



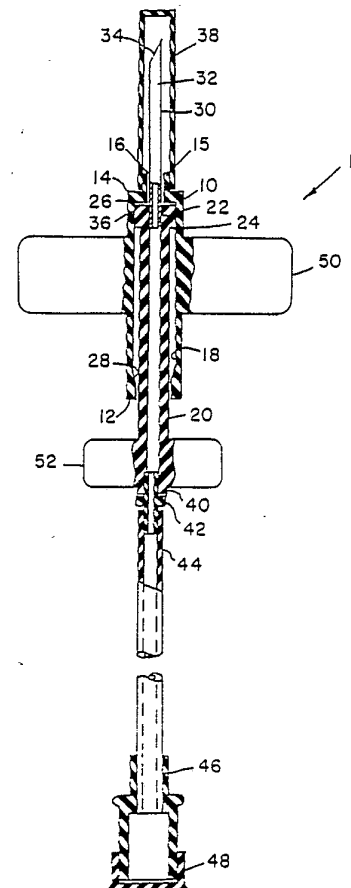
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US87/01574 (22) International Filing Date: 29 June 1987 (29.06.87) (31) Priority Application Number: 030,986 (32) Priority Date: 27 March 1987 (27.03.87) (33) Priority Country: US (71) Applicant: THE UNIVERSITY OF VIRGINIA ALUMNI PATENTS FOUNDATION [US/US]; 1224 West Main Street, Charlottesville, VA 22903 (US). (72) Inventors: JAGGER, Janine, C. ; Route 1, Box 104, Croyet, VA 22932 (US). PEARSON, Richard, D. ; 714 Shamrock Road, Charlottesville, VA 22903 (US). GUYENET, Patrice, G. ; Box 104, Route 1, Croyet, VA 22932 (US).</p>		<p>(74) Agent: WRAY, James, C.; 1493 Chain Bridge Rd., Suite 300, McLean, VA 22101 (US). (81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i></p>

(54) Title: RETRACTABLE SAFETY NEEDLE

(57) Abstract

An intravenous needle (30) with a sharpened distal end (34) has a proximal end (36) fixed within a first enlarged end (22) of an inner tube (20). The enlarged end (22) of the inner tube is held tightly within a first end (14) of an outer tube (10) by friction. The needle (30) passes through a constricted opening (16) in the first end (14) of the outer tube (10). The second end (40) of the inner tube (20) passes through a constricted opening in the second end (12) of the outer tube (10). The needle (30) is used by gripping soft plastic wings (50) on the outer tube (10) and removing a needle cover (38) from a nipple (15) on the first end (14) of the outer tube (10). The needle (30) is then inserted in the desired location and the outer tube (10) and a protruding end (52) of the inner tube (20) are taped in place. Fluids are permitted to flow through the inner tube (20) and needle (30). When use is complete, the needle is removed from the vein, the protruding end (52) of the inner tube (20) is pulled outward, pulling the first end (22) of the inner tube (20) and the needle (30) into the outer tube (10). The first end (22) of the inner tube (20) tightly wedges within the second end (12) of the outer tube (10), holding the needle (30) totally within the outer tube (10). Finally, the retracted used needle assembly (1) is discarded, encased in the outer tube (10).



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-1-

RETRACTABLE SAFETY NEEDLE

Background of the Invention

This is a continuation-in-part of serial number 771,640 filed September 3, 1985.

Needlestick injuries are intended to be avoided by properly disposing of needles.

Usually used needles are recapped with the same cover that originally covered the needles before use or by similar covers or tubes before a needle is discarded. That method requires movement of hands toward needles and may promote needlestick injuries during the recapping.

Often needles are disposed of by tossing them into nearby refuse containers, creating danger to those who handle the refuse containers. Usually contaminated needles are placed on trays for carrying to a disposal facility which may be distant from the place where the needles are used. That creates danger en route to persons carrying the trays or pushing carts on which the trays are located or to close by persons who may be injured when the tray slips or spills.

Needle destruction devices are available, but the destructive devices may not be convenient and may be placed permanently at a position that requires the movement of contaminated needles to the destruction devices.

Problems remain in the prevention of needlestick injuries caused by non compliance with established procedures or by inherently unsafe features of the established procedures.

SUBSTITUTE SHEET

-2-

For intravenous (I.V.) catheters, injuries may occur when hospital workers accidentally impale themselves on an I.V. catheter stylet after it has been removed from a patient's I.V. catheter. Currently, the devices have no means for safely resheathing the stylet and they are among the items commonly causing needle stick injuries in hospitals.

Another problem associated with the prior art is that of blood backflow following removal of the stylet and before attachment of the catheter to the I.V. tubing. In a conventional system, the catheter is a flexible plastic tube which must be introduced into the patient's vein. A hollow steel stylet runs the length of the catheter to render it rigid. The stylet has a sharp point which protrudes from the distal end of the catheter and enables it to pierce the skin and vein. After introduction of the catheter into the vein, the stylet is withdrawn, set aside, and the I.V. tubing is then connected to the catheter. Backflow of blood occurs when the stylet is removed and blood inadvertently escapes from the catheter port. This is inconvenient, messy, contaminates the environment with patients' blood, and makes it necessary for the health care worker to set aside the stylet and join the I.V. tubing to the catheter port as quickly as possible to stem the flow of blood.

SUBSTITUTE SHEET

-3-

Summary of the Invention

Our new design provides a means for retracting the steel needle/stylet into a rigid housing as the stylet is removed from the patient, thus precluding the possibility of the needle/stylet making contact with the hospital worker.

Our design entirely precludes the backflow of blood because the system remains closed and the stylet is retracted from the catheter but is not withdrawn from the device.

The new design also provides an alternative to the winged steel needle I.V. infusion set in which a steel needle is left in the vein rather than a plastic catheter. The "winged" design is easy to handle and preferred to the I.V. catheter under certain circumstances, but the steel needle may act as an irritant to the vein, requiring frequent removal of the device. In our new design, the indwelling portion of the device is flexible plastic rather than rigid steel, and furthermore, the convenient winged configuration can be retained for ease of handling.

Our intravenous catheter with retractable stylet provides a way to safely withdraw the steel stylet from the catheter without risk of needlestick injury and also precludes the inconvenience and environmental contamination of blood backflow when attaching the I.V. line to the catheter port. The device involves a steel needle bonded to standard clear plastic tubing to form a closed system. The needle/tubing assembly is encased in (but not bonded to) a closely fitting plastic cylinder slightly longer than the

SUBSTITUTE SHEET

-4-

length of the needle. Bonded to the plastic cylinder and protruding outward from it, is a plastic catheter. The steel needle is lodged within the catheter to provide rigidity, and the sharp beveled end protrudes from the catheter tip. For use, the catheter/needle portion is inserted through the skin into the vein. When proper placement is complete, the stylet can be retracted into the plastic cylinder by grasping the wing and pulling back on the tubing. The cylinder holds to the stylet/plastic tubing by friction. The stylet is prevented from being pulled too far through the cylinder by a constriction at the bottom end of the cylinder; and prevented from moving out the front of the cylinder by friction. The stylet then lodges in the cylinder for the duration of the use of the device. A rubber gasket at the base of the plastic catheter hugs the stylet just below the beveled point thus allowing the catheter, stylet, and tubing to form a closed, continuous conduit allowing the infusion of I.V. fluids/medications or the withdrawal of blood. The stylet then remains encased in the plastic cylinder and when the device is removed from the patient it is not exposed and can therefore not cause an inadvertent puncture wound. Because it is not necessary to withdraw the stylet from the device, as in the currently employed device, the problem of backflow of blood during connection of I.V. tubing is obviated. Furthermore, because the steel stylet does not remain as an irritant in the vein, the new device may be preferable to the current winged steel needle I.V. infusion sets under certain circumstances.

SUBSTITUTE SHEET

-5-

An intravenous needle with a sharpened distal end has a proximal end fixed within a first enlarged end of an inner tube. The enlarged end of the inner tube is held tightly within a first end of an outer tube by friction. The needle passes through a constricted opening in the first end of the outer tube. The second end of the inner tube passes through a constricted opening in the second end of the outer tube. The needle is used by gripping soft plastic wings on the outer tube and removing a needle cover from a nipple on the first end of the outer tube. The needle is then inserted in the desired location and the outer tube and a protruding end of the inner tube are taped in place. Fluids are permitted to flow through the inner tube and needle. When use is complete, the needle is removed from the vein, the protruding end of the inner tube is pulled outward, pulling the first end of the inner tube and the needle into the outer tube. The first end of the inner tube tightly wedges within the second end of the outer tube, holding the needle totally within the outer tube. Finally, the retracted used needle assembly is discarded, encased in the outer tube.

An intravenous administration system has a retractable safety needle. A steel needle intravenous administration device provides a way to safely resheath contaminated intravenous needles to reduce the risk of accidental needlestick injuries to health care personnel. The device uses a steel needle bonded to standard

SUBSTITUTE SHEET

-6-

clear plastic tubing to form a closed system. The needle/tubing assembly is encased in, but is not bonded to, a closely fitting plastic cylinder slightly longer than the length of the needle. The needle protrudes from one end of the cylinder. The cylinder has two small wings at the sides for easy manipulation of the needle. A plastic tab is bonded to the tubing at a position spaced from the cylinder. After the intravenous device is removed from the patient, the contaminated needle is retracted into the plastic cylinder by grasping the wing and pulling axially on the tab. The cylinder grips the plastic tubing by friction which is sufficient to keep the needle from withdrawing during insertion of the device. The grip is overcome, allowing the needle to be pulled into the cylinder, when appropriate force is applied. The needle is prevented from being pulled too far through the cylinder by a constriction at the second end of the cylinder and is prevented from moving out of the first end of the cylinder by friction. The cylinder serves as a protective barrier, protecting hospital personnel from hazardous contaminated needles.

A disposable medical needle apparatus comprises an outer tube and an inner tube mounted in a concentric friction fit relationship. An intravenous needle has a sharpened distal end and a proximal end. The proximal end of the needle is tightly gripped within a first end of the inner tube, and the needle extends

SUBSTITUTE SHEET

-7-

outward therefrom through a first constricted opening in a first end of the outer tube. A second end of the inner tube extends outward through a second constriction in the second end of the outer tube. First gripping means on the outer tube provides for gripping the outer tube and second gripping means on the second end of the inner tube provides for gripping the inner tube when sliding the inner tube and needle axially in the outer tube. Connection means on the second end of the inner tube connects the inner tube to a fluid supply.

Preferably, the second constriction in the second end of the outer tube comprises wedge shaped means opening toward the first end of the outer tube for clamping the first end of the inner tube when the second gripping means is pulled in an axial direction away from the outer tube.

In a preferred embodiment, the first end of the inner tube comprises an enlarged head for tightly gripping an inner wall of the outer tube and for preventing outward passage of the first end of the inner tube beyond the second constriction at the second end of the outer tube when the second gripping means pulls the inner tube axially in the outer tube.

Preferably, the first gripping means comprises a soft plastic wing extending outward from the outer tube, and the second gripping means comprises a plastic tab extending outwardly from the second end of the inner tube.

SUBSTITUTE SHEET

-8-

Preferably, the first gripping means comprises soft plastic wings extending oppositely from the outer tube, and the second gripping means comprises plastic tabs extending oppositely from the second end of the inner tube.

In a preferred embodiment, a nipple extends axially on the first end of the outer tube and a tubular plastic cover connected to the nipple extends axially therefrom over the needle and beyond the sharpened distal end of the needle for covering the needle prior to use.

A preferred method of using intravenous needles comprises holding an inner tube fixed within an outer tube, extending a needle from a proximal end fixed within a first end of the inner tube through a constricted opening in a first end of the outer tube, gripping the outer tube and pushing a sharpened distal end of the needle into the desired position, flowing fluids through the inner tube and the needle, discontinuing the flow of fluids through the inner tube and the needle, removing the needle from the vein, protruding a second end of the inner tube through a constricted opening in the second end of the outer tube, gripping the second end of the inner tube and pulling the first end of the inner tube and the needle axially within the outer tube, tightly engaging the first end of the inner tube with the second end of the outer tube and holding the needle within the outer tube.

These and other objects and features of the invention are apparent in the disclosure which includes the above and ongoing specifications with the claims and the drawings.

SUBSTITUTE SHEET

Brief Description of the Drawings

Figure 1 is an elevational view partly in section of the intravenous needle assembly of the present invention.

Figure 2 is a view showing the gripping of the elements for retracting the needle.

Figure 3 is a view partially cut away showing the retracted needle in the protective cylinder.

Figure 4 is a sectional view of a preferred intravenous catheter with retractable stylet.

Figure 5 is the same view as Figure 4 with the stylet in a retracted position.

-10-

Detailed Description of the Drawings

Referring to Figure 1 a needle assembly of the present invention is generally indicated by the numeral 1. A cylinder 10 has two ends 12 and 14 with restricted openings. The first end 14 has a projecting nipple 15 with a constriction 16 in a form of a restricted axial opening. The inner cavity 18 of the cylinder 10 slidably receives inner tube 20 while gripping the enlarged first end 22 of the inner tube. The outer surface 24 of the enlarged end 22 is tightly gripped by the inner surface 26 at the first end of cavity 18 to hold the unused needle in a protruded usable condition. The second end of the cavity 18 is in a form of a wedge-shaped constriction 28 which tightly grips the outer surface 24 of the enlarged end 22 of tube 20 when tube 20 is pulled rearward or downward as shown in Figure 1. The gripping of the enlarged end 22 within the wedge 28 holds the needle 30 entirely within the outer tube 10 preventing accidental contact with the needle 30, its shaft 32, or its sharpened distal end 34. The proximal end 36 of the needle is tightly gripped within the first end 22 of the inner tube 20. A protector tube 38 is held on the nipple 15 to prevent accidental contact with the protruded needle 30 before the needle is used.

The second end 40 of the inner tube 20 is provided with a connector 42 for connection to an elongated flexible connector tube 44 which is provided on its distal end with a connector 46 for connecting tube 44 to a supply tube connected to a fluid container.

SUBSTITUTE SHEET

-11-

Cap 48 protects the connector 46 before it is used.

In use, one grips wings 50 and then removes the tubular cover 38 from the nipple 16. Gripping the wings 50, one slides the needle into its desired position. After the needle has been used, wings 50 and tabs 52 are gripped separately as shown in Figure 2, and tabs 52 and tube 20 are pulled in an axial direction away from wings 50, extending tube 20 from outer tube 10 and pulling needle 30 and sharpened distal end 34 into the outer tube as shown in Figure 3. The enlarged first end 22 of the inner tube 20 is firmly gripped by the inner wedge surface 28, preventing further relative movement between needle 30 and the outer protective tube 10, as shown in Figure 3.

Referring to Figures 4 and 5, an intravenous catheter is shown in unretracted and retracted states. In the unretracted state, which is the condition of the catheter prior to insertion into a body, the stylet 100 has an end portion 102 that extends a short length beyond an end of catheter 104. Catheter 104 is made of flexible plastic material and is connected to a rigid plastic housing 106. The connection of the catheter to the housing may be by any suitable means including adhesive bonding.

A length of fluid conduit or tubing 108 is connected to a proximal end of the stylet 100. The tubing 108 is flexible and may have a diameter substantially the same as the stylet such that when the metal stylet is inserted into the tubing, an enlarged diameter portion 110 is created.

SUBSTITUTE SHEET

-12-

The housing is provided with a restriction 112 at a proximal end thereof and a seal 114 is provided within the housing at a distal end thereof. The housing is also provided with grips 116 which facilitate use of the catheter as will be described later. The opposite end of the tubing 108 can be provided with an adaptor 188 to facilitate the introduction of fluid into the tubing.

Initially, the stylet punctures the body with the exposed sharpened tip 102 so that the catheter 104 can be introduced into the body as well. After the initial puncture, the stylet 100 is withdrawn from the catheter 104 by pulling the tubing 108. Withdrawal of the stylet is limited by an abutment of the joint 110 and the constriction 112, as shown in Figure 5. In the fully withdrawn position illustrated in Figure 5, a seal is created between housing 106 and the stylet 100 such that fluid flows between the catheter 104, the stylet 100 and the tubing 108 and completely bypasses the housing 106. After use, the catheter is withdrawn from the body and the assembly can be discarded with the stylet encased in rigid plastic, thereby posing no danger of accidental needlestick to persons handling the assembly.

While the invention has been described with reference to specific embodiments, modifications and variations may be constructed without departing from the scope of the invention.

The scope of the invention is defined in the following claims.

SUBSTITUTE SHEET

-13-

We claim:

1. An intravenous catheter with retractable stylet comprising,
 - a stylet having a body-insertable distal end and a proximal end connected to a length of flexible plastic tubing,
 - a rigid plastic housing of length sufficient to encase the stylet in a retracted position,
 - a flexible plastic catheter, connected to a distal end of the housing, of length sufficient to substantially cover and be supported by the stylet in a non-retracted position,
 - sealing means, positioned within the distal end of the housing, for sealing by engaging the stylet, and
 - abutment means, limiting travel of the stylet.
2. The device of claim 1 wherein the abutment means comprises an increased diameter joint between the stylet and the flexible plastic tubing.
3. The device of claim 2 wherein the joint abuts a constriction at the proximal end of the housing to prevent rearward withdrawal of the stylet from the housing.
4. The device of claim 3 wherein the joint abuts the sealing means at the distal end of the housing to prevent forward movement of the stylet beyond the catheter.
5. The device of claim 1 wherein the sealing means comprises an elastomeric seal tightly fitted in the housing and having a bore slideably receiving the stylet.

SUBSTITUTE SHEET

-14-

6. The device of claim 1 further comprising grip means connected to the housing for gripping the housing and pulling the tubing.

7. A method of using an intravenous catheter comprising, inserting a stylet into a body, wherein the stylet supports a flexible catheter and is connected to fluid conduit, withdrawing the stylet into a rigid housing connected to the catheter by pulling the fluid conduit, and sealing a fluid flow path comprising the catheter, the stylet and the fluid conduit with sealing means disposed in a distal end portion of the rigid housing.

8. The method of claim 8 further comprising, withdrawing the catheter from the body and discarding the catheter with the stylet encased in the housing.

9. Disposable medical needle apparatus comprising an outer tube and an inner tube mounted in a concentric friction fit relationship, an intravenous needle having a sharpened distal end and a proximal end, the proximal end of the needle being tightly gripped within a first end of the inner tube, and the needle extending outward therefrom through a first constricted opening in a first end of the outer tube, a second end of the inner tube extending outward through a second constriction in the second end of the outer tube, first gripping means on the outer tube for gripping the outer tube and second gripping means on the second end of the inner tube for gripping the inner tube whereby the inner tube may be slid

SUBSTITUTE SHEET

-15-

within the outer tube, and connection means on the second end of the inner tube for connecting the inner tube to a fluid supply.

10. The apparatus of claim 9 wherein the second constriction in the second end of the outer tube comprises wedge shaped means opening toward the first end of the outer tube for clamping the first end of the inner tube when the second gripping means is pulled in an axial direction away from the outer tube.

11. The apparatus of claim 9 wherein the first end of the inner tube comprises an enlarged head for tightly gripping an inner wall of the outer tube and for preventing outward passage of the first end of the inner tube beyond the second constriction at the second end of the outer tube when the second gripping means pulls the inner tube axially in the outer tube.

12. The apparatus of claim 9 wherein the first gripping means comprises a soft plastic wing extending outward from the outer tube and wherein the second gripping means comprises a plastic tab extending outwardly from the second end of the inner tube.

13. The apparatus of claim 9 wherein the first gripping means comprises soft plastic wings extending oppositely from the outer tube and wherein the second gripping means comprises plastic tabs extending oppositely from the second end of the inner tube.

SUBSTITUTE SHEET

-16-

14. The apparatus of claim 9 further comprising a nipple extending axially on the first end of the outer tube and a tubular plastic cover connected to the nipple and extending axially therefrom over the needle and beyond the sharpened distal end of the needle for covering the needle prior to use.

15. The method of using intravenous needles comprising holding an inner tube fixed within an outer tube, extending a needle from a proximal end fixed within a first end of the inner tube through a constricted opening in a first end of the outer tube, gripping the outer tube and pushing the needle into the desired position, flowing fluids through the inner tube and the needle, discontinuing the flow of fluids through the inner tube and the needle, removing the needle from the vein, protruding a second end of the inner tube through a constricted opening in the second end of the outer tube, gripping the second end of the inner tube and pulling the first end of the inner tube and the needle axially within the outer tube, tightly engaging the first end of the inner tube with the second end of the outer tube and holding the needle within the outer tube.

16. The method of using medical needles comprising holding a needle fixed within an outer cylinder extending a needle from a proximal end fixed within a needle connector at a first end of an inner tubular member through a constricted opening in a first end of the outer cylinder, gripping the outer cylinder and pushing the needle into the desired position, flowing fluids through the inner tubular member and

SUBSTITUTE SHEET

-17-

the needle, discontinuing the flow of fluids through the inner tubular connection and the needle, removing the needle from the vein, protruding a second end of the inner tubular member through a constriction near the second end of the outer tube, gripping the second end of the inner tubular member and pulling the first end of the inner tubular member and the needle axially within the outer cylinder, stopping the needle connector with the second constriction and holding the needle within the outer cylinder.

17. Disposable medical needle apparatus comprising an outer cylinder and an inner tubular element mounted in a concentric relationship, a needle having a sharpened distal end, a needle connector means for connecting the needle to a first end of the inner tubular element and the needle extending outward from the needle connector through a first constricted opening in a first end of the outer cylinder, a second end of the inner tubular element extending outward through a second constriction in the outer cylinder whereby the inner tubular element may be slid axially within the outer cylinder, a radially extended means on the needle connector for preventing passage of the radially extended means past the second constriction.

18. The apparatus of claim 17 wherein the second constriction comprises wedge shaped means opening toward the first end of the outer cylinder for clamping the needle

SUBSTITUTE SHEET

-18-

connector when the inner tubular element is pulled in an axial direction.

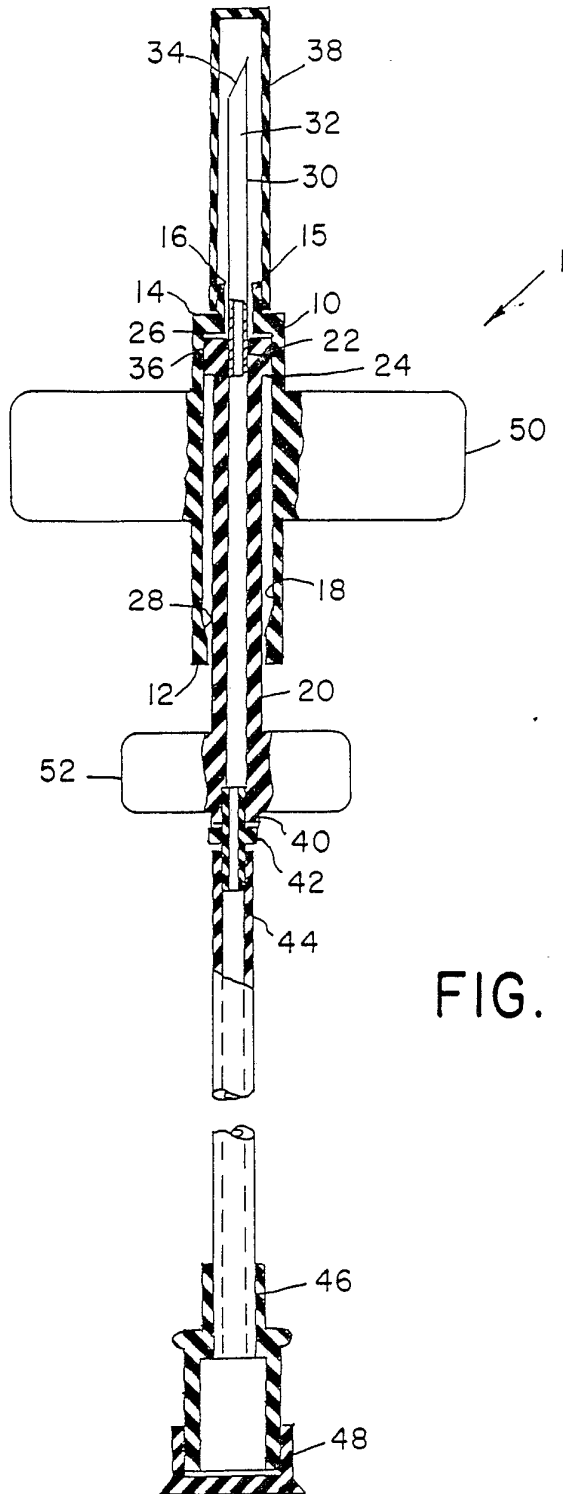
19. The apparatus of claim 17 wherein the needle connector comprises an enlarged head for tightly gripping an inner wall of the outer cylinder and for preventing outward passage of the connector beyond the second constriction.

20. The apparatus of claim 17 further comprising means on an internal surface of the outer cylinder tightly engaging the first end of the inner tubular element in the outer cylinder and holding the needle within the outer cylinder after the needle has been used and after the inner tubular element is slid axially within the outer cylinder.

21. The apparatus of claim 10 further comprising means on an inner surface of the outer tube for tightly engaging the first end of the inner tube and holding the needle within the outer tube after the inner tube is slid within the outer tube.

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1/3



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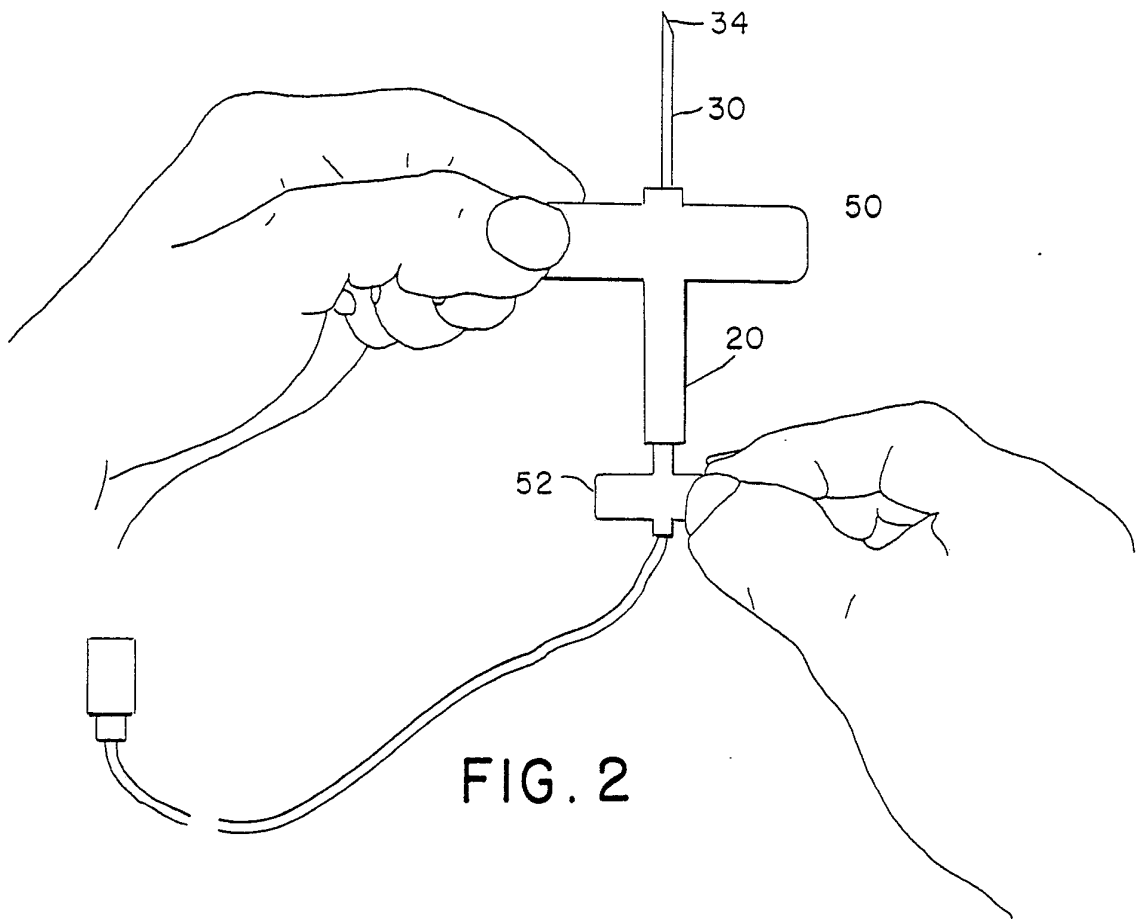


FIG. 2

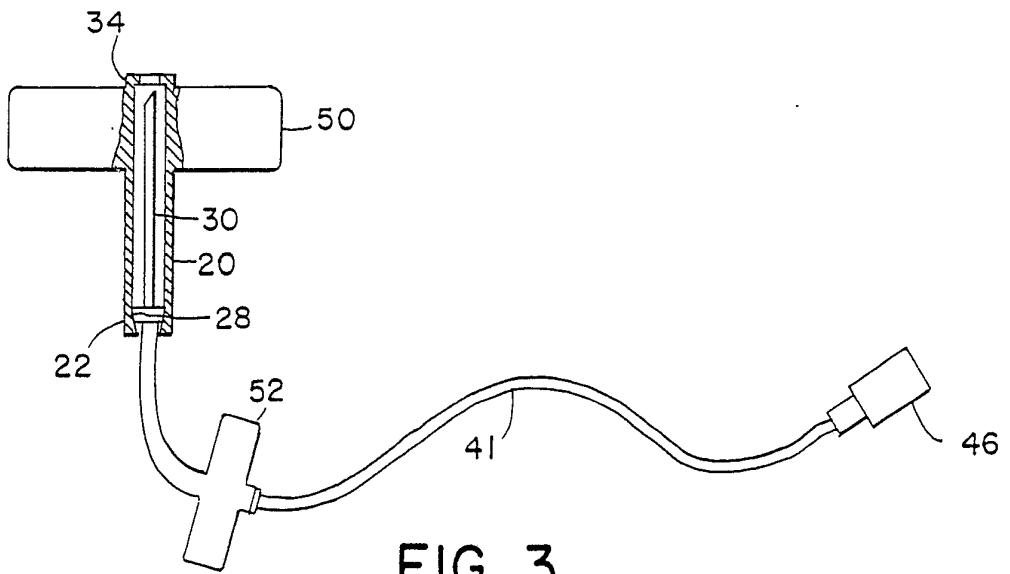


FIG. 3

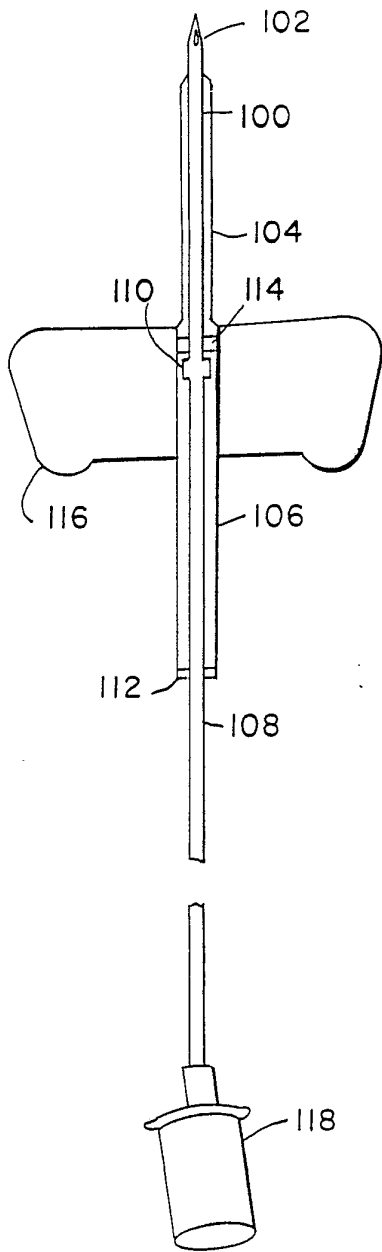


FIG. 4

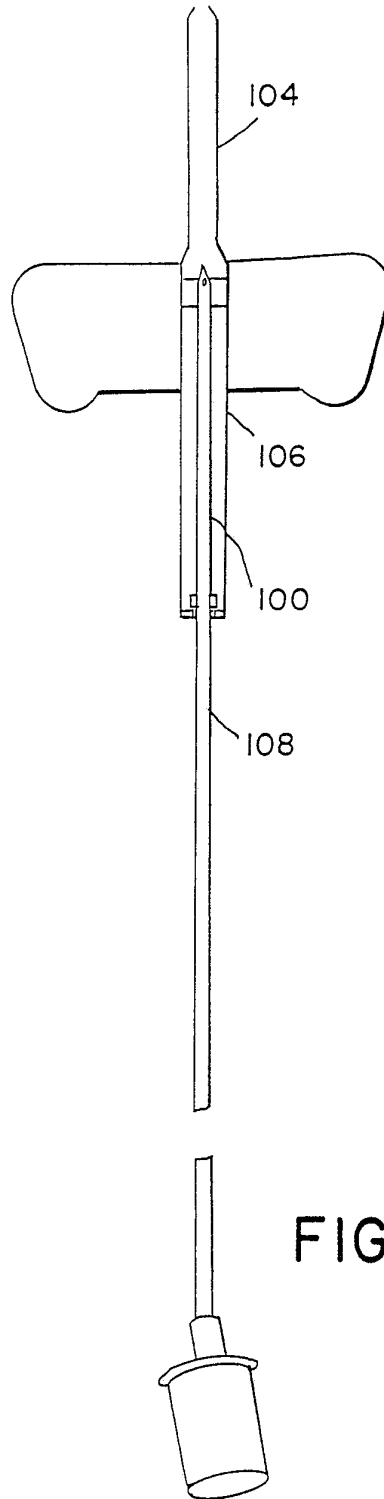


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US87/01574

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC (4): A61M 5/00		
U.S. Cl. 604/171, 604/177, 604/198, 604/162		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S.	604/162, 604/163, 604/164, 604/169, 604/171, 604/177, 604/198, 604/263	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category [*]	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X Y	US, A, 4,160,450 (DOHERTY) 10 July 1979 See the entire document.	1, 7, 9-11, 15-21 2-4, 6, 8, 12-14
Y	US, A, 3,769,975 (NIMOY ET AL.) 06 November 1973, see column 1, lines 16-19; column 2, lines 6-24.	6
Y	US, A, 4,362,156 (FELLER, JR. ET AL.) 07 December 1982, see Figures 1, 2 and 4; column 1, lines 14-22.	6
Y	US, A, 3,572,334 (PETTERSON) 23 March 1971, see Figure 2.	12, 13
Y	US, A, 3,910,272 (FORBERG) 07 October 1975, see Figure 1; column 4, lines 16-23.	14
Y	US, A, 3,055,361 (BALLARD) 25 September 1962, see Figures 3 and 4.	14
<p>[*] Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ²	Date of Mailing of this International Search Report ¹	
17 September 1987	07 OCT 1987	
International Searching Authority ¹	Signature of Authorized Officer ²⁰	
ISA/US	H. Macey <i>H. Macey</i>	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

- A US, A, 3,906,946 (NORDSTROM) 23 September 6, 12, 13
1975, see Figures 1 and 5.
- A US, A, 3,536,073 (FARB) 27 October 1970
See the entire document.
- A US, A, 3,670,727 (REITERMAN) 02 June 1972
See the entire document.
- A US, A, 4,425,120 (SAMPSON ET AL.) 10
January 1984, see the entire document.

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers because they relate to subject matter ¹² not required to be searched by this Authority, namely:

2. Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.