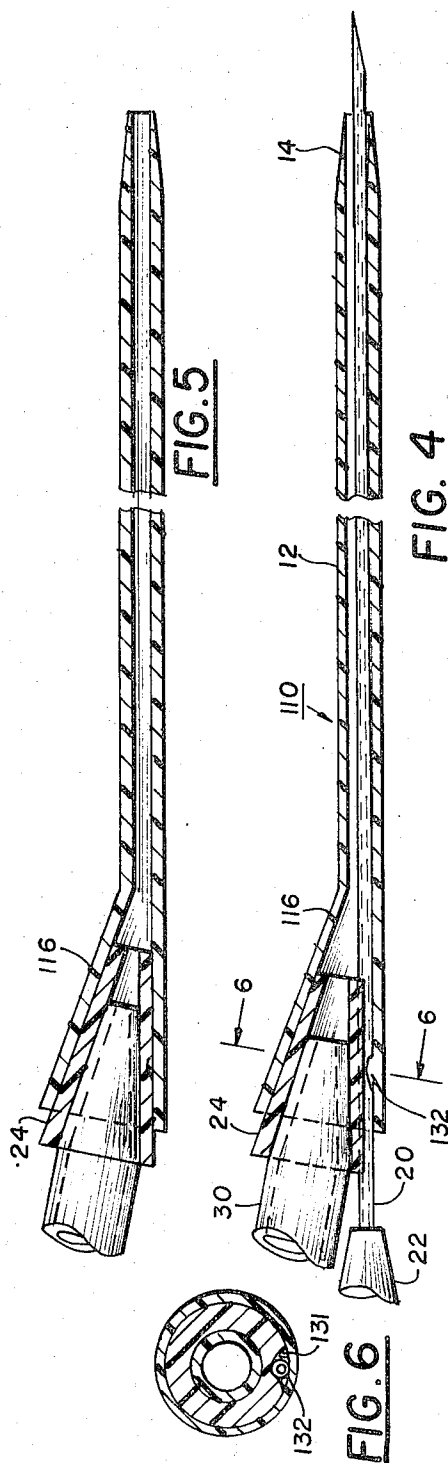
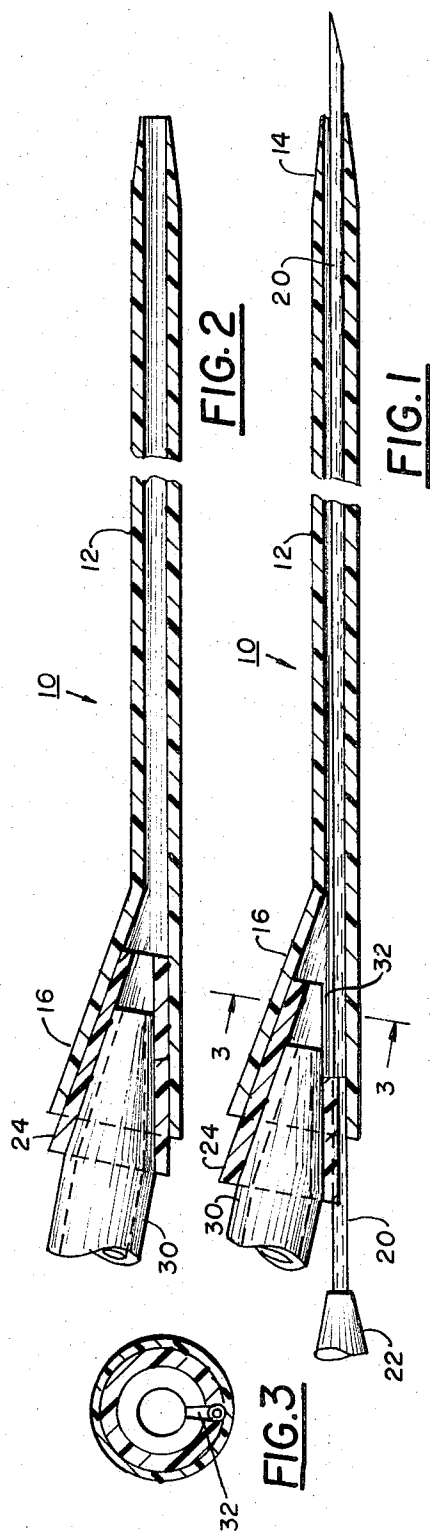




[54] INTRACORPOREAL CATHETER
ASSEMBLY

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[22] Filed: May 29, 1973

[21] Appl. No.: 364,756

[52] U.S. Cl. 128/221, 128/214.4

[51] Int. Cl. A61m 5/32, A61m 25/00

[58] Field of Search 128/214.4, 214.2, 214 R,
128/221, 218 M, 348, 349 R, DIG. 28, 272;
215/6, DIG. 3; 128/274, DIG. 16

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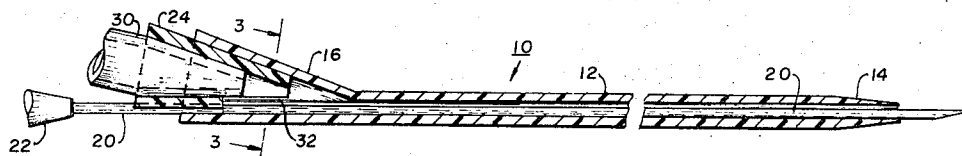
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[57] ABSTRACT

An intracorporeal catheter assembly comprises a catheter having a conically shaped hub, which as molded has one inner wall made to lie in a common plane with a connected inner wall of the catheter. A semiflexible cone-like sleeve is mounted within the catheter hub with the inner taper of this sleeve adapted to receive and retain the distal end of an intravenous feeding system. A needle is initially passed between the outer surface of the hub-mounted sleeve and the inner wall of the catheter hub and through the catheter. This needle when inserted into and through the catheter acts as a shutoff valve for the flow from the feeding system until after the catheter has been placed in the vein whereupon the needle is withdrawn and the semiflexible sleeve and the connected feeding system is secured in the hub of the catheter by urging the distal end of the feeding system and the sleeve forwardly into the hub after which intravenous flow is commenced.

8 Claims, 6 Drawing Figures



INTRACORPOREAL CATHETER ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of art as established in the U.S. Pat. Office and to which this invention pertains is found in the general Class of "Surgery" (Class 128) and more particularly in the subclass of "dosing devices" (subclass 213). In particular this catheter pertains to the subclass thereunder of devices pertaining to "intravenous, coaxial" (subclass 214.4).

2. Description of the Prior Art

There have been many approaches to a system for providing a flexible catheter with means for determining the intravascular placement of the catheter into the body of the patient. Among the patents directed toward said systems is U.S. Pat. No. 3,323,299 to SPADEMAN of Apr. 11, 1967. In this patent, as with many others, the fluid connection is made as a branch portion of the member to which the flexible cannula is attached. In U.S. Pat. No. 2,828,744 to HIRISCH of Apr. 1, 1958 and U.S. Pat. No. 3,017,884 to DOHERTY of Jan. 23, 1962 there are showings of apparatus in which a flexible catheter is used with a needle to enable a penetration of and by the catheter of the skin. After the penetration of the skin and vein by the catheter and needle is accomplished, the needle is withdrawn from the catheter and the fluid flow tubing system is connected to a socket receiving end of the catheter. The removing of the needle from the catheter and subsequent connection to the intravascular feeding tubing system is often made with various amounts of spillage occurring. In my U.S. Pat. No. 3,599,637 as issued on Aug. 17, 1971, a metal needle is inserted into a flexed length of rubber tubing prior to insertion through the internal passageway of the catheter and after intravascular insertion is made the needle is removed through the self-sealing rubber tubing and fluid flow begins.

It is an object of this invention to present a catheter unlike conventional catheters in that the catheter of this invention has its main axis extended along one inside surface of a connected conical hub. This conical inner configuration although displaced from the axis of the catheter is adapted to receive a partially compressible tubular member which also is cone-like in construction and configuration. A needle connected to a syringe, flashback, flexible container or other source of negative pressure is inserted through the catheter hub and along the hub side aligned with the catheter and then into and through the catheter. The needle in its occupying of the passageway of the catheter is locked in position by the distal portion of a semiflexible tubular member fitted into the conical hub with this needle acting as a shutoff for fluid flow of the feeding, injecting or draining of fluid to and through the catheter until the needle is withdrawn from the catheter. Upon withdrawal of the needle the distal part of the semiflexible member which has been prior connected to a feeding, injecting or drainage unit expands to fill the space occupied by the needle and is further locked in place during the operation of pushing the catheter into the intrabody structure (eg. vein, artery, bladder, spinal canal, etc.).

SUMMARY OF THE INVENTION

The catheter assembly of this invention includes a length of flexible plastic tubing having its distal end ta-

pered to assist in the penetration of the skin of the patient. This catheter is used in combination with a needle to accomplish the penetration. The other end of the catheter is attached to or is integrally molded to a conical hub portion which provides a tapered entrance into the bore of the catheter. In the molding of the hub its axis is disposed at an angle to the axis of the catheter bore so that at one particular point or portion on the inside surface of the hub the axis of the catheter is coincident with and extends along one inner surface of the hub. The outer portion of the hub receives and retains a short portion of a tapered plastic tubular member which is sized to fit the hub. This tubular member is sufficiently resilient or compressible so as to fit partially around a needle. The inner contour of the plastic cone is sized to receive and retain the discharge end of a feeding, injecting or drainage tubing assembly. A needle having one end usually attached to or attachable to a syringe container, flashback member or like negative pressure creating device is inserted through the hub and lays against one side surface of the hub, the axis of the needle leading into the catheter is adjacent one side of the inside hub surface. The needle after passing through the hub is caused to enter the tapered opening in the hub and to then be slidably advanced to and through the catheter. The conical semiflexible insert is then inserted into the hub forcibly, its distal portion compressing against the needle and locking it in place for body puncture through the skin (eg. vein, artery, bladder, spinal canal).

There has been chosen a specific embodiment of a catheter contoured to receive a conical semiflexible tubular member into which is received the end of a feeding, injecting or drainage unit. With the catheter there is also shown a needle which is connected to a means for creating a negative pressure to determine the placement of the catheter in the body of the patient as in a vein. This specific embodiment and a modification thereof have been chosen for the purposes of illustration and description as shown in the accompanying drawing wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 represents a sectional side view of an intracorporeal catheter assembly of this invention and assembled for venipuncture;

FIG. 2 represents the sectional side view of the assembly of FIG. 1 but with the needle portion of the assembly withdrawn from the catheter and the catheter portion assembled to a tubing end of a feeding, injecting or drainage unit;

FIG. 3 represents a slightly enlarged sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 represents a sectional side view of a catheter assembly as in FIG. 1 but with an additional needle guide and retainer formed on the interior surface of the hub;

FIG. 5 represents the sectional side view of the assembly of FIG. 4 but with the needle portion of the assembly withdrawn and the assembly withdrawn from the catheter and the catheter portion assembled to a tubing end of a feeding, injecting or drainage unit, and

FIG. 6 represents a slightly enlarged sectional view taken on the line 6—6 of FIG. 4.

In the following description and in the claims various details will be identified by specific names for convenience; these names, however, are intended to be ge-

neric in their application. Corresponding reference characters refer to like members throughout the two figures of the drawing.

The drawing accompanying, and forming part of this specification discloses certain details of construction for the purpose of explanation of the broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the concept and principles of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and in particular to FIGS. 1, 2 and 3 it is to be noted that a catheter member 10 is preferably made of a flexible plastic. In the shown arrangement the catheter has a reduced diameter forward portion 12 which has its front, forward or end 14 tapered to a thin edge. The catheter has its leftward or rear end enlarged to provide a conical hub 16. This hub section 16 is preferably rigid or semirigid and it and the catheter portion have their bores sized to provide a sliding fit and passageway for a needle 20 along one side of the inner surface of the cone-like hub. The needle 20 has its forward end sharpened or pointed in a conventional manner to assist in the puncture of the skin of the patient. This needle at its rearward end is connected to an aspirating device 22, which device may be in the form of a flexible bottle, syringe or flashback determination device. Inserted into the hub 16 is a flexible and semirigid conical member 24 of thin plastic. As molded and in use the conical shape of the hub has one side of the hub aligned with the catheter portion.

The conical member 24 is of a material which is sufficiently compressible so that the needle 20 after being inserted through the hub 16 and the catheter 12 as in FIG. 1 and then withdrawn as in FIG. 2 expands from its slightly deflected condition of FIG. 1 so that its distal or forward one-third to one-half length which initially engaged the needle expands to occupy this space and prevent leakage of fluid and renders the system fluid-tight. The tubing 30 forming the feeding system is conventionally and universally flexible so that it may be further tightened by locking into the hub socket 16 as in FIG. 1 during forward insertion of the catheter 12 and needle 20 to and through the skin of the patient.

The leftward end of the compressible member 24 is sized so as to receive and retain this distal end of a feeding, injecting or drainage unit 30. It is to be noted that the hub portion 16 is formed with a chamfered or tapered entrance to the bore portion of catheter portion 12 which provides a guide for the entrance and passage of the needle into and through the passageway of the catheter and hub. The semirigid tubular member 24 is preferably of a thin plastic material to occupy minimal space and be compressible and able to receive into its proximal larger half the fluid conducting unit 30 in a fluid-tight manner. For ease of identification and description conical member 24 is hereinafter called the "intermediate collar."

USE AND OPERATION

The catheter assembly 10 may be made as either one or two members. If made as two members the hub 16 and catheter 12 are joined in a fluid-tight assembly. The needle 20 is inserted into this hub 16 and through

the catheter 12 after which intermediate collar 24, which is sized to snugly engage the interior of the hub socket 16, is mounted in this socket. This assembly is retained in the condition as in FIG. 1 until time of use when the distal end of the feeding, injecting or drainage unit 30 is inserted into collar 24. The point of the needle 20 is caused to protrude an amount sufficient to permit a puncture and penetration of the skin of the patient who is to receive the feeding, flow or the like.

The needle 20 and enclosing catheter assembly 10 of FIG. 1 is inserted into the body (eg. vein, artery, etc.) of the patient in the normal manner. The presence of blood in the flashback or syringe is an indication of a satisfactory entrance into a vein where this is the desired result. An absence of blood, of course, indicates to the attendant that the needle is not in the vein. After the placement of the needle into the vein has been confirmed, the needle 20 and flashback device 22 attached thereto is withdrawn from the assembly and the compressed distal part of intermediate collar 24 expands to fill the space formerly occupied by the needle shank and allows the attached system to flow in a fluid-tight manner. After the needle 20 has been withdrawn the intermediate collar 24 assumes the contour of the hub 16 as in FIG. 2 and is further locked by the forward pushing of the catheter into the body. The needle 20 when in the bore of the catheter 12 acts as a shutoff or flow restrictor to fluid carried in the connected feeding, injecting or drainage tube.

After the needle 20 is withdrawn from the catheter 12, the flow of fluid from the feeding tube is permitted to pass through member 30 and then through the catheter and into the body (eg. vein) of the patient. The arrangement of FIG. 2 provides a neat and compact single channel arrangement which permits the taping of the hub 16 and flexible member 22 to the skin of the patient in a conventional manner. The forward insertion of the catheter 12 into the body of the patient (eg. vein) usually performed by gripping the feeding insert 30 and hub of the catheter acts to further lock the intermediate collar 24 into the hub 16. The intermediate collar, as in FIG. 1, may have one or more short longitudinal slits 32 at its distal portion to facilitate compression against or around the needle and expansion after removal of the needle. The length and diameter of the catheter 12 is merely a matter of selection. The needle 20 used with the selected catheter is sized to slide into the bore of the catheter and the needle is of a length so that when assembled as in FIG. 1 the sharpened end of the needle extends beyond the tapered end 14 of the catheter to act as the initial portion to penetrate the skin of the patient.

A second catheter of narrower diameter but much longer length than the catheter 12 may be threaded through collar 24 instead of a fluid flow system and upon removal of the needle 20 following body penetration (eg. vein or artery) the second catheter is threaded through the first catheter into the body. Customarily, this second catheter is protected from contamination by a thin malleable plastic sheath while being threaded through catheter 12 and into the vein of the patient.

The hub 16 may be a separately formed part of rigid or semirigid plastic or may be of metal. The catheter 12 may be molded to this hub or may be cemented in place or may be swaged into a fluid-tight connection. It is only necessary that the fluid passageway from the hub to the catheter be fluid tight and that the hub be dis-

placed at an angle to the catheter so that the axis of the catheter will pass along and parallel to one side wall of one local inner hub surface.

ALTERNATE EMBODIMENT OF FIGS. 4, 5 AND 6

Referring finally to FIGS. 4, 5 and 6 there is shown an alternate assembly to that of FIG. 1. In this assembly the hub 116 has formed on its inner surface and in alignment with the axis of the catheter a pair of spaced lugs or ears 131 and 132. These ears are spaced so as to act as a guideway for the needle and to retain the needle in alignment with the axis of the catheter 12 when and while the needle lays against the inner surface of the hub 116.

This alternate embodiment is particularly useful where the intermediate collar 24 and/or the hub 116 is flexible to the extent that the needle 20 would tend to displace the collar 24 during the withdrawal of the needle. The ears 131 and 132 also assist in aligning the needle for initial insertion into the catheter 12. The collar 24 in this embodiment is contemplated as being a relatively thin conical tube having no cuts in its length. Its use and manipulation correspond to the description of the assembly of FIG. 1.

It is, of course, recognized that the distal end 30 of the feeding system can be made as a permanent connection to or with an integrally molded end which is then the intermediate member 24. In this arrangement needle 20 is inserted into the catheter 10 and would remain in this condition until just before use. The one-piece member replacing tubing 30 and intermediate member 24 would then be mounted into hub 16 or 116 as in FIG. 1 or FIG. 4. Penetration is accomplished and the needle withdrawn as above-described.

Terms such as "left," "right," "up," "down," "front," "back," "in," "out" and the like are applicable to the embodiments shown and described in conjunction with the drawing. These terms are merely for the purposes of description and do not necessarily apply to the position in which the intracorporeal catheter may be constructed or used. The conception of this catheter assembly and its application is not limited to the specific embodiment shown but departures therefrom may be made within the scope of the accompanying claims and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A single-channeled intracorporeal catheter having a receiving socket for connection to the distal end of a fluid conducting system for feeding, injecting and draining, said catheter and connection including: (a) a catheter member of flexible tubing having its intermediate portion formed with a relatively constant bore, said catheter having a distal end of tapered configuration and having its other end secured in a fluid-tight manner to a hub having a tapered socket terminating at and connecting to this bore, the size of the socket progressively increasing as it approaches and reaches the open end of the hub and having the axis of this tapered socket disposed at a divergent angle to the bore of the catheter so that the inner surface of one side portion of the tapered socket of this hub is parallel to the axis of the catheter bore; (b) a tubular intermediate member of semirigid material and having a residual bias and having both a tapered bore and an outer tapered configuration which mates with and is snugly fitted into the tapered socket of the hub, the tapered bore

of said intermediate member sized and configured to provide a tapered socket to receive and retain the distal end of a fluid conducting system, and (c) a needle slidably mounted within the catheter bore, this needle positioned so as to lay along and on that inner side wall surface portion of the tapered socket portion of the hub that lies in a common plane with the catheter axis, said needle having a sharpened point on its distal end, the outer diameter of the needle sized so as to be slidable in the bore of the catheter member, said needle when mounted in the catheter having a sufficient length to enable its midshaft to pass through the tapered socket of the hub and bore of the said catheter, the point of the needle extending beyond the distal end of the catheter while the needle is slidably retained between the outer surface of the intermediate member and the wall of the tapered socket of the hub, this needle midshaft displacing and to a degree compressing that inserted portion of the intermediate member adjacent the bore of the catheter, the angle divergence of the axis of the hub of the catheter and the mounted intermediate member from the axis of the catheter being sufficient for the shaft of the mounted needle to avoid interference with and permit ready seating and securing of the distal end of a fluid conducting system in the receiving socket of the intermediate member and as and after the needle is withdrawn from the bore of the catheter the intermediate member by its residual bias moves from its displaced condition and into a fluid sealing condition with the tapered socket formed with the hub.

2. An intracorporeal catheter as in claim 1 in which the needle is of hollow construction and having that end opposite the sharpened end attachable to a blood receiving and indicating device.

3. An intracorporeal catheter as in claim 1 in which the catheter member is of flexible plastic and the hub is of a more rigid plastic to which the catheter member is attached in a fluid-tight manner.

4. An intracorporeal catheter as in claim 1 in which the intermediate tubular member is of compressible plastic of about sixty to seventy durometer hardness and has at least one slit longitudinally disposed of one-half to one-third the length of the intermediate member, said slit formed through the wall and in the smaller end of the tubular member.

5. An intracorporeal catheter as in claim 1 in which the tapered bore of the intermediate member and distal end of the connected fluid conductor are compatibly configured so that when pushed forwardly into the body, after removal of the needle, the tapered configurations further lock the end of the fluid conductor in the intermediate member and the intermediate member into the tapered socket in the catheter hub.

6. An intracorporeal catheter as in claim 1 in which the inner surface of the tapered socket in the hub is formed with inwardly directed ear guides, said guides adapted to engage the shank of a needle to guide the needle during withdrawal from a body structure and through the bore of the catheter and then past the intermediate member the combined residual bias of the intermediate member and the catheter hub sufficient to close that area prior occupied by the just withdrawn needle to prevent blood seepage from this needle passageway by and between the hub socket inner surface and the intermediate member's outer tapered surface.

7. An intracorporeal catheter as in claim 1 in which the catheter and extending needle point in the assem-

bled condition are adapted for ready penetration through the skin and into the body.

8. A single-channeled intracorporeal catheter having a receiving socket for connection to the distal end of a fluid conducting system for feeding, injecting, draining and the like for use with a patient, said catheter and connection including: (a) a catheter member of flexible tubing having its intermediate portion formed with a relatively constant bore, said catheter having a distal end of tapered configuration and having its other end secured in a fluid-tight manner to a hub whose inner surface is formed with a cone-like configuration and having the axis of this inner cone-like configuration disposed at such an angle divergent to the catheter's axis that the inner surface of one side portion of the hub is parallel to the axis of the catheter bore, the cone-like bore of the hub increasing from a bore diameter substantially equal to the bore of the catheter's flowconnected end to a larger diameter toward the open end of the hub; (b) an intermediate member of semirigid material and having a residual bias and having both a tapered bore and an outer conical shape, this outer conical shape mating with and snugly fitted into the cone-like bore of the hub, the tapered bore of said intermediate member sized and configured to provide a tapered socket to receive and retain the distal end of a fluid

conducting system, said member having at least one longitudinally disposed slit of one-half to one-third the length of the intermediate member, said slit formed through the wall and in the smaller end of said member, and (c) a needle slidably mounted within the catheter bore positioned so as to lay along and on that inner side wall surface portion of the hub that lies in a common plane with the catheter axis, said needle having a sharpened point on one end, the outer diameter of the needle sized so as to be slidable in the bore of the catheter member and when in said catheter bore providing a fluid shutoff to any flow from a fluid conducting system connected to the open end of the intermediate member and from thence to the catheter, said needle further constructed with a determined length so that when mounted in the catheter to pass through hub and bore of the said catheter the point of the needle extends beyond the distal end of the catheter, the needle while inserted between the intermediate member and the hub inner wall also entering the longitudinally formed slit to reduce displacement of the inner portion of the mounted intermediate member and as and after the needle is withdrawn the intermediate member by its residual bias moves into a fluid sealing condition with the cone-like configuration formed within the hub.

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