

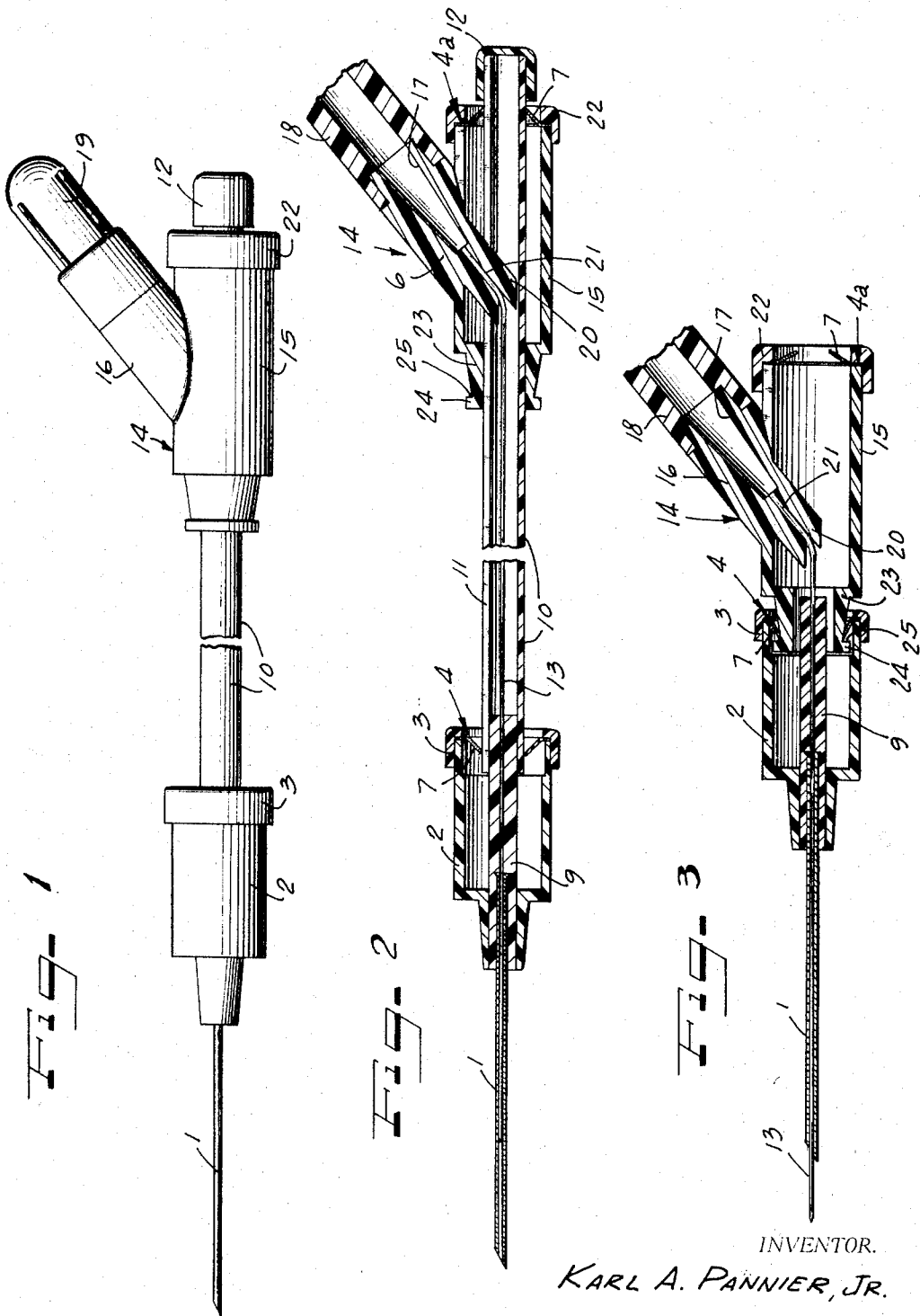
April 15, 1969

K. A. PANNIER, JR.
CATHETER PLACEMENT UNIT WITH UNIDIRECTIONAL LOCKING MEANS
TO PREVENT CATHETER RETRACTION

3,438,373

Filed March 21, 1966

Sheet 1 of 2



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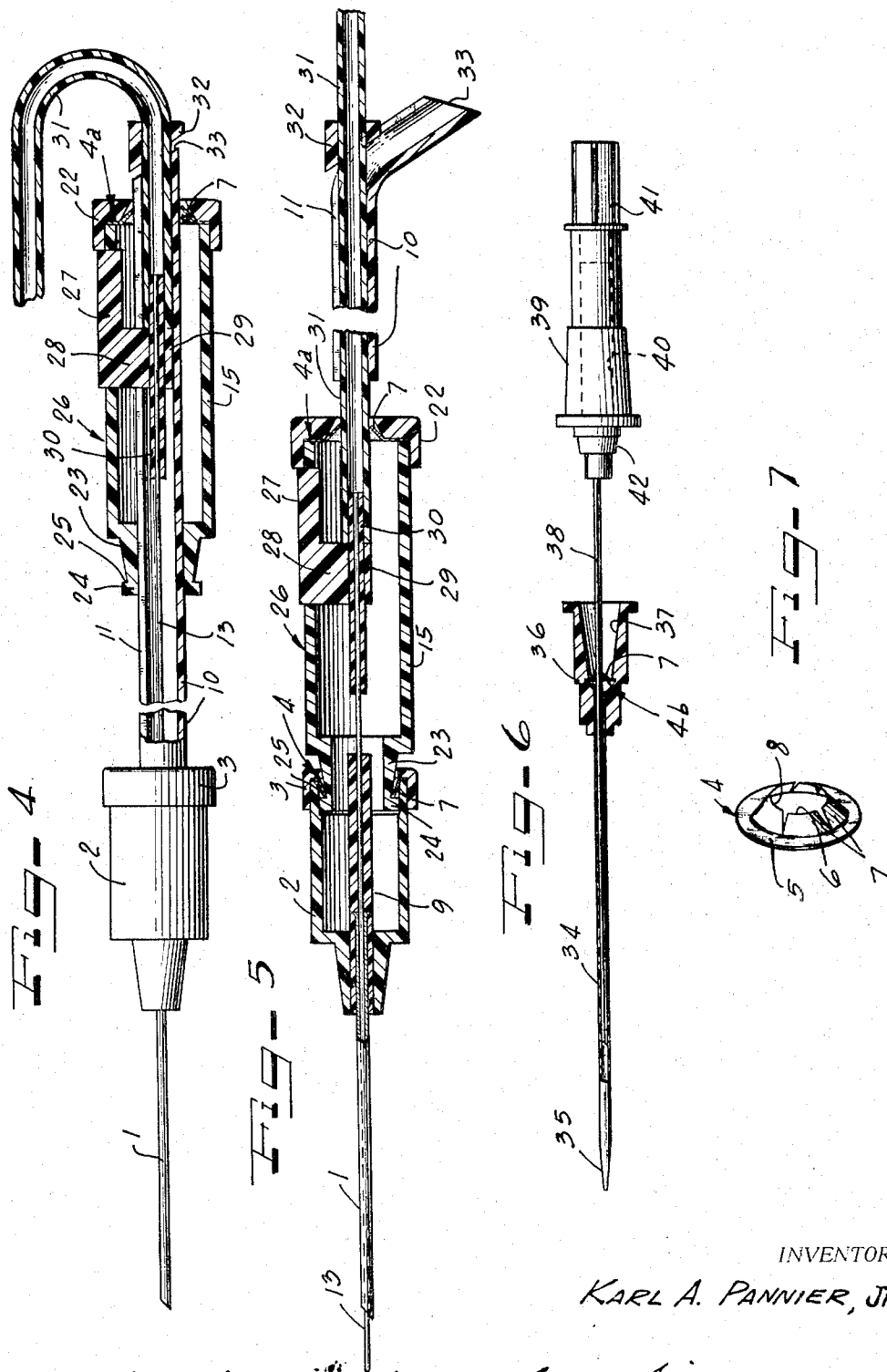
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CATHETER PLACEMENT UNIT WITH UNIDIRECTIONAL LOCKING MEANS TO PREVENT CATHETER RETRACTION

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Filed Mar. 21, 1966, Ser. No. 536,155

Int. Cl. A61m 5/14, 5/32, 25/00

U.S. Cl. 128—214.4

8 Claims

ABSTRACT OF THE DISCLOSURE

A catheter placement unit to facilitate the positioning of a catheter in a body lumen, said unit including a needle and a catheter telescopically associated therewith, the unit also being equipped with unidirectional locking means so disposed as to automatically prevent retraction of the catheter relative to the needle once advancement of the catheter relative to the needle into the body lumen has begun.

Heretofore, varieties of catheter placement units have been developed, many of which included a needle, with or without a lumen, and a catheter telescopically associated with the needle. Usually, the needle would be used to make a puncture in a body vessel, such as a vein for example, and then the catheter would be advanced relative to the needle into the lumen of the body vessel. In other instances, however, wherein a relatively short catheter would be placed in the vein of a hand for example, the needle and catheter would be advanced together into the lumen of the vein, and then the needle be withdrawn from the catheter. In all of the catheter placement units developed heretofore of which I am aware, partial or complete retraction of the catheter relative to the needle after some advancement of the catheter, was possible, and vice versa, reinsertion of the needle in the catheter after partial retraction of the needle was possible. Consequently if the first insertion of the needle and that partial advancement of the catheter was not satisfactory, a new attempt would be made with relative movement between the catheter and needle in both directions. Therefore, in the manipulation of these previously known catheter placement units it sometimes happened that a piece of the catheter was severed by the needle to become freely disposed in the lumen of a body vessel, a result most dangerous to the patient.

With the foregoing in mind, it is an important object of the instant invention to provide a catheter placement unit embodying unidirectional locking means whereby the catheter can only be moved relative to the needle in a direction of advancement but cannot be retracted relative to the needle either after partial or complete advancement; or vice versa, the unit wherein the needle is withdrawn from the catheter, the needle can only move relative to the catheter in a direction of withdrawal but cannot be advanced relative to the catheter either after partial or complete withdrawal.

It is also an important object of this invention to provide a catheter placement unit embodying unidirectional locking means which prevent retraction of the catheter relative to the needle, or advancement of the needle relative to the catheter, such locking means being so arranged as not to act directly upon the catheter.

It is also a desideratum of this invention to provide a catheter placement unit embodying a needle with a hollow hub, and advancing means to move a catheter into position relative to the needle, with locking means to engage the advancing means and lock the same securely to the needle hub after advancement of the catheter.

A further feature of the invention resides in the provision of a catheter placement unit embodying a needle having a hollow hub with locking means therein to hold the end portion of a catheter sheath and catheter advancing means to enter said hub, release the locking means from engagement with the sheath so the same may be removed, and then engage the locking means in a manner to secure the catheter advancing means and needle hub together.

Still another desideratum of this invention is the provision of a catheter placement unit embodying unidirectional locking means in the form of a thin washer having an opening therein defined by sloping teeth which in some structures may engage a catheter sheath, and in other structures engage a needle in a manner to prevent retraction of the catheter relative to the needle after partial or full advancement, and prevent reinsertion of a needle after partial or full withdrawal from a catheter.

Still a further object of this invention is the provision of a catheter placement unit embodying a catheter sheath having a longitudinal slit therein with the catheter already connected to a tube extending out of the sheath for connection to an infusion system, and improved means for removing the catheter sheath as the catheter is advanced into the lumen of a body vessel.

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 drawings, in which:

FIGURE 1 is a fragmentary side elevational view of a catheter placement unit embodying principles of the instant invention;

FIGURE 2 is a fragmentary vertical sectional view through the structure of FIGURE 1, with parts removed;

FIGURE 3 is a fragmentary vertical sectional view through the structure of FIGURE 1 showing the catheter in fully advanced position;

FIGURE 4 is a fragmentary part sectional part elevational view of a catheter placement unit of different construction but embodying principles of the instant invention;

FIGURE 5 is a vertical sectional view of the structure of FIGURE 4, with the catheter fully advanced;

FIGURE 6 is a part vertical sectional part elevational view of another form of placement unit embodying principles of the instant invention, showing the catheter partially advanced relative to the needle; and

FIGURE 7 is a greatly enlarged perspective view of a locking member.

The first illustrated embodiment of the instant invention, seen in FIGURES 1 to 3 inclusive, embodies a needle 1, which in this instance is provided with a lumen through which a catheter is ultimately advanced. The needle 1 has firmly secured thereto an enlarged hollow hub 2. A cap 3, firmly secured to the hub, holds a locking member, generally indicated by numeral 4, firmly in position between the cap and the adjacent end of the hub.

With reference now to FIGURE 7, it will be seen that the locking member 4 is preferably in the form of a metallic washer having a circumferential flange 5 having a central opening 6 defined by a plurality of spring teeth 7 sloping away from the flat flange 5, these spring teeth having relatively sharp forward edges 8. The opening 6 in the locking member is of course sized in accordance with the part passing therethrough so that that part may move freely in one direction, but if an attempt is made to move it through the locking member in the opposite direction, the teeth will bite into the part and prevent such movement. The locking member may be mounted

with the teeth sloping in either direction, as the case may be.

The hub 2 surrounds an inner semi-hub 9 having a lumen therethrough in line with the needle lumen. Around the outer end of this hub an end of a catheter sheath 10 is disposed, extending beyond the fingers 7 of the locking element 4 so as to be retained in position within the hub by that locking element. The sheath 10 is provided with a longitudinal slit 11, and the tube being made of a plastic such as polyethylene, the slit is maintained closed by the inherent resiliency of the plastic sufficiently to maintain sterilization of the interior of the sheath. The outer end of the sheath is preferably provided with a closure cap 12 which not only aids in maintaining sterility but also aids in guiding proper positioning of the parts during assembly.

Inside the sheath is a cannula or catheter 13 which is much more flexible than the sheath itself. The catheter is disposed with the inner end thereof in telescopic association with the needle 1, and in this instance the catheter extends into the lumen of the needle. The outer end of the catheter is associated with a catheter advancer, generally indicated by numeral 14. The catheter advancer 14 embodies a barrel like body 15 surrounding the sheath 10, and from which a branch nipple 16 extends at an angle having a passage 17 therein for connection with a tube 18 leading to an infusion system. Initially, before use, the branch passage 17 is closed by means of a plug 19 to maintain sterility, as seen in FIGURE 1. The nipple 16 has a lower portion 20 extending through the slit in the sheath and the end of the catheter is firmly anchored in a passage through this extension 20 by fusion or otherwise as indicated at 21. On the outer end of the body 15 is a cap 22 firmly secured thereto and between this cap and the end of the body 15 a locking member 4a is held, this member being of the same construction as the locking member 4 previously described, but being disposed with the fingers 7 thereof sloping outwardly toward the end of the sheath carrying the cap 12. The inner end of the body 15 of the advancer is provided with a tapered nose 23 having a radial flange 24 on the end thereof defining a shoulder 25, the flange being sized to spread the fingers of the locking member 4 and pass therebeyond.

In use, a commonly known needle protector, not shown, is stripped from the needle, the plug 19 is removed from the branch nipple 16 and the device connected to an infusion system. Infusion is started to flush out the catheter and needle to remove air and any sterilization residue that may be present. Then infusion may be stopped, and the needle inserted in the lumen of a vein or other body vessel; and the catheter advanced into the lumen of the body by holding the needle hub with one hand, grasping the adapter 14 with the other sliding the adapter toward the needle hub from the position shown in FIGURES 1 and 2 to the position seen in FIGURE 3. During this operation the end of the sheath is maintained inside the needle hub by the fingers 7 of the locking member 4, until just prior to the full advancement of the catheter when the flange 24 on the nose 23 of the advancer spreads the fingers 7, and releases the sheath for complete removal. Upon complete advancement of the catheter, the flange passes through the fingers of the locking member and these fingers engage the shoulder 25 as seen in FIGURE 3, and the advancer is securely locked to the needle hub.

It will be especially noted that the needle can never be advanced relative to the catheter, and the catheter cannot be retracted relative to the needle. Danger of the needle injuring the catheter is therefore eliminated. Should any attempt be made to retract the catheter relative to the needle after partial advancement thereof the fingers 7 on the locking member 4a would bite into the held sheath and stop such an attempt. Should any attempt be made to retract the catheter relative to the needle after complete advancement thereof, the fingers 7 of the locking

member 4 resting against the shoulder 25 of the advancer would prevent any such attempt. It will thus be seen that any relative backward and forward movement between the catheter and the needle is entirely prevented, and only unidirectional movement of the catheter relative to the needle is permitted. It will also be noted that the means insuring unidirectional movement of the catheter relative to the needle never come in direct contact with the catheter itself, the catheter being freely disposed within the sheath and needle and not subject to any pressure from other portions of the apparatus.

Of course, it is preferable once the needle has made a venipuncture or the equivalent to start infusion and advance the catheter while infusion is taking place. Upon complete advancement of the catheter the needle and catheter are together retracted sufficiently to remove the needle from the body of the patient whereupon the needle may be protected and the catheter secured to the patient's body by adhesive tape or the like in a known manner.

All parts of the catheter placement unit with the exception of the needle and the two locking members may be made of extruded or molded plastic material, and the locking members and needle may also be made of other material than metal if the material has sufficient strength and rigidity, and is not susceptible to breakage.

The form of the invention illustrated in FIGURES 4 and 5 embodies the same needle and hub construction, substantially the same sheath, and an advancer, generally indicated by numeral 26, involving the same barrel and nose construction as described above. In this instance, however, the catheter is initially connected to an elongated tube projecting out of the sheath, which tube is securely associated with the catheter and may be connected directly with an infusion system.

In this instance, there is no branch nipple 16 associated with the adapter 26, but the outer end of the catheter remains inside the body 15 of the adapter. The adapter is provided with a fixed member 27 having an inward extension 28 passing through the slit 11 in the sheath 10. This extension 28 is provided with a tubular portion 29 at the inside end thereof which embraces and is secured to a nipple 30. The catheter 13 has its outer end fused or otherwise anchored inside the nipple 30. A tube 31 for connection with an infusion system extends into the sheath and has its inner end fused or otherwise secured to the outer end of the nipple 30, thereby being fixedly connected through the nipple with the catheter. The tube 31 is made of stronger plastic material than the catheter, and outside the catheter sheath a solid wedge-shaped member 32 is fixedly secured to the tube 31. The outer end of the catheter sheath is cut off slantwise as indicated at 33 complementary to the adjacent face of the wedge member 32.

This form of the instant invention is operated in substantially the same manner as the previous form, with the single exception that as the catheter is advanced through the needle, the tube 31 is pulled along with the advancer through the sheath, and the wedge-shaped member 32 causes the sheath to progressively spread at the slit 11 and be canted at an angle laterally to the tube 31 for removal of the sheath. When the catheter has been fully advanced and the advancer is locked to the needle hub as above described, the remaining portion of the catheter sheath may be easily withdrawn by pulling it against the member 32. As in the previous embodiment, when the catheter is fully advanced the advancer is locked to the needle hub, and the locking member 4a prevents any retraction of the catheter relative to the needle at any time prior to complete advancement, and after complete advancement has been reached the locking member 4 prevents retraction of the catheter relative to the needle. The form of FIGURES 4 and 5 provides all of the advantages of the previously described embodiment.

That form of the invention illustrated in FIGURE 6

embodies a catheter 34 preferably having a tapered leading end 35, with the outer end thereof securely anchored in a hub 36 having a tapering cavity 37 for connection to an infusion system. In this instance, an needle 38, preferably having a lumen, extends inside the catheter and the catheter is telescoped off the needle rather than through it. The outer end of the needle is connected to a hollow elongated hub 39 having a blood receiving reservoir 40 therein which may be closed by a suitable plug 41. The inner end of the hub is provided with a projection 42 tapered complementally to the cavity 37 in the catheter hub 36 and these parts may be telescopically joined when the placement unit is first assembled. When the nose 42 is engaged within the cavity 37, the pointed end of the catheter 35 is just outward of but adjacent to the point of the needle and the tapers aids the catheter entering a venipuncture or the like along with the needle. Adjacent the base of the socket 37 in the catheter hub a locking member 4b is mounted, this being of the same construction as the locking member 4 seen in FIGURE 7, but sized so that the fingers 7 thereof, sloping outwardly, engage the needle 38.

In use, this form of the invention cannot be connected to an infusion system prior of venipuncture or the like, and infusion cannot take place while the catheter is being advanced into the body lumen. However, this arrangement is usually utilized with short catheters requiring little advancement and the tapering end on the catheter aids in offsetting the advantage of the spreading of the vein by infusion during advancement of the catheter. After venipuncture or the like has been established by both the needle and the catheter, the plug 41 having been removed, blood will pass through the needle and collect in the reservoir 40 of the needle hub, visibly through the transparent hub, and when this occurs to signify the needle has properly entered a vein, the plug 41 is replaced. Further venipuncture is not necessary, and the catheter by virtue of its hub, which functions as an advancer, may be advanced into the vein, until the catheter hub is adjacent the puncture point, when the needle may readily be withdrawn from the catheter and the catheter hub connected to the infusion system. It will be noted that at no time can the catheter be retracted relative to the needle after advancement has begun, because of the fingers 7 of the locking member firmly engaging the needle. It will also be noted that these fingers on the locking member prevent a reinsertion of the needle or a movement of the needle in that direction, relative to the catheter and consequently there is no danger of the catheter being injured by virtue of relative movement between it and the needle.

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

I claim as my invention:

1. In a catheter placement unit of telescopic parts, a needle, a catheter telescopically associated with said needle, a catheter advancing means connected to one end of the catheter to move the catheter relative to said needle and advance the other end of the catheter in a body lumen, and positive unidirectional locking means carried by said advancing means out of contact with the catheter and positioned to act continuously on one of said parts of said unit other than the catheter to automatically prevent retraction of the catheter relative to said needle once advancement of the catheter has begun.
2. The catheter placement unit of claim 1, wherein said locking means are positioned to act on said needle.
3. The catheter placement unit of claim 1, also including

a sheath having a lengthwise slit therein and containing said catheter, and

means on said advancing means extending into said sheath to disrupt the same along said slit as the catheter is advanced,

said locking means acting on said sheath behind the advancing catheter.

4. The catheter placement unit of claim 2, wherein said locking means is in the form of a metallic washer having a central opening defined by a series of annular teeth sloping away from the needle point and in engagement with the needle, said catheter surrounding said needle.

5. The catheter placement unit of claim 3, wherein said locking means is in the form of a metallic washer having a central opening defined by a series of annular teeth sloping away from the needle point and in engagement with said sheath.

6. The catheter placement unit of claim 5, also including,

a hollow hub on said needle into which said sheath extends,

a second metallic washer in said hub with the teeth thereof sloping toward the needle point in engagement with said sheath, and

a nose on said advancing means having an annular flange thereon and sized to enter said hub as the catheter reaches complete advancement, elevate said washer teeth to release said sheath, and permit said teeth to lock behind said flange.

7. The catheter placement unit of claim 6, also including,

a flexible tube extending through said sheath and connected to said catheter on the needle side of the locking means carried by said advancing means, and

a wedge-shaped member secured to said tube outside said sheath to direct said sheath away from said tube as the catheter is advanced for removal of the sheath when the catheter is completely advanced.

8. In a catheter placement unit,

a needle,

a hollow hub on said needle,

a catheter sheath having one end extending into said hub and having a longitudinal slit therein,

locking means in said hub holding said one end of said sheath,

a catheter in said sheath,

catheter advancing means having a portion thereof extending into said sheath through said slit, and

a nose on said advancing means to enter said hub when the catheter is almost fully advanced, release said locking means from said sheath, and engage with said locking means to secure the needle hub and advancing means together so that retraction of the catheter relative to the needle is prevented.

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U.S. Cl. X.R.