

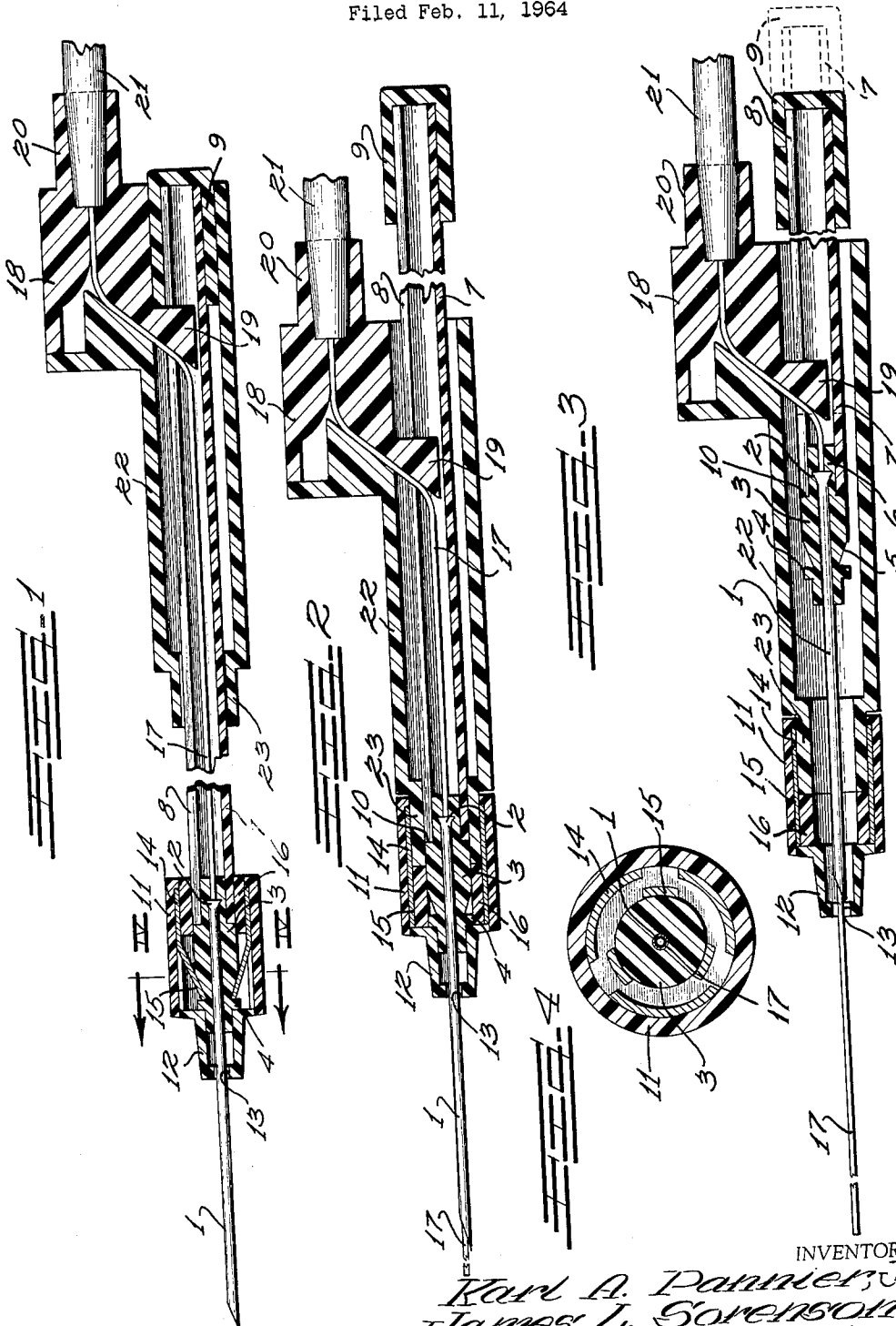
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INTRAVENOUS CATHETER PLACEMENT UNIT WITH RETRACTABLE NEEDLE

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3,262,449 INTRAVENOUS CATHETER PLACEMENT UNIT WITH RETRACTABLE NEEDLE

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This invention relates to improvements in a catheter placement unit with retractable needle, and more particularly to such a unit highly desirable for the placement of an intravenous catheter for parenteral infusions into the body by means of a catheter, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

Catheter placement units have now been developed which facilitates the positioning of a catheter in a vein or other part of a patient's body by advancing the catheter through a cannulated needle already inserted in the body, while infusion is taking place. After the catheter is properly positioned it is necessary for the attending surgeon to withdraw the needle from the body of the patient, and since it cannot be removed entirely from the catheter already connected to the infusion system, something must be done to the needle to prevent it ultimately cutting the catheter or jabbing the flesh of the patient during subsequent movement of the patient while the catheter remains in place. Providing such protection against what might be termed a "floating" cannulated needle has proven irksome and at times quite difficult in the past. Frequently, adhesive tape has been utilized and wrapped around at least the pointed end of the needle and a part of the catheter when the catheter is anchored, also by adhesive tape, to the body of the patient. This procedure was tedious as well as delicate, and the free needle limited the exposed length of the catheter with which the surgeon had to work.

With the foregoing in mind, it is an important object of the instant invention to provide a catheter placement unit including a cannulated needle through which the catheter is advanced, and which unit is so constructed that immediately upon withdrawal of the needle after advancement of the catheter, the needle is automatically sheathed completely within a part of the unit itself.

Another important object of this invention is the provision of a catheter placement unit including a cannulated needle through which a catheter is advanced while infusion takes place, the unit being so arranged that the needle may be withdrawn by manipulating a part of the unit and is immediately and completely sheathed within a part of the unit, no further protection for the patient or the catheter from the needle being necessary.

It is also an important feature of this invention to provide a catheter placement unit embodying a cannulated needle through which the catheter may be advanced, the unit being so constructed that the needle is withdrawn from the body of a patient directly into and completely sheathed by a part of the unit, leaving an added length of catheter available for the surgeon to work upon.

Also a desideratum of this invention is the provision of a catheter placement unit having a cannulated needle retractable into a part of the unit, there being a catheter sheath temporarily bonded into the hub of the needle and by means of which the needle may be withdrawn from the body of a patient into retracted position, whereupon the catheter sheath breaks free from the needle and may be discarded.

Still another feature of this invention resides in the provision of a catheter placement unit so constructed that as a cannulated needle embodied therein is withdrawn from the body of a patient it is sheathed in a

portion of the unit, there being means holding the needle firmly for insertion into the body of a patient which are automatically released upon full advancement of the catheter through the needle.

Another object of the invention is the provision of a catheter placement unit so constructed that a cannulated needle may be inserted in the body of a patient and withdrawn therefrom into a completely sheathed location without contact of the surgeon's hands upon the needle at any time.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is an enlarged fragmentary central vertical sectional view, parts being shown in elevation, of a catheter placement unit embodying principles of the instant invention, portions of the unit itself being exaggerated, and the unit being shown in position for but prior to use;

FIGURE 2 is a view similar in character to FIGURE 1 but showing the catheter fully advanced through the needle;

FIGURE 3 is a view similar in character to FIGURES 1 and 2 but illustrating the needle retracted after advancement of the catheter and the removal of the catheter sheath; and

FIGURE 4 is a greatly enlarged transverse vertical sectional view taken substantially as indicated by the line IV-IV of FIGURE 1, looking in the direction of the arrows.

As shown on the drawings:

All parts of the instant invention, with the exception of the cannulated needle and a locking element which are both preferably metal, may satisfactorily be made of a suitable moldable plastic material, the catheter and its sheath preferably being transparent, and where parts of the structure are initially in separate pieces for assembly advantages, the parts may be firmly united with the use of a suitable cement.

The illustrated embodiment of the instant invention includes a cannulated needle 1 having a flared outer end 2. Around the outer end of the needle and firmly secured thereto is a bushing or false hub 3, the complete structure of which is best seen in FIGURE 3. Adjacent the inner edge thereof, that end which is near the patient's body when the device is in use, the bushing is provided with a radially extending flange 4 with an annular inwardly tapering wall 5 adjacent that flange. On the outer end thereof the bushing is reduced in diameter to form a cylindrical projection 6 for telescopic engagement with a catheter sheath 7.

The sheath 7 is preferably an extrusion of a non-wettable plastic material, polyethylene being one satisfactory substance, and is provided with a slit 8 extending longitudinally thereof along the top of the unit. The sheath is extruded in such a manner that it has an inherent resiliency which acts to maintain the slit 8 closed at all times, thereby rendering it unnecessary to use any added physical sealing means. Accordingly, surface tension of any liquid, outside or within the sheath, will prevent that liquid from flowing through the relatively firmly closed slit 8. The outer end of the sheath is preferably closed by a friction fitted cap 9 to preserve sterility of the contents of the sheath. The inner end of the sheath is telescoped over the extension 6 on the bushing 3 and at the annular region 10 the sheath is temporarily bonded to the bushing by means of a light cement or in an equivalent manner. The sheath may be of any desired length,

depending upon the length of catheter desired, usually 6 or 9 inches.

A needle hub 11, which is grasped by the surgeon when the needle is inserted, generally cylindrical in shape encases the aforesaid false hub or bushing 3, but in spaced relationship thereto. This hub 11 is provided with a nose 12 on the inner end thereof of reduced diameter which has an aperture 13 therein of sufficient size for the needle to readily slide therethrough. With reference now to FIGURE 1, it will be seen that as the unit is originally assembled, the shoulder for the bushing 3 is seated against the inner wall of the hub 11. It is held in that position by a retainer 14 in the form of a thin metallic cylinder fixed inside the hub 11 in any suitable manner. This retainer has a plurality of tangs 15, there being three shown in the illustrated embodiment, bent inwardly and downwardly from the retainer cylinder 14 into end engagement with the flange 4 on the bushing 3 thereby holding the needle 1 sufficiently firmly for the surgeon to grasp the hub 11 and insert the needle in the body of a patient. Inside the outer end of the hub 11 and also inside the retainer 14 is a slidable sleeve 16 frictionally fitted over the sheath 7 and a part of the bushing 3, which sleeve is frictionally maintained in position and which is used to release the tangs 15 from their engagement with the flange 4 in a manner that will later appear.

A catheter 17 extends through the sheath and enters the cannula of the needle 1, the outer end of the catheter being firmly anchored, cementitiously or equivalently, in catheter advancing means or an actuator 18. The actuator 18 has the external appearance of two cylinders, one upon the other, and the catheter terminates in the upper cylinder, extending through the slit 8 in the catheter sheath 7 inwardly of a projection 19 also extending from the upper portion of the actuator through the slit in the tube. This projection when the actuator is moved along the tube opens the tube at the slit and aids the advancement of the catheter, since the projection is slightly wider than the diameter of the catheter. The outer end of the upper portion of the actuator terminates in a tubular extension 20 shaped in the form of a Leur fitting for the reception of the end of an infusion tube 21 which may be connected with any suitable form of infusion apparatus or system. The lower portion of the actuator is in the form of a tube 22 which encloses the catheter sheath 7 and on its inner end is reduced in diameter to form a projecting portion 23 which rather intimately fits the catheter sheath 7 and functions as a guide for the actuator, and which is also of approximately the same diameter as the aforesaid slidable sleeve 16 in the needle hub 11.

Initially, the catheter is, of course, provided with a guard for the needle which also keeps the needle sterile, and a sterile cap is placed over the Leur fitting 20, and the entire assembly may be encased in a plastic film sack.

In use, the instant catheter placement unit is extremely easy to operate, quite effective, and the placement of the catheter may be accomplished with great rapidity and no mess. The outer sack and Leur fitting cap are removed, and the catheter is connected to the infusion system through the tube 21. The needle guard is removed, and the catheter unit is flushed with the infusion solution to remove any possible air and also any sterilization residue. The surgeon may then grasp the needle hub 11 and insert the needle in the body of a patient. Then, it is a simple expedient to smoothly and easily advance the catheter, infusion having been started, by holding the needle hub 11 in one hand, grasping the actuator 18 in the other hand and moving the actuator toward the needle hub into the position seen in FIGURE 2. The catheter is then advanced fully into the patient's body, and it will be noted that the portion 23 upon the inner end of the actuator has contacted the movable sleeve 13 in the needle hub and forced that sleeve toward the oppo-

site end of the hub thereby elevating the prongs 15 to the position seen in FIGURES 2 and 3 and releasing the needle bushing 3. This advancement of the catheter and the release of the needle bushing and the telescopic connection of the actuator with the needle hub may all be accomplished in one smooth movement. It is a simple expedient then to retain hold of the needle hub 11, and grasp the projecting end of the catheter sheath 7 and pull it outwardly thereby withdrawing the needle from the patient's body and sheathing it within the needle hub and the actuator as seen clearly in FIGURE 3. The temporary bond at 10 between the catheter sheath and the bushing 3 is sufficient for that purpose, but when the needle is fully sheathed and the parts are substantially in the position seen in FIGURE 3, the temporary bond breaks loose and the catheter sheath is disposed of. The withdrawal of the needle and the sheathing of it in the catheter hub and actuator and removal of the catheter sheath is also one smooth simple operation. It will also be noted that the sheathing of the needle upon withdrawal leaves an added portion of catheter previously covered by the needle available for the surgeon to work upon. Thus, it can be seen that with the instant invention, to completely, place a catheter and withdraw the needle requires only three simple movements of the part of the surgeon, namely (1) insertion of the needle; (2) placement of the catheter with automatic release of the needle bushing; and (3) withdrawal of the needle, sheathing of the needle and freeing the catheter sheath.

It will be understood that modification and variations may be effected without departing from the scope of the novel concepts of the present invention.

We claim as our invention:

1. In a catheter placement unit, a cannulated needle, a bushing on said needle, a catheter sheath having a longitudinal slit therein temporarily bonded at one end thereof to said bushing, catheter advancing means having a passage therethrough and arranged for connection to an infusion system and movable along said sheath with a portion of the advancing means extending through said slit, a catheter in said sheath with one end anchored in the passage of said advancing means and the other end within said needle, a needle hub around and spaced from said bushing, holding means in said hub to prevent movement initially of said bushing relative to said hub, and means carried by said advancing means to effect release of said holding means when the catheter is fully advanced,

whereby the needle may be retracted and sheathed within said hub and advancing means and the catheter sheath discarded.

2. In a catheter placement unit, a cannulated needle, a hub spaced around said needle, retaining means in said hub preventing movement initially of the needle relative to the hub, catheter advancing means, a catheter having one end connected to said advancing means and the other end within said needle, a tubular portion in said advancing means shaped to enter said hub when the catheter is fully advanced and effect release of said retaining means to permit retraction of said needle into said hub and tubular portion, and retracting means connected to said needle.

3. In a catheter placement unit, a cannulated needle, a bushing secured around said needle, a shoulder on said bushing, a hub spaced around said bushing, a metal cylinder in said hub,

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tangs on said cylinder bent into endwise engagement with said shoulder to prevent movement initially of said needle relative to said hub,
 a sleeve inside said cylinder outwardly of said tangs,
 a catheter advancer having an end portion sized to enter said hub,
 a catheter connected at one end to said advancer with the other end in said needle, and retracting means connected to said needle,
 whereby when the catheter is advanced the end portion of the advancer forces said sleeve further into said hub to release said tangs and permit retraction of said needle into said hub and advancer. 10

4. In a catheter placement unit,
 a cannulated needle, 15
 a bushing secured around said needle,
 a shoulder on said bushing,
 a hub spaced around said bushing,
 a metal cylinder in said hub,
 tangs on said cylinder bent into endwise engagement with said shoulder to prevent movement initially of said needle relative to said hub,
 a sleeve inside said cylinder outwardly of said tangs,
 a catheter sheath temporarily bonded at one end to said bushing and having a longitudinal slit therein, 25
 a catheter advancer having a portion extending through said slit and movable along said sheath and having a tubular portion sized to enter said hub and force said sleeve to spread said tangs out of engagement with said shoulder, and 30
 a catheter in said sheath with one end secured to said advancer and the other end in said needle,
 whereby when the catheter has been advanced the needle may be retracted inside said hub and advancer by a pull on said sheath and the sheath discarded. 35

5. In a catheter placement unit,
 a cannulated needle,
 a false hub on the outer end of said needle,
 a catheter sheath with a longitudinal slit therein and one end temporarily bonded to said false hub, 40
 a catheter in said needle and sheath,
 a larger hub surrounding said false hub in spaced relationship thereto,
 retaining means in said larger hub holding said false hub against movement initially relative to the larger hub, and 45
 a catheter advancer with a part extending through said slit connected to said catheter and having a tubular portion to telescope inside said hub when the catheter is advanced and effect release of said retaining means, 50
 whereby said needle may be retracted into said larger hub and advancer by a pull on said sheath which breaks the bond between the sheath and false hub when the catheter is retracted.

6. In a catheter placement unit,
 a hollow needle hub,

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a cannulated needle freely slidable in said hub and projecting out of said hub,
 means in said hub restraining the needle from moving initially relative to said hub,
 a catheter advancer,
 a catheter having one end disposed in said needle and the other end secured to said advancer,
 a projecting portion on said advancer to enter said hub and release said restraining means and free said needle for retraction into said hub and advancer when the catheter is fully advanced, and retracting means connected to said needle.

7. In a catheter placement unit,
 a hollow needle hub,
 a cannulated needle slidable through said hub,
 means restraining said needle from movement initially relative to said hub with the major portion of said needle projecting from said hub,
 means to advance a catheter and enter said hub to release said restraining means and permit said needle to be retracted until the projecting end thereof is housed in said hub,
 a catheter connected at one end with the second said means and the other end inside said needle, and retracting means connected to said needle.

8. In a catheter placement unit,
 a hollow needle hub,
 a cannulated needle slidable through said hub,
 means restraining said needle from movement initially relative to said hub with the major portion of said needle projecting from said hub,
 means to advance a catheter and enter said hub to release said restraining means and permit said needle to be retracted until the projecting end thereof is housed in said hub,
 a catheter connected at one end with the second said means and the other end inside said needle, and needle retracting means in the form of a removable catheter sheath having a longitudinal slit therein through which an end portion of the catheter extends.

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