United States Patent

[11] **3,550,591**

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[21] Appl. No. **753,587**
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[45] Patented **Dec. 29, 1970**

[54] **INTRAVENOUS CATHETER UNIT**
3 Claims, 15 Drawing Figs.

[52] **U.S. Cl.** **128/214.4,** 128/221
[51] **Int. Cl.** **A61m 5/00**
[50] **Field of Search** ..... 128/214.4, 221, 347, (I.C. Digest)

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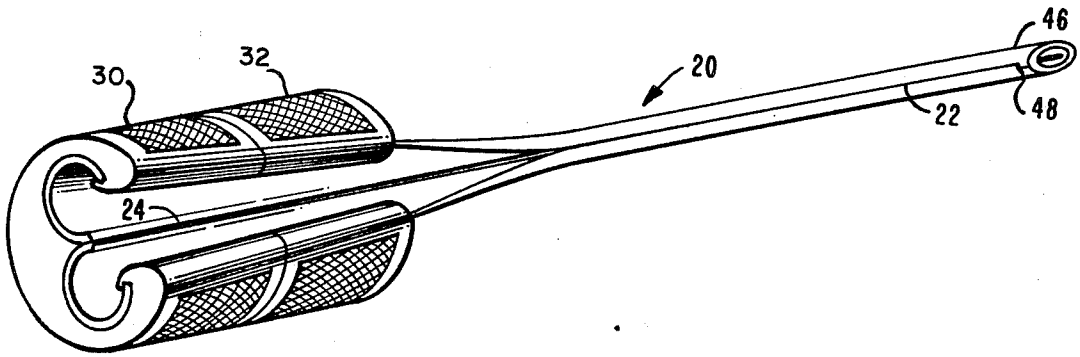
Attorney—Julius L. Rubinstein

ABSTRACT: Catheters are flexible plastic tubes which extend through a hollow metal needle for the long term infusion of liquids into the vein of a patient. This invention relates to a hollow metal needle through which the catheter extends. The hollow needle is provided with a slit which extends along its entire length. In addition, the needle is provided with means of causing the needle to hinge open to widen the slit enough to pass the catheter through. In this way the needle may be separated from the catheter after the catheter is placed inside the vein. This arrangement protects the catheter from damage caused by the sharp point of the needle.



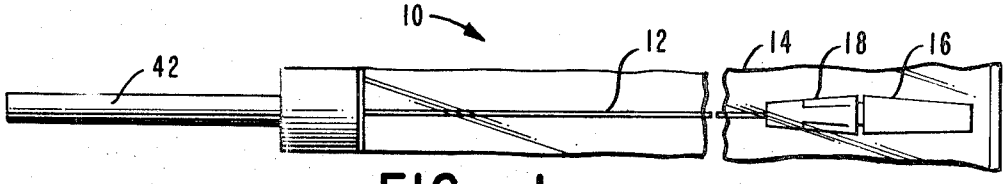


FIG.—1

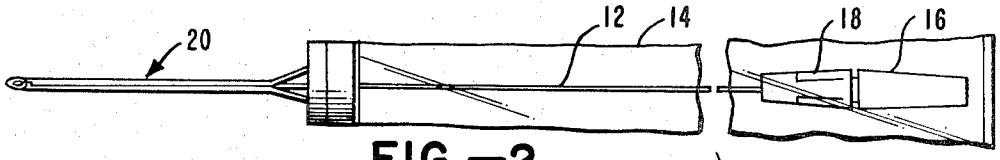


FIG.—2

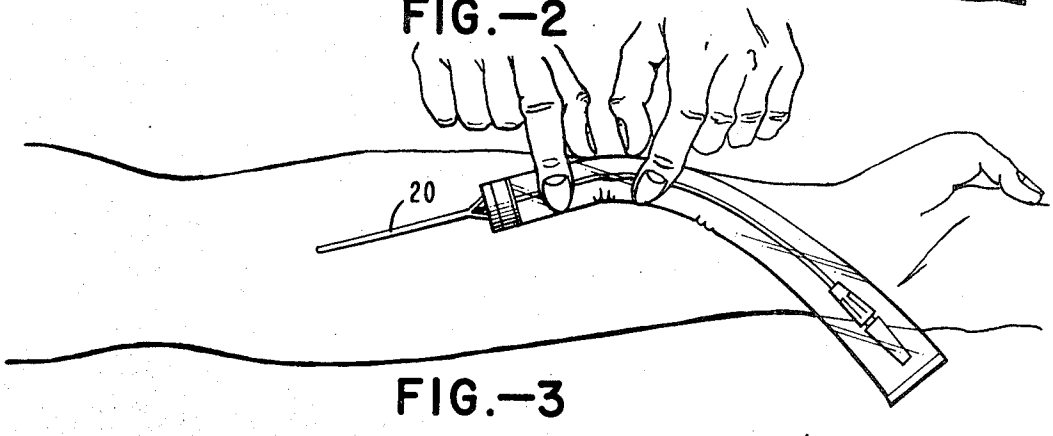


FIG.—3

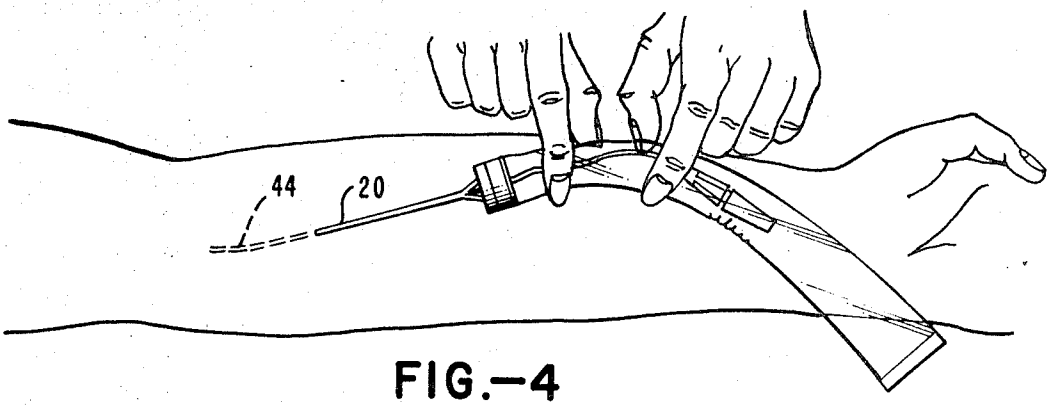


FIG.—4

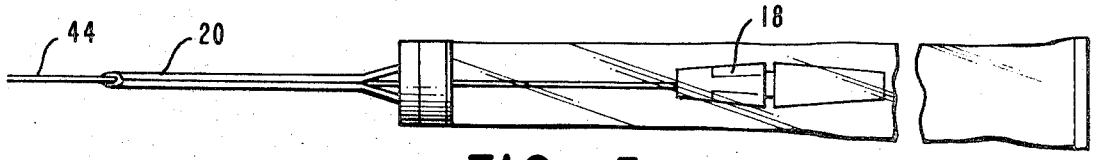


FIG.—5

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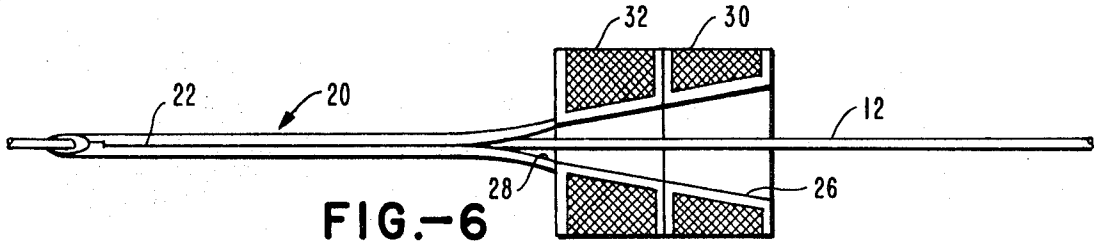

FIG.-6

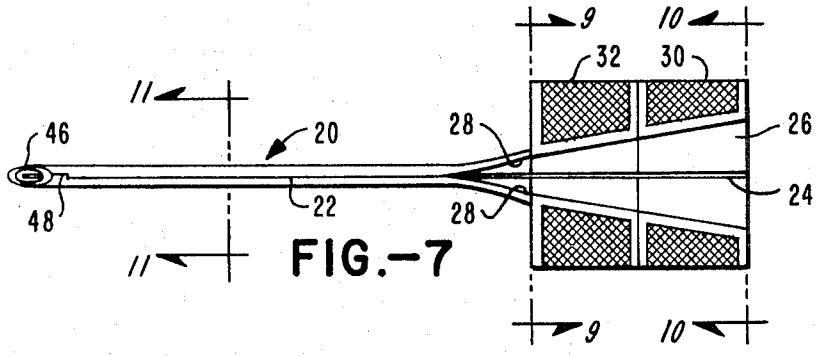

FIG.-7

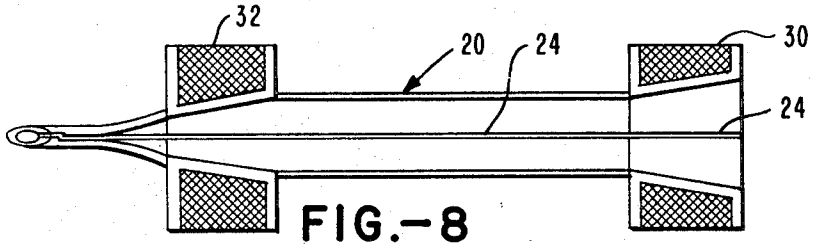

FIG.-8

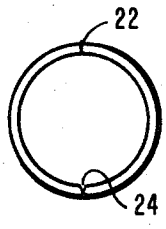

FIG.-11

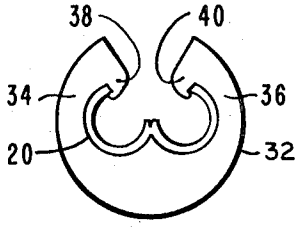

FIG.-9

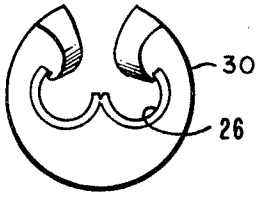

FIG.-10

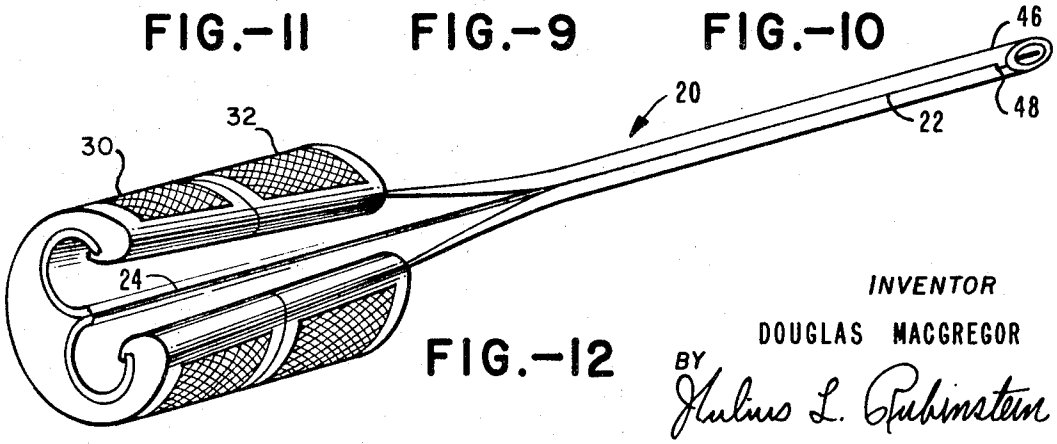

FIG.-12

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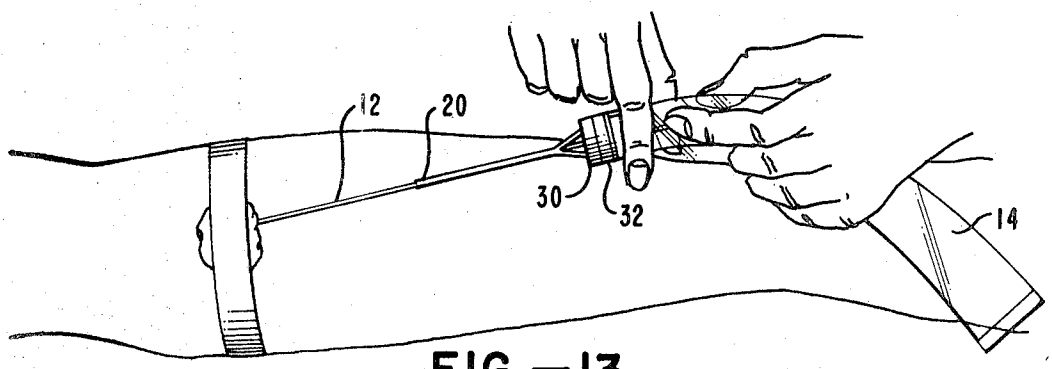

FIG.—13

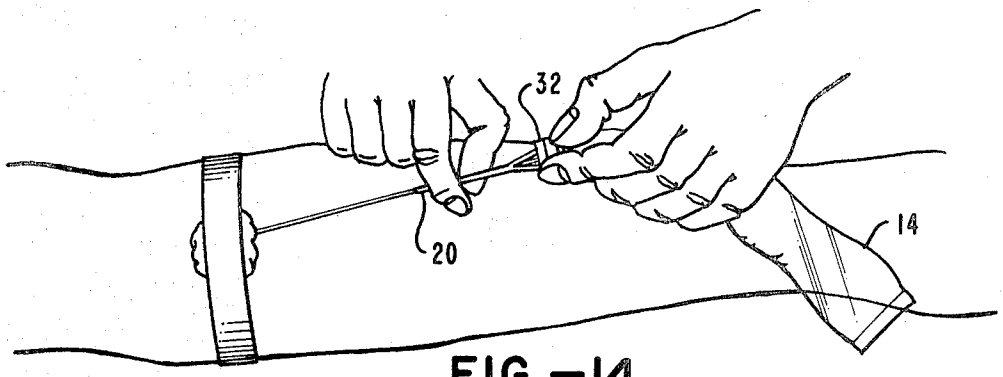

FIG.—14

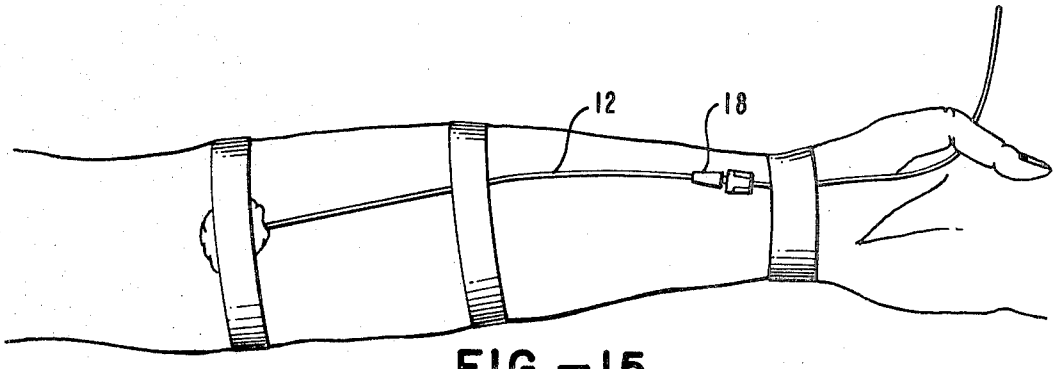

FIG.—15

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INTRAVENOUS CATHETER UNIT

BRIEF SUMMARY

Catheters have been developed for the long term infusion of liquids into a patient's vein. These catheters or flexible elastic tubes extend through a hollow metal needle. The needle is used to penetrate the vein. Thereafter, one end of the catheter is moved through the hollow needle into the vein and left there while the needle is removed from the vein. The other end of the catheter is connected to the liquid supply.

Heretofore, the needle was taped against the skin of the patient while the catheter remained inside the vein. However, movements of the patient's body sometimes caused the sharp point of the needle to tear or break the catheter. On occasions when the catheter was broken, the flow of the blood carried the portion of the catheter bins inside the vein through the body until it finally lodged in a vital artery in the heart of or brain causing death or serious injury.

What is needed, therefore, and comprises an important object of this invention, is to provide a needle which can be separated from the catheter after the end of the catheter is positioned inside the vein, to prevent the needle from tearing or damaging the catheter.

This and other objects of this invention will become more apparent when better understood in the light of the accompanying specifications and drawings wherein:

FIG. 1 is a plan view of the catheter assembly with the catheter needle protected by a plastic shielding tube.

FIG. 2 discloses the catheter needle assembly with the protective shielding tube removed.

FIG. 3 discloses the needle of the catheter assembly inserted inside the vein of an arm, but before the catheter is moved inside the vein.

FIG. 4 disclosed discloses the needle of the catheter assembly inserted inside the vein but with the end of the catheter advanced into the vein.

FIG. 5 discloses the catheter assembly with the catheter shown projecting through the end of the hollow needle.

FIG. 6 discloses the catheter needle constructed according to the principles of this invention and showing the catheter extending through the fixed and movable hubs of the needle.

FIG. 7 shows the catheter needle without the catheter extending therethrough.

FIG. 8 shows the catheter needle after it has been split open by the movement of the movable hub.

FIG. 9 is a sectional vie view taken on the line 9–9 of FIG. 7 showing an end view of the movable hub.

FIG. 10 is a sectional view taken on the line 10–10 of FIG. 7 showing an end view of the fixed hub.

FIG. 11 is a sectional view taken on the line 11–11 of FIG. 7 showing a cross-sectional view of the hollow needle.

FIG. 12 shows a perspective view of the catheter needle constructed according to the principles of this invention.

FIG. 13 shows the catheter assembly after the needle has been withdrawn from the vein leaving the end of the catheter inside the vein.

FIG. 14 shows the forward movement of the movable hub of the needle splitting the needle so that the catheter needle can be removed from the catheter.

FIG. 15 shows the catheter secured inside the arm of the patient with the catheter needle entirely removed.

Referring now to FIG. 1 of the drawing, a catheter assembly indicated generally by the reference numeral 10 comprises a catheter 12 enclosed in a plastic guard sleeve 14. A flow control plug 16 and an adapter 18 are secured to the inner end of the catheter in a manner well-known in the art.

The catheter assembly includes a catheter needle indicated generally by the reference numeral 20. The needle is typically a hollow tube with a pointed end. (See FIG. 2) In the disclosed embodiment the needle is either slit or rolled from sheet metal and provided with a slit 22. (See FIG. 6) The slit 22 extends completely through the wall of the tube. (See FIG. 11) In addition, the tube or needle has at least one generally straight groove 24 formed on the inner surface of the walls of the tube opposite the axially extending slit 22. This groove, as will be described below, forms a line of weakness in the tube and serves as a hinge. (See FIGS. 1, 2, 6, 7 and 11)

The groove 24 should be somewhere between one-quarter and three-quarters of the thickness of the needle wall depending on the metal used to form the needle in order for the groove to function satisfactorily as a hinge or break line, as described below. In any event, the groove must be deep enough so that when the slit is widened there is not sufficient spring in the metal to close the slit in the needle again.

The needle is formed so that the rear portion 26 is flared causing the facing edges of the slit 22, which are in abutting relationship from the point of the tube or needle to a region adjacent the rear end of the tube, to diverge at 28. (See FIGS. 6 and 7) The flared portion of the needle produces a gap in the slit which may be closed or covered by a piece of plastic or other means.

The needle is also provided with movable and fixed generally channel shaped hubs. These are hubs 32 and 30 respectively. (See FIGS. 6, 7 and 8) The flared rear portion 26 of the tube is rigidly secured to fixed hub 30. (See FIG. 10) However, the flared rear portion of the needle lies between and is embraced by the walls 34 and 36 of the movable hub 32. (See FIG. 9) These walls terminate in inwardly projecting beads 38 and 40 which ride over the edges of the slit as will be described below and provide the necessary cam action.

The inner end of the plastic guard sleeve 14 may be removably secured to the fixed hub 30, prior to use, by friction or some adhesive or other suitable means. Also, prior to use, the needle may be protected by means of the removable plastic cover 42. (See FIG. 1)

In operation, the plastic guard sleeve 42 is first removed. Then the needle is inserted into a vein of the patient. (See FIG. 3) Next the catheter 12 is forced forward from the position shown in FIG. 2 to the position shown in FIGS. 3 and 5. When this happens the end of the catheter extends out of the needle into the vein. (See FIG. 4)

Next, the needle 20 is withdrawn from the vein leaving the catheter inside the vein. (See FIG. 13) After that the movable hub 32, riding on the diverging edges of the slit, is forced forward toward the tip 46 of the needle 20. (See FIG. 14) When this happens the cam action exerted by the walls 34 and 36 and beads 38 and 40 on the edges of the diverging part of the slit exerts pressure on the sides of the slit splitting the needle by causing it to hinge open on groove 24, as shown in FIG. 8.

When this happens the catheter can be lifted out of the needle 20 and the channel shaped fixed and movable hubs. When this happens the catheter needle is completely separated from the catheter removing all source of danger. Thereafter, all that remains secured to the patient is one end of the catheter in the vein of the patient in FIG. 15, while the opposite end of the catheter is connected to a supply of liquid, usually food or blood.

It is noted in the embodiment shown, that the groove 24 does not extend completely to the end 46 of the needle. This is to prevent the needle from breaking into two halves. However, under some circumstances splitting the needle entirely may be desirable and to do this it is only necessary to extend the groove 21 completely to the sharp point of the needle.

If there should be a reason why the movable hub 32 should not be removed from the needle it may be prevented by placing a set back 48 in slit 22 of the needle 20. Of course, the hub 32 would also be provided with a suitable set back to prevent hub 32 from being moved beyond the edge of the needle. Safety reasons would require the set back 48 to be placed in such a position that the moveable hub 32 covers the point 46 of the needle to prevent damage to the catheter or injury to personnel handling the needle.

The embodiment in the drawing discloses a needle designed to split open with an axially extending slit extending through the walls of the tube. It is, of course, contemplated that the

needle could have other configurations which are designed to permit the catheter to be removed from the needle after the catheter is inserted in the vein. For example, the needle could be a tightly wound spiral of metal shaped something like a spring and after use the needle could be stretched so that the coils are separated enough to permit the catheter to be wound out of the needle. Alternatively, the needle could be formed initially from two generally semicircular parts with one needle nesting inside the other and shaped so that when in a nesting condition they form a tube, but after use the parts of the needle could be separated from each other to permit the catheter to be removed. It is also contemplated that the needle could be formed with a slit wide enough to permit the catheter to be moved therethrough. Prior to use the slit could be covered by some frangible or removable plat plastic. When the time comes to separate the catheter, the plastic could be stripped away by some suitable means to permit the catheter to pass through the slit.

Obviously man modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention can be practiced otherwise than as specifically described.

I claim:

1. A needle for a catheter assembly comprising a hollow tube, said tube having a sharp point at one end, a generally straight axially extending slit extending through the walls of the tube, said slit having generally abutting edges extending from the point of the tube to a region generally adjacent the rear end of said tube, a generally straight groove formed in the inner walls of the tube opposite said slit to serve as a hinge, the edges of said slit adjacent the rear edges of said tube diverging, and cam means embracing said tube and riding on the diverging edges of said slit and movable from the rear end of said tube to the forward end of said tube for exerting pressure on the adjacent abutting edges of said slit to cause the tube to hinge on the groove in said tube to widen said slit enough so the catheter can be moved therethrough whereby the needle can be separated completely from the catheter.

2. A needle for a catheter assembly comprising a hollow tube, said tube having a sharp point at one end, a generally straight axially extending slit extending through the walls of the tube, said tube having generally abutting facing edges from the point of the tube to a region adjacent the rear end of the tube, a generally straight groove formed in the inner walls of the tube opposite the slit to provide a line of weakness in the walls of the tube whereby the groove functions as a hinge, the said facing edges of the slit adjacent the rear end of the tube diverging, the rear portion of said tube flared and rigidly secured to a generally channel-shaped hub, a movable generally channel-shaped hub, said movable hub having walls portions embracing the sides of the tube, the wall portions terminating in inwardly projecting beads, riding on the diverging edges of the slit and retaining the movable hub on the tube whereby when the movable hub is forced toward the point of the tube the wall portions and beads riding on the diverging edges of the slit of the tube exert a cam action which exerts pressure on the adjacent edges of the slit to cause the tube walls to hinge on the groove thereby moving the walls of the tube enough to widen said slit so the catheter can be moved therethrough whereby the needle can be completely separated from the catheter.

3. The needle for the catheter assembly described in claim 2 wherein the portion of the slit in the tube adjacent the sharp point is provided with a set back, said movable hub provided with a suitable set back to prevent the movable hub from being removed from the needle, the location of si said set back in the slit such that when the movable hub is moved as far toward the point of the tube as it can go, the movable hub covers the sharp point of the tube for the safety of the persons using the catheter assembly.