

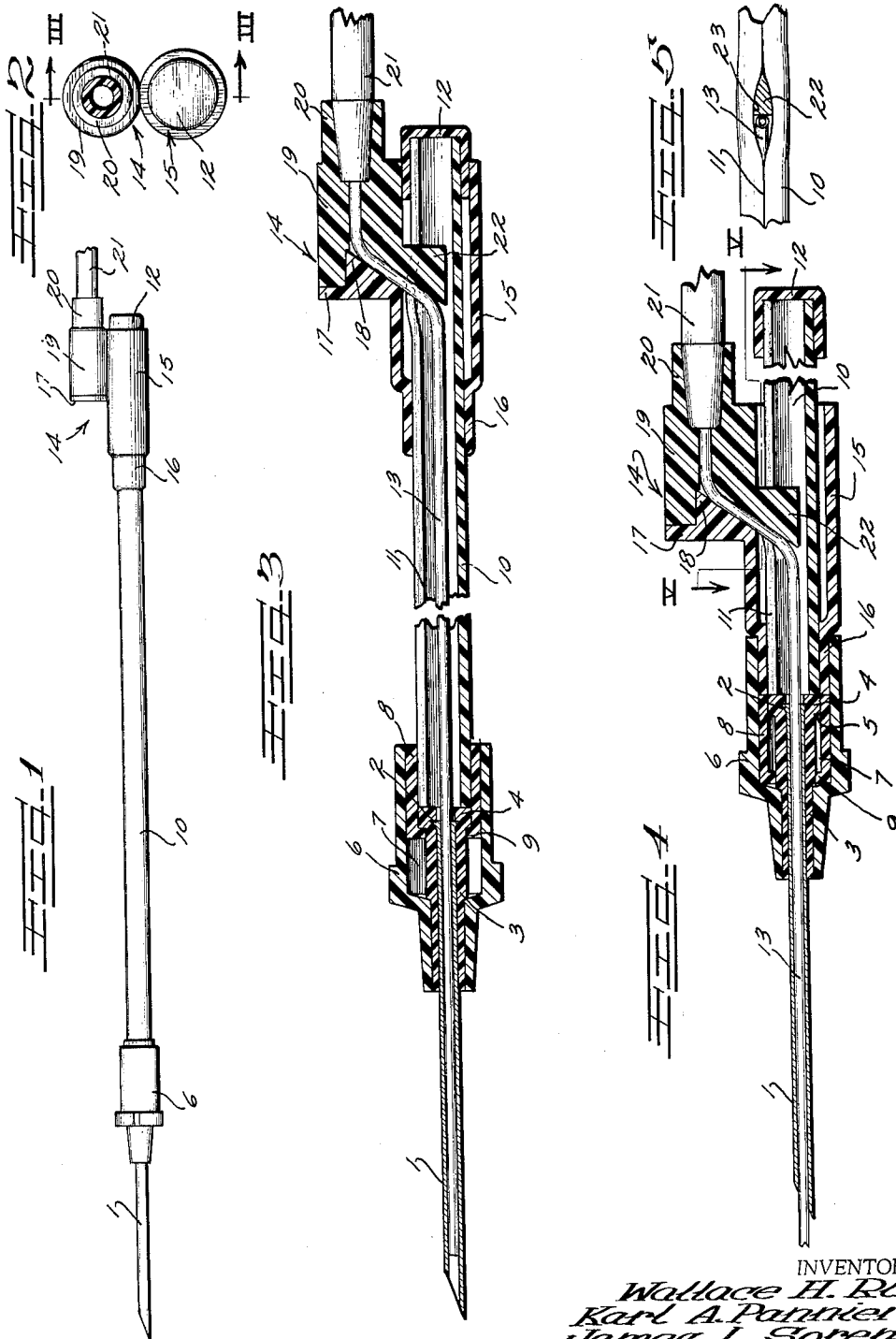
July 26, 1966

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3,262,448

INTRAVENOUS CATHETER PLACEMENT UNIT

Filed Nov. 6, 1963



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INTRAVENOUS CATHETER PLACEMENT UNIT
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Filed Nov. 6, 1963, Ser. No. 321,956

5 Claims. (Cl. 128—214)

This invention relates to improvements in a catheter placement unit, 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.

It has now become desirable to place a catheter, particularly one of the intravenous type, by advancing the catheter through a cannulated needle into a vein or the like while infusion through the catheter takes place. It is also desirable to avoid the use of stylets or the like to stiffen the catheter during insertion, with the ultimate danger of puncturing the wall of the vein, and also to avoid the use of a split or slotted needle with the ultimate danger of infection by virtue of an intraluminal plug of tissue forming upon insertion of the needle and ultimately contaminating the catheter. The catheter, of course, must be maintained in a sterile condition at all times and the placement unit must be such that the catheter can readily, easily, and rapidly be inserted without danger of puncturing a wall of the vein and without danger of contamination. To this end devices have heretofore been designed wherein the catheter, usually a flexible plastic tube, was guided by means of a more rigid sheath therearound against bending during insertion, the sheath being rupturable and removed after the catheter was in position and the catheter advancing means associated with the hub of the cannulated needle. Some difficulty was experienced, however, with such an apparatus in maintaining a fluid tight disruptable sheath which permitted desirably smooth and easy advancement of the catheter; in the removal of the sheath after the catheter has been advanced; insuring that the catheter advancing means would always remain engaged with the sheath during advancement of the catheter, and then easily and firmly engaging the catheter advancement means with the needle hub.

With the foregoing in mind, it is an important object of this invention to provide a catheter placement unit embodying a plastic sheath more rigid than the catheter contained therein and which is easily lengthwise disrupted by the catheter advancing means, by virtue of the fact that the sheath while having a longitudinal slit is not physically sealed but the slit remains closed by virtue of the inherent resiliency in the sheath itself.

Another object of the instant invention is the provision of a catheter placement unit in which a plastic sheath protects the catheter before and during advancement thereof, the sheath being secured to the hub of a cannulated needle, and the structure being such that the sheath is automatically released from the needle hub when the catheter is fully advanced.

It is also a desideratum of this invention to provide a catheter placement unit embodying a protective sheath containing a catheter and means for advancing the catheter which actually embrace the protective sheath, whereby the catheter advancing means and sheath cannot become disengaged from each other until the sheath is removed after advancement of the catheter.

A further feature of this invention is the provision of a catheter placement unit embodying a cannulated needle, a protective sheath with a catheter therein, and means for advancing the catheter, the structure being such that

the catheter advancing means firmly engage the hub of the needle when the catheter has been fully advanced.

It is also an object of this invention to provide a catheter placement unit embodying the aforesaid desiderata and objects, yet which is sufficiently economical to warrant only a single usage after which the entire unit may be discarded.

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 a fragmentary side elevational view of a catheter placement unit embodying principles of the instant invention connected to a part of an infusion system;

FIGURE 2 is an enlarged end view taken from the right-hand side of FIGURE 1, illustrating the infusion system tube in section;

FIGURE 3 is an enlarged fragmentary central vertical sectional view taken substantially as indicated by the line III—III of FIGURE 2, looking in the direction of the arrows and showing parts in elevation;

FIGURE 4 is a fragmentary sectional view similar in character and location to FIGURE 3 but showing the catheter fully advanced; and

FIGURE 5 is a fragmentary vertical sectional view taken substantially as indicated by the line V—V of FIGURE 4.

As shown on the drawings:

All parts of the instant invention may satisfactorily be made of a suitable plastic material, preferably transparent, with the sole exception of the cannulated needle itself, which is preferably metal.

The illustrated embodiment of the instant invention embodies a hollow or cannulated needle 1 having a relatively narrow annular flange 2 on the outer end thereof. Around the outer end portion of the needle is a tubular bushing 3 which is secured tightly to the needle. This bushing has an enlarged outer end or annular flange 4 and in that portion of the bushing the enlarged end 2 of the needle is firmly embedded. The enlarged end 4 of the bushing provides an inner shoulder 5, as seen in FIGURE 4. The needle is also provided with a hollow hub 6, by means of which it may be manipulated for a venipuncture or the like, and this hub is firmly seated on the inner part of the bushing 3. The bushing 3 and the hub 6 may be cemented or equivalently secured together so as to form substantially an integral structure with the needle.

The outer part of the hub is enlarged to provide an annular space 7 therein between the hub and the bushing 3. Within that space 7 is a slidable sleeve 8 having an inner annular flange 9 on its inner end which abuts the aforesaid shoulder 5 on the bushing when the device is initially made and prior to use, as seen in FIGURE 3. A tubular catheter sheath 10 has one end frictionally engaged within the sleeve 8. This engagement is relatively firm to maintain the parts united until after advancement of the catheter, but a sheath and sleeve may be quickly disengaged at the completion of an operation.

The sheath 10 is preferably made of a non-wettable plastic material and is provided with a slit 11 extending longitudinally thereof along the top of the unit. The sheath is preferably extruded, polyethylene being one satisfactory material, in such a manner that it has an inherent resiliency which acts to maintain the slit 11 closed at all times, there being no physical seal added to maintain the sides of the slit in contact. Thus, we have provided what might well be termed a surface-tension seal, because the plastic not being wettable, surface-tension of any liquid, outside or within the sheath, prevents that liquid from flowing through the relatively firmly closed

slit 11. The closure of the slit 11, however, is amply sufficient to maintain the contents of the sheath in a sterile condition. The outer open end of the sheath may be closed prior to usage by a friction fitted cap 12 or in an equivalent manner to preserve sterility.

Inside the sheath 10 is a catheter 13, preferably a slender flexible tube of plastic material, less rigid than the sheath 10. As seen in FIGURE 3, the catheter extends well into the needle 1 but does not project from the sharp end thereof. The outer end of the catheter 13 is locked, cementitiously or equivalently, in a hub-like actuator or catheter advancing means generally indicated by numeral 14. This actuator 14 is preferably made in two separate parts for purposes of economy since relatively simple two-piece molds may be utilized.

The lower part of the actuator 14 comprises a tubular member 15 through which the sheath 10 extends, the tubular portion 15 being of sufficient diameter to receive the sheath cap 12, as clearly seen in FIGURE 3. The other end of the tubular member 15 is reduced in diameter as indicated at 16 to rather intimately fit the sheath 10 and slide thereover during advancement of the catheter. Upstanding from the tube 15 on the upper side thereof is a disc-like cover 17 from the outer side of which extends a triangular projection 18 of a width approximating the diameter of the catheter.

The other part of the actuator 14 comprises a tubular member 19, having a slot therein to accommodate the aforesaid projection 18, and the inner end of which is closed by the cap 17. This member 19 has an upper passage to accommodate the outer end of the catheter and a reduced outer end portion 20 shaped in the manner of a Leur fitting to receive the end of an infusion tube 21 connected to any suitable infusion apparatus. Depending from the member 19 is a blunt edged tongue or projection 22 which extends through a suitable slot in the tubular member 15, down inside the sheath 10 through the slit 11. This projection 22 complements the aforesaid projection 18 in forming an upwardly sloping track for the catheter. The projection 22, as best seen in FIGURE 5, is preferably slightly wider than the catheter so that it establishes a somewhat oval-shaped opening 23 at the slit in the sheath. With the slit closed in the manner above explained, it is not necessary to utilize a knife edge projection to separate the walls on each side of the slit, but the blunt ended projection 22 is quite satisfactory for that purpose. As seen best in FIGURE 5, the catheter extends upwardly near the center of the oval opening 23 and therefore is not injured by sliding along against the walls defining the slit 11, because as the actuator is moved along the sheath 10 the oval shaped opening in the sheath will travel along with the projection 22.

The two tubular members 15 and 19 are cemented together at points of contact including the cover disc 17 securely so as to form, in effect, an integral structure.

In use, the instant invention is extremely simple and effective. It will be understood, of course, as is well known in this art, that a suitable cap will be disposed over the needle 1 to maintain sterility, and likewise a disposable cap will be placed over the portion 20 of the actuator, and this is removed as well as the needle cap at the start of the operation. First, the device may be connected to the infusion tube 21, and the catheter and needle flushed out to remove any air and sterilization residue that may in the system. Then, the hub of the needle may be grasped by the hand of the operator and the veni-puncture made. While infusion continues, the actuator 14 is pushed along the sheath 10 the slit 11 opening in front of the projection 22 and closing behind it as the actuator advances. The catheter moves along ahead of the actuator, being prevented from bending by the sheath 10, passing out through the point of the needle into the vein. The catheter may thus be easily and rapidly advanced into the desired position without the use of a split needle or any form of stylet and with substantially no danger of injuring the wall of the vein.

When the catheter is almost fully advanced, and the parts approach the position seen in FIGURE 4, it will be noted that the reduced end portion 16 will contact the sleeve 8 in the needle hub, and force this sleeve inwardly from the position seen in FIGURE 3 to the position seen in FIGURE 4, thereby disengaging the sleeve from the end of the sheath 10. As seen in FIGURE 4, when the catheter is fully advanced, the reduced portion 16 of the tube 15 seats firmly within the hub 6 of the needle against the end of the sleeve 8, and the sheath may be easily withdrawn through the actuator and discarded.

It will be noted that during the placement of the catheter, the surface-tension seal of the slit in the sheath permits smooth even and relatively rapid advancement of the actuator, and the actuator must remain in proper engagement with the sheath at all times until the sheath is discarded. When the reduced end portion 16 of the actuator is engaged with the needle hub, the sheath may be easily withdrawn therefrom, without the danger of any jerky action that might cause injury by the needle. After placement of the catheter, the needle may be withdrawn from the body of the patient, leaving the major portion of the catheter in proper position within a vein or other opening, and the catheter taped to the patient's skin in a well known manner.

The cap 12 on the outer end of the sheath may be removed at the start of the operation if so desired to permit ready expulsion of air through that end, and air might escape through the opening 23 in the slit of the sheath, so that there is no danger of any air being forced intravenously. The sheath will only occasionally acquire a quantity of blood from leakage between the catheter and the needle, and since the surface of the tube is non-wettable the blood is prevented from flowing more than an inch or two into the sheath. When the sheath is removed, the blood remains within it and is discarded along with the sheath. There is no objectionable mess, and the entire operation may be done smoothly without spilling any blood on the outside.

From the foregoing, it is apparent that we have provided a highly efficient form of catheter placement unit, sufficiently economical for a single usage, and which may be manipulated with complete sterility of the catheter in a smooth and facile manner with no danger to the patient and with no mess occurring when the catheter is placed.

It will be understood that modifications 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, hollow hub means on said needle, a sleeve slidable in said hub means, a catheter sheath having one end frictionally engaged in said sleeve, said sheath having a slit therein extending longitudinally thereof, a catheter in said sheath with one end extending into said needle, catheter advancing means associated with said sheath and connected with the other end of the catheter, means on said advancing means to open the slit in said sheath as the advancing means are moved therealong, and an end portion on said advancing means of a size to push said sleeve out of engagement with said sheath and seat in the hub means of said needle when the catheter is fully advanced.
2. In a catheter placement unit, a cannulated needle, hollow hub means on said needle, a sleeve slidable in said hub means, a catheter sheath having a longitudinal slit therein and one end frictionally engaged by said sleeve,

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a catheter in said sheath with one end extending into said needle, and
 catheter advancing means movable along said sheath to advance the catheter through said needle while spreading said sheath at said slit, and
 means on said advancing means to slide said sleeve off the end of said sheath and seat in said hub means when the catheter is advanced.

3. In a catheter placement unit,
 a cannulated needle,
 a hollow hub on said needle,
 a catheter sheath engaged with said needle hub, said sheath having a longitudinal slit therein and possessing an inherent resiliency tending to maintain said slit closed,
 a catheter in said sheath with one end extending into said needle,
 catheter advancing means securely connected to the other end of said catheter and having a portion embracing said sheath and slidable therealong, and
 means on said advancing means to spread said sheath at said slit as the catheter is advanced through said needle.

4. In a catheter placement unit,
 a cannulated needle,
 a hollow hub on said needle,
 movable means in said hub,
 a catheter sheath frictionally connected at one end to said movable means,
 said sheath having a longitudinal slit therealong closed by the inherent resiliency of said sheath,
 a catheter in said sheath with one end extending into said needle and the other end portion extending through said slit,

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a catheter actuator slidable along said sheath and secured to the extending end portion of the catheter, a blunt projection on said actuator extending into said sheath behind the catheter and opening said slit wider than the catheter, and
 an end portion on said actuator sized to enter the needle hub and disengage said movable means from said sheath when the catheter is advanced.

5. In a catheter placement unit,
 a cannulated needle,
 hollow hub means on said needle,
 movable means in said hub,
 a catheter sheath having one end removably connected to said movable means,
 a catheter in said sheath with one end extending into said needle,
 means to advance said catheter through said needle, and
 means on said advancing means to release the engagement of said movable means and said sheath when the catheter is advanced to permit removal of said sheath.

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