

May 25, 1965

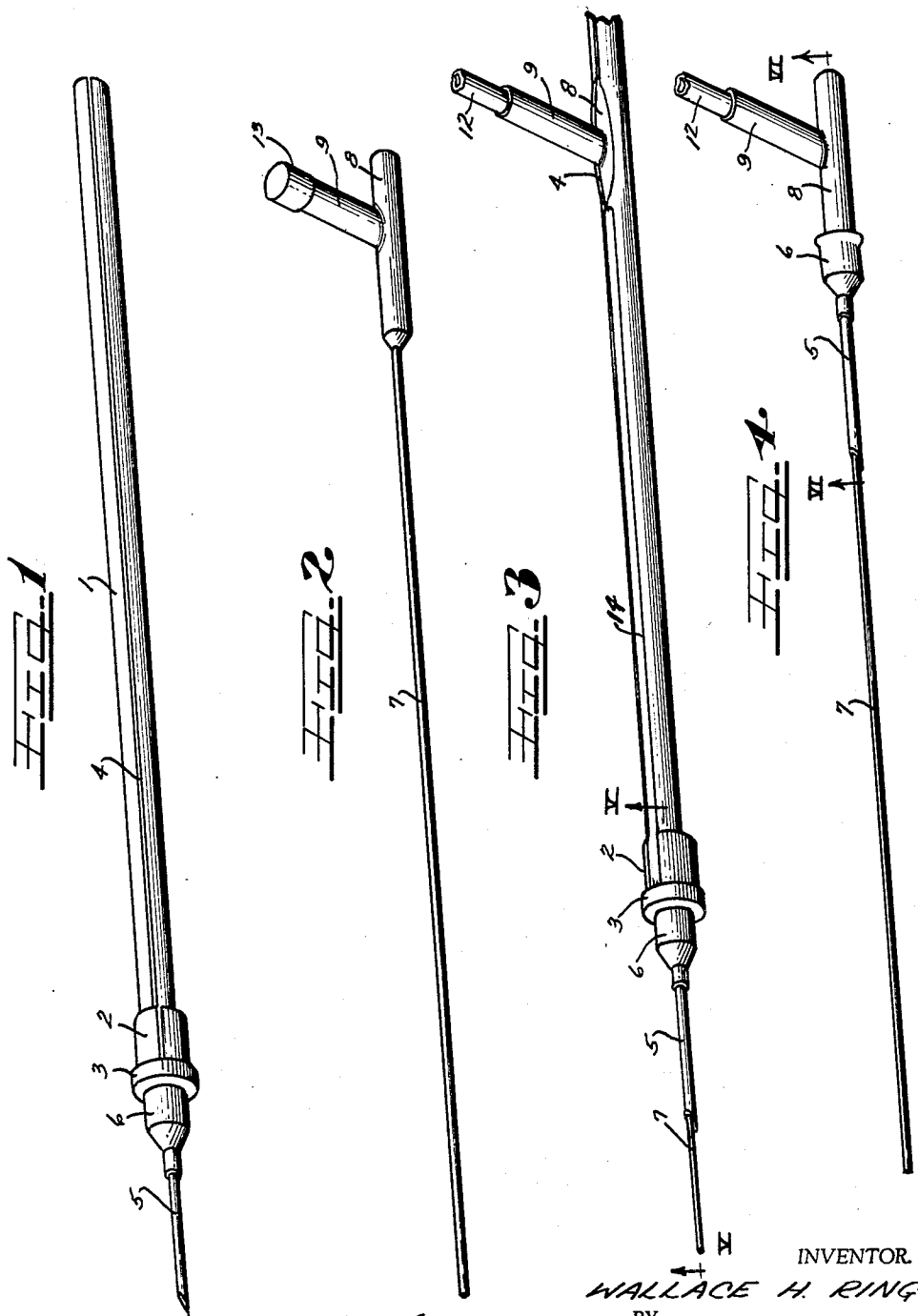
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3,185,152

INTRAVENOUS CATHETER PLACEMENT UNIT AND METHOD OF USE

Filed June 19, 1962

3 Sheets-Sheet 1



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INTRAVENOUS CATHETER PLACEMENT UNIT AND METHOD OF USE

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FIG. 5

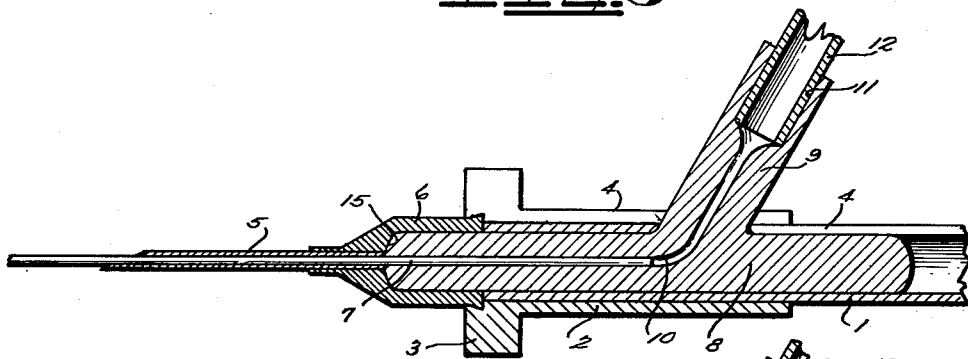


FIG. 6

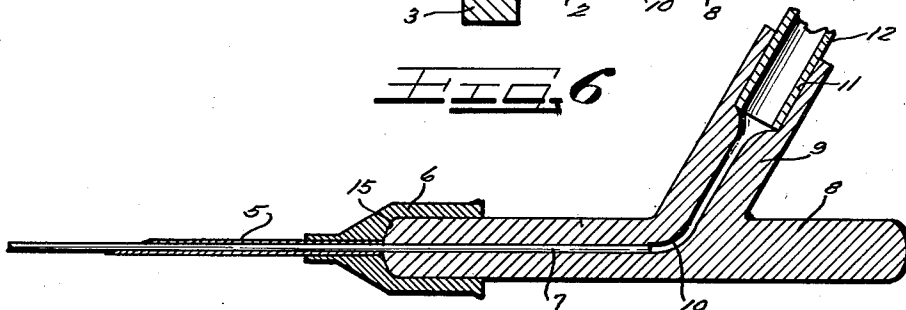
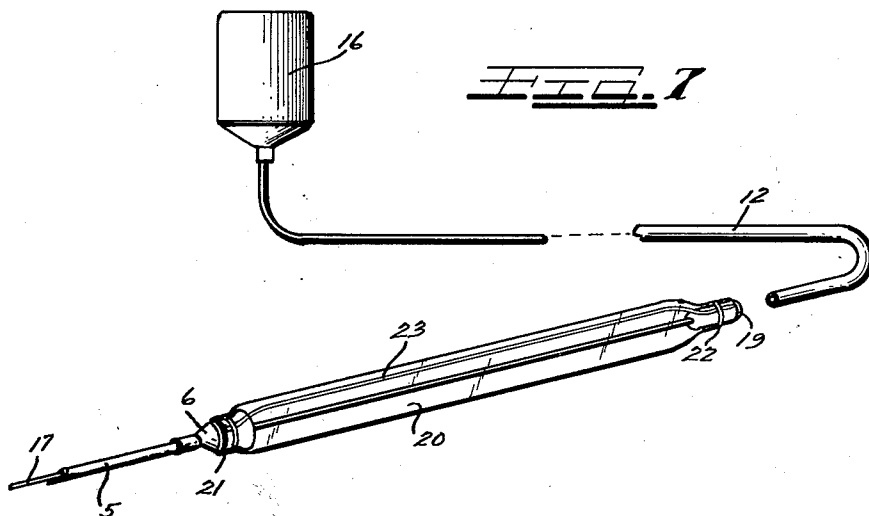


FIG. 7



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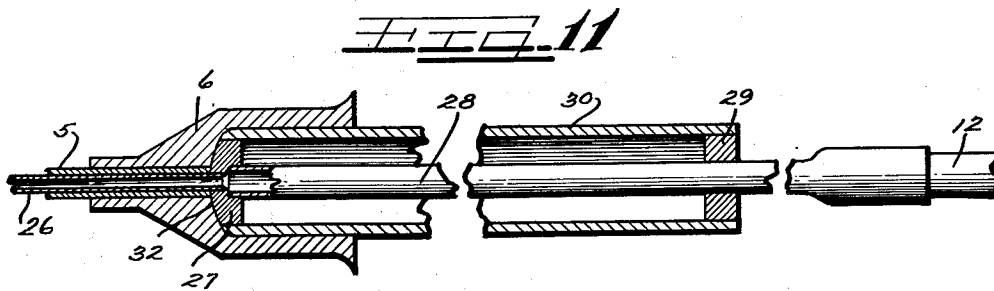
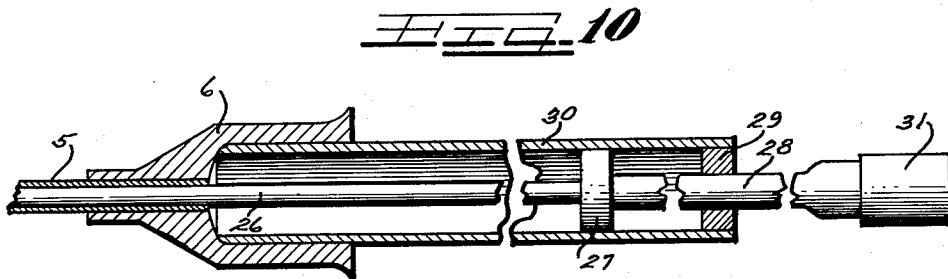
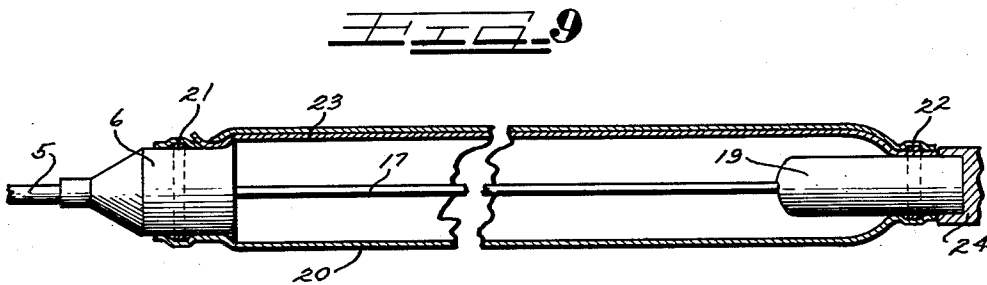
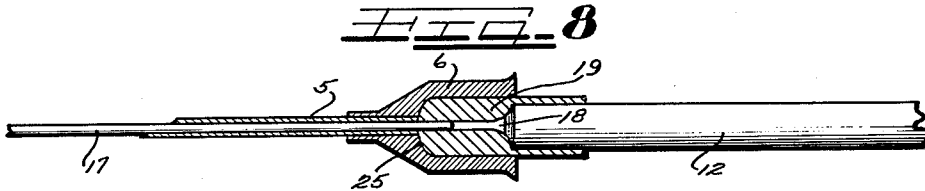
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INTRAVENOUS CATHETER PLACEMENT UNIT AND METHOD OF USE

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3 Sheets-Sheet 3



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3,185,152

INTRAVENOUS CATHETER PLACEMENT UNIT AND METHOD OF USE

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12 Claims. (Cl. 128—214)

This invention relates to improvements in an intravenous catheter placement unit and method of use, the invention being highly desirable for use in connection with parenteral infusions into the body by means of a catheter, with particular regard to intravenous infusions, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

Heretofore, an objectionable amount of difficulty has been experienced in the placement of a catheter in the form of a flexible plastic tube through a cannulated needle into the vein of a patient for the administration of an intravenous infusion. More recently heretofore, catheter units, which are most frequently used once and then discarded, have been provided with the sterile catheter disposed within an enclosure, either rigid or pliable, and the catheter is manipulated through the cannulated needle while it remains within the enclosure or a part thereof so as to maintain sterility. Perhaps the main difficulty with such previous units resided in the fact that the catheter could not be connected to the infusion system prior to venipuncture, and as a consequence, there was danger of residue from the sterilization material entering the patient's vein, air embolism, loss of blood from the patient, possible infection or spread of disease from infected blood, and a messy operation frequently resulted.

With the flexible enclosure as made heretofore the catheter was found difficult to properly guide into the patient's vein, especially when dry. In some instances stylets through the catheter to stiffen the same have been used, but such endangers perforating the vein wall when the catheter is advanced. Where comparatively rigid tubes or enclosures have been used, such necessitating the use of a plunger to position the catheter, it was necessary to remove the plunger before connection to the infusion tube giving rise to the dangers above expressed, and the plunger was liable to stick particularly upon the withdrawal attempt. In addition, some heretofore known devices used split or slotted needles with danger of accumulation of an intraluminal plug of tissue upon insertion of the needle, interfering with the ultimate advancement of the catheter through the needle. The use of a slotted needle also interferes with maintenance of sterility, because the catheter, which must remain intravenously for relatively long periods of time, must come into contact with the skin which is not usually sterile and which probably bears an irritating disinfectant solution.

It should also be noted that many operators of long experience have perfected the technique of performing the venipuncture with the needle attached to a hypodermic syringe, after which the syringe is carefully removed from the needle and a connection made with the infusion system. While this technique may be performed with great facility, it is practically impossible to utilize that technique with catheter units as heretofore provided.

With the foregoing in mind, it is an important object of the instant invention to provide a catheter placement unit so arranged that the catheter itself may be connected to the infusion tube or system prior to venipuncture and prior to the removal of the enclosure which maintains the catheter sterile until use.

Another important object of this invention is the provision of a catheter placement unit so arranged that the catheter may be advanced through the cannulated needle after connection with the infusion system and while infusion is in process.

Another desideratum of this invention is the provision of a catheter placement unit including a comparatively rigid enclosure for the catheter which, in one form may be utilized without a plunger, and in another form with a plunger.

Still another feature of the invention resides in the provision of a catheter placement unit so constructed that the cannulated needle may be removed from the unit, used with a hypodermic syringe to effect venipuncture, and then connected to the catheter enclosing means without loss of sterility.

Still another object of this invention is the provision of a catheter placement unit embodying a comparatively rigid enclosure for the catheter, which enclosure guides the catheter while it is advanced through the needle into the patient's vein, and which enclosure is disruptible as the catheter is advanced for removal of the enclosure from the positioned catheter.

It is also an object of this invention to provide a catheter placement unit embodying a comparatively rigid enclosure for the catheter in which a hollow plunger operates to position the catheter, the catheter being connected to the plunger head, and after positioning of the catheter, the plunger is not removed but becomes a part of the infusion system.

It is a further and important object of this invention to provide a new and novel method of use of a catheter placement unit.

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 view of a portion of a catheter placement unit, showing the enclosure for the catheter and the cannulated needle joined together prior to assembly of the unit;

FIGURE 2 is a similar view of the catheter joined to its actuating means prior to assembly of the unit;

FIGURE 3 is a fragmentary elevational view of the assembled unit connected to an infusion tube and showing the catheter partially advanced;

FIGURE 4 is a fragmentary elevational view showing the catheter fully advanced and its original enclosure removed;

FIGURE 5 is an enlarged fragmentary vertical sectional view taken substantially in the location indicated by the line V—V of FIGURE 3, looking in the direction of the arrows, but showing the catheter advancing means engaged with the needle hub and illustrating the catheter in elevation;

FIGURE 6 is a similar fragmentary enlarged vertical sectional view taken substantially as indicated by the line VI—VI of FIGURE 4;

FIGURE 7 is an elevation view illustrating a catheter placement unit embodying principles of the instant invention but of a somewhat different construction, showing the same connected to the infusion system and with the catheter partly advanced;

FIGURE 8 is an enlarged fragmentary vertical sectional view of the structure of FIGURE 7 illustrating the catheter as completely advanced;

FIGURE 9 is an enlarged fragmentary vertical sectional view of the structure of FIGURE 7 illustrating the catheter in its enclosure prior to use;

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FIGURE 10 is a fragmentary part vertical sectional part elevational view illustrating a still different form of the instant invention prior to use; and

FIGURE 11 is a view similar in character to FIGURE 10, illustrating the catheter fully advanced.

As shown on the drawings:

In the first illustrated embodiment of the instant invention, seen in FIGURES 1 to 6 inclusive, there is shown a catheter enclosure 1 which is tubular in form and made of a suitable plastic or equivalent material. A collar 2 is attached to the catheter tube at one end thereof and this collar is headed as indicated at 3, which head forms a socket for the hub of a needle. Both the tube 1 and collar 2 are slotted as indicated at 4. It will be understood that while this tube is inherently somewhat flexible it is far more rigid than the catheter to be contained therein, so that the tube will function as a guide for the catheter. In FIGURE 1 a cannulated needle 5 is shown with its hub 6 engaged in the socket of the head 3.

In FIGURE 2 the catheter assembly is illustrated separate from the placement unit. This assembly includes a catheter 7 in the form of an elongated flexible tube of plastic or equivalent material and an actuator comprising a plug 8 and an arm 9 integral therewith and extending therefrom by means of which the catheter is manipulated. As best seen in FIGURES 5 and 6 the actuator is provided with a passage 10 in the inner portion thereof, and which passage turns and extends through the arm 9. The outer portion of the plug 8 being solid. The catheter 7 is seated in the passage 10 in the inner portion of the plug 8. The outer end of the arm 9 is shaped interiorly to form an enlarged socket in communication with the passage 10, which socket receives telescopically the end of the commonly known infusion tube which forms a part of the infusion or administering system. Initially, as seen in FIGURE 2, the outer end of the arm 9 is covered with a cap 13 to maintain sterility of the catheter until time of usage.

When the structures of FIGURES 1 and 2 are assembled the plug or piston 8 is snugly but slidably disposed within the enclosure tube 1 with the arm 9 thereof projecting through the slot in the tube, the catheter 7 being disposed within the tube and terminating approximately inside the collar 2. The slot 4 may be closed to preserve sterility in substantially any suitable manner as indicated at 14 in FIGURE 3 by means of a disruptible or separable material such as a cementitious substance, a covering of thin paper or the equivalent, an interlocking of the tube walls adjacent the slot or in any other desirable fashion. As the catheter is advanced through the needle 5 by holding the collar 2 and moving the arm 9 from right to left in FIGURE 3, the enclosure tube 1 is disrupted at the slot and when the catheter is fully advanced through the needle 5 as seen in FIGURE 4, the entire enclosure tube 1 with the collar and head 2 and 3 is discarded. From the showing in FIGURES 5 and 6 it will be noted that the inner end of the piston or plug 8 is shaped complementally to the inner portion of the hollow needle hub 6 so that there will be an intimate seating as indicated at 15 when the catheter is fully advanced.

In the initial placement unit, it will be understood that the needle may have any suitable form of removable covering or closure to maintain the sterility thereof, which is removed at the time of venipuncture. The catheter itself is maintained in a sterile condition by the closure tube 1 and cap 13 on the arm 9. Any particular form of infusion administering apparatus may be utilized with the instant invention, and in FIGURE 7 I have diagrammatically illustrated an infusion liquid container 16 from which the aforesaid infusion tube 12 leads, and it will be understood of course that such apparatus is provided with suitable valve means, not shown.

In operation, the instant invention is extremely simple, clean, positive and may be facily used. Either before or after the sac enclosing the needle is ruptured, the cap

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13 is removed from the arm 9 and the infusion tube 12 inserted in that arm. The infusion liquid is then permitted to flow through the still enclosed and sterile catheter and the needle to flush out the system to eliminate any air and sterilization residue that may be in the system. Venipuncture is then made with the needle, and the infusion system activated, thus preventing any loss of blood by back flow. While infusion is in process, the sterile catheter is advanced through the needle into the vein of the patient by moving the arm 9 toward the needle and disrupting the tube or sheath 1. The relatively rigid tube or sheath 1 effectively guides the catheter in this operation, and as the flexible catheter leaves the needle it is free to follow the tortuous contours of the vein.

A highly important advantage is obtained in positioning the catheter during infusion. The infusion liquid will effectively expand the vein ahead of the catheter, permitting easy and rapid advancement with minimal danger of puncturing the wall of the vein. This procedure is particularly advantageous where a patient is in a condition of shock and the veins are collapsed, a condition wherein heretofore it was extremely difficult to properly insert a catheter. But with the collapsed vein being expanded ahead of the catheter by the infusion liquid, the instant invention makes the positioning of the catheter even under such circumstances an easy and facile operation. It will be noted that the catheter remains sterile, there is no mess developed during the operation, no loss of blood from the patient, no danger of spreading disease should the patient's blood be infected, no danger of irritation to the patient by any sterilization compound residue entering his vein, and no danger of air embolism.

The instant invention possesses a further advantage in that should the operator so desire the needle may be snapped out of the head 3 on the collar 2 of the catheter enclosure, and the venipuncture made with the needle attached to a syringe. After venipuncture, with reasonable care to maintain sterilization, the syringe may be removed, and the hub of the needle snapped back into the head 3, infusion started, and the still sterile catheter advanced into the vein through the needle in the manner above described.

Another distinct advantage of the instant invention resides in the fact that should the venipuncture be faulty, the catheter may be resheathed, by moving the arm 9 and piston 8 rearwardly, the needle withdrawn, the catheter flushed out, and if sterile precautions are observed, the device may be used for another attempt. That was impossible with catheter units as heretofore known, since the catheter could not be resheathed and its sterility preserved.

Of course, after the catheter has been properly positioned in the vein, the entire sheath or enclosure 1, 2 and 3 is discarded.

In FIGURES 7, 8 and 9 I have illustrated a different form of the invention wherein a catheter 17 having an expanded following end 18 is seated in the passage of a connector 19 as seen in FIGURE 8, which connector is shaped to telescopically receive the end of the infusion tube 12.

As this form of the invention is initially supplied, prior to use, the catheter 17 is encased within a flexible or pliable closure sheath 20 which may satisfactorily be a plastic film. This enclosure sheath has one end portion thereof embracing the hub 6 of the cannulated needle and is provided with a circumferential tear strip 21 to release that end. The other end of the sheath is engaged around the connector 19 on the catheter, and a tear strip 22 is provided for releasing. A third tear strip 23 is disposed lengthwise of the sheath so that it may readily be removed after the catheter has been positioned in the patient's vein. It will be noticed, as seen in FIGURE 9, that the end of the connector 19 projects without the sheath and is provided with a cap 24 to maintain the sterility of the catheter. Of course, the needle is provided with the customary cap to maintain sterility, which is not shown in the drawings.

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This form of catheter placement unit is utilized in substantially the same general manner as the previously described form. The cap may be removed from the needle 5, the cap 24 removed from the connector 19, and the infusion tube 12 inserted in the open end of the connector. Then the venipuncture is made, and the catheter is advanced through the needle into the vein by compressing the sheath 20 between the fingers near the needle hub, pushing the catheter forward, taking a new grip and pushing forward again, until the catheter is advanced, infusion taking place during the advancement. When the catheter is fully advanced, the connector 19 may be gripped and pressed into the hollow hub 6 of the needle to seat in position as indicated at 25 in FIGURE 8. Then the tear strips 21, 22 and 23 may be used to disrupt the sheath 20 for its removal and discarding. Should it be desired to make the venipuncture with the aid of a hypodermic syringe or the like, the tear strip 21 may be used to rupture the leading end of the sac, the needle slipped out of the sac or sheath, due measures being taken to insure retention of sterility, and after the hypodermic syringe has been removed, the sheath may be again placed over the needle hub and held in place while the catheter is advanced. Of course, as in the previous embodiment, the catheter and needle may first be flushed out with infusion liquid to eliminate air and any residue matter prior to making the venipuncture.

In FIGURES 10 and 11 I have illustrated a still different form of the invention in which a catheter 26 has the trailing end thereof seated in a perforated piston 27 and a hollow plunger 28 is seated in the opposite side of the piston and extends outwardly through a perforated plug 29 which closes the outer end of a rigid tube 30 forming a sheath for the catheter. The inner end of the tube 30 is telescopically seated in the hollow hub 6 of the needle. The hollow plunger rod 28 ultimately forms a part of the infusion system after catheter has been positioned, and the projecting end thereof is provided with a cap 31 to maintain sterility until time of use. Nothing is needed with this structure to maintain sterility except the cap 31 and a cap over the needle 5. In use, the needle cap is removed, the cap 31 is removed, the hollow plunger rod connected to the infusion tube 12, the venipuncture made, and the catheter advanced through the needle by grasping the protruding portion of the plunger rod 28 and forcing the catheter along ahead of the piston 27 which ultimately seats in the hollow hub of the needle as indicated at 32 in FIGURE 11. The parts then remain as shown in this figure during the time of infusion. Should the venipuncture be faulty, the catheter may be withdrawn into the tube 30, the needle carefully removed, and a new venipuncture made utilizing the same apparatus. This embodiment of the invention provides all of the advantages of the previously described embodiments.

It may be noted that preferably all parts of the three described embodiments of the invention with the exception of the cannulated needle and the piston 27 of the embodiment shown in FIGURES 10 and 11 may satisfactorily be made of polyvinyl, polyethylene, or equivalent plastic substances.

From the foregoing, it is apparent that I have provided a simple form of catheter placement unit in which the catheter is connected to the infusion system prior to venipuncture and is advanced through the cannulated needle into the vein of the patient during the infusion process, reliance being had upon the expansion of the vein by the infusion liquid to aid in the advancement of the catheter. The placement unit is economical in construction, permits various modes of making the venipuncture, is easily and effectively used, and the loss of catheter placement units through faulty operation is negligible.

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

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I claim as my invention:

1. In a catheter placement unit for positioning a catheter in the body of a patient,
 - a cannulated needle having a hollow hub,
 - a closed sheath engaged with the needle hub,
 - a catheter in said sheath,
 - hollow connecting means attached to an end of the catheter for placing the catheter in communication with an infusion system and having an end projecting outside said sheath,
 - a removable cap on the projecting end of said means, and
 - means for disrupting said sheath lengthwise when the catheter is positioned, whereby the catheter may be positioned while sheathed and during infusion.
2. In a catheter placement unit,
 - a cannulated needle,
 - a hollow hub on the outer end of said needle,
 - a tubular catheter sheath attached to said hub and having a line of separation longitudinally thereof,
 - a catheter of less rigidity than said sheath inside said sheath with one end extending into said needle hub, and
 - hollow catheter advancing means at the other end of said catheter and extending through said sheath, whereby said advancing means may first be connected to an infusion system and then manually moved to both advance said catheter and disrupt said sheath along said line of separation.
3. In a catheter placement unit,
 - a cannulated needle,
 - a hollow hub on the outer end of said needle,
 - a tubular catheter sheath having a socket at one end in which the needle hub is removably seated and a line of separation longitudinally thereof,
 - a catheter in said sheath, and
 - catheter advancing means connected to an end of the catheter and arranged to connect said catheter in an infusion system, said advancing means being manually movable to both advance the catheter through said needle and disrupt said sheath along said line of separation.
4. In a catheter placement unit,
 - a cannulated needle,
 - a hollow hub on the outer end of said needle,
 - a thin pliable sheath connected to said needle hub,
 - a catheter in said sheath, with one end extending into said needle hub,
 - a connector on the other end of said catheter and extending outside said sheath to incorporate the catheter in an infusion system, and
 - tear strip means embodied in said sheath to disrupt the same longitudinally for removal laterally with respect to the axis of the catheter after the catheter has been placed through said needle, whereby the catheter may be positioned while fully sheathed and during infusion.
5. In a catheter placement unit,
 - a cannulated needle,
 - a hollow hub on the outer end of said needle,
 - a rigid tubular sheath having one end secured to said needle hub,
 - a hollow piston in said sheath,
 - a catheter having one end extending into said needle hub and the other end seated in said piston,
 - a hollow plunger having its inner end seated in the outer side of said piston and its outer end extending without said sheath for connection with an infusion system,
 - a removable cap over the outer end of said plunger, and
 - said piston being shaped to seat in said needle hub after advancement of the catheter through said needle with the hollow plunger remaining as a part of the infusion system.

6. The method of positioning a catheter contained in a sterile sheath in the body of a patient, including the steps of
- 5 inserting a cannulated needle in the patient's body, starting an infusion of liquid through the catheter and needle,
- 10 advancing the catheter through the needle into the patient's body while infusion proceeds, and maintaining the portion of the catheter outwardly of the needle and the patient's body within a sterile sheath until the catheter is fully advanced.
7. The method of positioning a catheter contained in a sterile sheath connected to a cannulated needle in the vein of a patient, including the steps of
- 15 connecting the catheter associated with the cannulated needle to an infusion system, making a venipuncture with the needle, starting infusion through the catheter and needle, advancing the catheter through the needle into the vein during infusion, and
- 20 maintaining the portion of the catheter outwardly of the needle and the patient's body within a sterile sheath until the catheter is fully advanced.
8. The method of using a catheter placement unit embodying a cannulated needle and a sheathed catheter with means for connecting the catheter to an infusion system projecting outside the sheath, including the steps of
- 25 connecting the catheter to an infusion system, flushing out the catheter and needle with infusion liquid, making a venipuncture with the needle, starting infusion,
- 30 advancing the catheter through the needle into the vein of a patient while infusion proceeds, and removing the catheter sheath.
9. The method of using a catheter placement unit embodying a sheathed catheter associated with a cannulated needle, including the steps of
- 35 connecting the unit to an infusion system, flushing out the catheter and needle with infusion liquid,
- 40 making a venipuncture with the needle, starting infusion into the vein of a patient, and advancing the fully sheathed catheter through the needle into the vein while infusion proceeds.
10. The method of using a catheter placement unit embodying a sheathed catheter associated with a cannulated needle, including the steps of
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- connecting the sheathed catheter to an infusion system, thereafter making a venipuncture with the needle, starting infusion into the vein of a patient, advancing the fully sheathed catheter through the needle into the vein as infusion proceeds, and removing the catheter sheath.
11. The method of using a catheter placement unit embodying a sheathed catheter associated with a cannulated needle, including the steps of
- 10 connecting the sheathed catheter to an infusion system, thereafter making a venipuncture with the needle, starting infusion into the vein of a patient, advancing the sheathed catheter through the needle into the vein of a patient while infusion proceeds, and progressively disrupting the catheter sheath.
12. In a catheter placement unit, a cannulated needle having a hollow hub, a closed sheath engaged with said needle hub, said sheath having a line of separation lengthwise thereof,
- 20 a catheter in said sheath with one end thereof terminating adjacent the needle hub, connecting means extending outside said sheath and secured to the other end of the catheter for connecting the same to an infusion system, and means for disrupting said sheath along said line of separation contemporaneously with the positioning of the catheter through said needle into a patient's body, whereby the catheter may be positioned while sheathed and during infusion.

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