. A pointer, such as an extension 33 of collar 25 will register with these marks. A registration mark 34 may also be associated with the hub 19 of the cannula. That mark is conveniently aligned with the exit end of the lumen as well as, for example, with the central mark of the indelica 32. Therefore, with the rotation of hub 27, the physician will be aware of the direction in which that exit end extends.

As will be understood, an assembly such as the present, is of inestimable value in the case of cardiac catheterization. Prior to the development of the assembly, there has been considerable difficulty in inserting the catheter in the vein through to the heart. This is because rotation of the parts resulted in a curling of the catheter which is usually formed of nylon or similar material. Also, it was found that occasionally the proximal end of the cannula would crack due to torsion on the later. Heretofore to alleviate this strain, the proximal end of the catheter was ordinarily loosened from the injection device and rotated. Under these circumstances, there was great danger that air might enter the lumen of the cannula and thus disrupt the continuous flow of anticoagulant liquid.

With the present apparatus, an incision is made in the vein in the arm, and a catheter conveniently formed of woven nylon is inserted. In that insertion, it is attached as shown in Fig. 1 preferably to two three-way valves such as 11 and 12, and through the former to a syringe assembly such as 9. The second coupling of valve 12 connects with a tube 7 coupled to a container having a solution of anticoagulant fluid. The second connection of this valve casing is coupled to tube 8 in turn connected to an oscilloscope or similar instrument. Where a needle valve such as is indicated at 10 and 16 is used, the interior of the assembly any surges in blood pressure are reduced. This permits, in a more correct manner, the visualization of pressure on the oscilloscope.

With the catheter inserted in the vein, it is moved by rotation and proper manipulation toward the heart which it enters through the right auricle. Usually during this procedure, and throughout the entire operation, a small amount of anticoagulant solution is constantly flowing through the catheter. Where desirable, the flow may be interrupted by shifting the valve within casing 11. Through upon the syringe assembly 9 will permit of the taking of specimen of blood from the heart for analysis. By a suitable manipulation of the valves within both casings 11 and 12, blood pressure may also be observed. Where a register or indication such as 32—33 is resorted to, a physician will be able to determine precisely the extent to which rotation of the parts has been effected. In other words, it is feasible to determine precisely the direction in which the discharge of the solution from opening 6 is occurring. Similarly, if a hollow needle, or other form of a cannula were involved, an equally accurate determination could be made.

While cardiac catheterization is a primary purpose of the present assembly and unit, it will be apparent that it might be advantageously otherwise utilized. For example, it may be employed by a urologist or gynecologist for the introduction of solutions into body cavities. A radiologist or surgeon may employ the assembly including the unit in the preparation of cardiograms. It may also be utilized in connection with spinal or caudal analgesia. In all instances, and without manipulating the entire assembly, the physician can readily rotate the catheter, tubing or other cannulae units with respect to the parts of the unit which is attached.

Thus, among others, the several objects of the invention as specifically aforesaid are achieved. Obviously numerous changes in construction and rearrangement of the parts may be resorted to without departing from the spirit of the invention as defined by the claims which are:

1. In a medical assembly in combination a cannula, a fluid-conducting tube to be connected to a source of liquid injectable through the cannula, a fitting assembly connected to said tube, coupling means associated with said assembly and cannula, connected and relatively rotatable parts providing an adapter, coupling means included in said adapter and engaged with the coupling means of said cannula and fitting respectively to furnish quick-detachable connections therewith and means accessible from the exterior of said adapter for causing relative rotation of its parts to turn said cannula around its axis and with respect to said fitting assembly including the unit in the preparation of cardiograms.

2. In an assembly as defined in claim 1, and a syringe structure connected to said fitting assembly.

3. In a medical assembly as defined in claim 1, and a further fluid-conducting tube for ascertaining blood pressure conditions also connected to said fitting assembly.

4. In an assembly as defined in claim 3, and valve means connected to said latter tube for preventing pressure-surge therefrom.

5. In an assembly as defined in claim 1, said fitting assembly including a valve for controlling fluid flow from said tube.

6. In an assembly as defined in claim 1, a syringe, said fitting assembly including a pair of multiple type valves, one interposed between said cannula and tube, and the other between said syringe and cannula.

7. In an assembly as defined in claim 1, said cannula having its lumen terminate in an outlet opening, and indicating means associated with said cannula to indicate the disposition of such outlet with respect to one of the parts of said adapter.

8. In an assembly as defined in claim 1, and a fluid-tight packing interposed between the surfaces of the relatively rotatable parts providing such adapter.

References Cited in the file of this patent

UNITED STATES PATENTS

993,774 Greenlaw ........................ May 30, 1918
1,273,174 Noakes ............................. July 23, 1918
2,226,039 Wilte ................................ Dec. 24, 1940
2,532,669 Jones .............................. Dec. 5, 1950

FOREIGN PATENTS

727,959 Great Britain ......................... Apr. 13, 1955