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**Burdulis**

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- (54) **FLUSHABLE HUB**
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- (\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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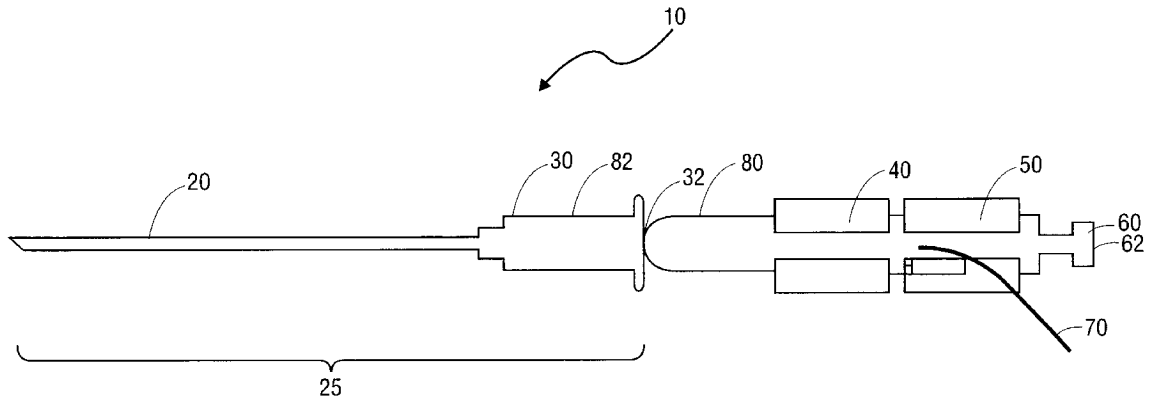
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- (51) **Int. Cl.**<sup>7</sup> ..... **A61M 25/16**; A61M 25/18; A61M 39/00; A61M 39/10
- (52) **U.S. Cl.** ..... **604/533**; 604/264; 604/93.01; 604/500; 600/585
- (58) **Field of Search** ..... 604/533, 523, 604/247, 246, 93.01, 19, 500, 506, 96.01, 160, 264; 600/585

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(57) **ABSTRACT**  
 A catheter unit comprising a catheter having a hub, a connector and catheter, the connector comprising a first port, a second port, and third port. The first port, located at the proximal end of the connector and protruding from the connector, is coupled to a lock member. The second port, located within a cylindrical portion of the connector, is adapted to receive a guidewire. The third port is located at the distal end of the connector.

**12 Claims, 4 Drawing Sheets**



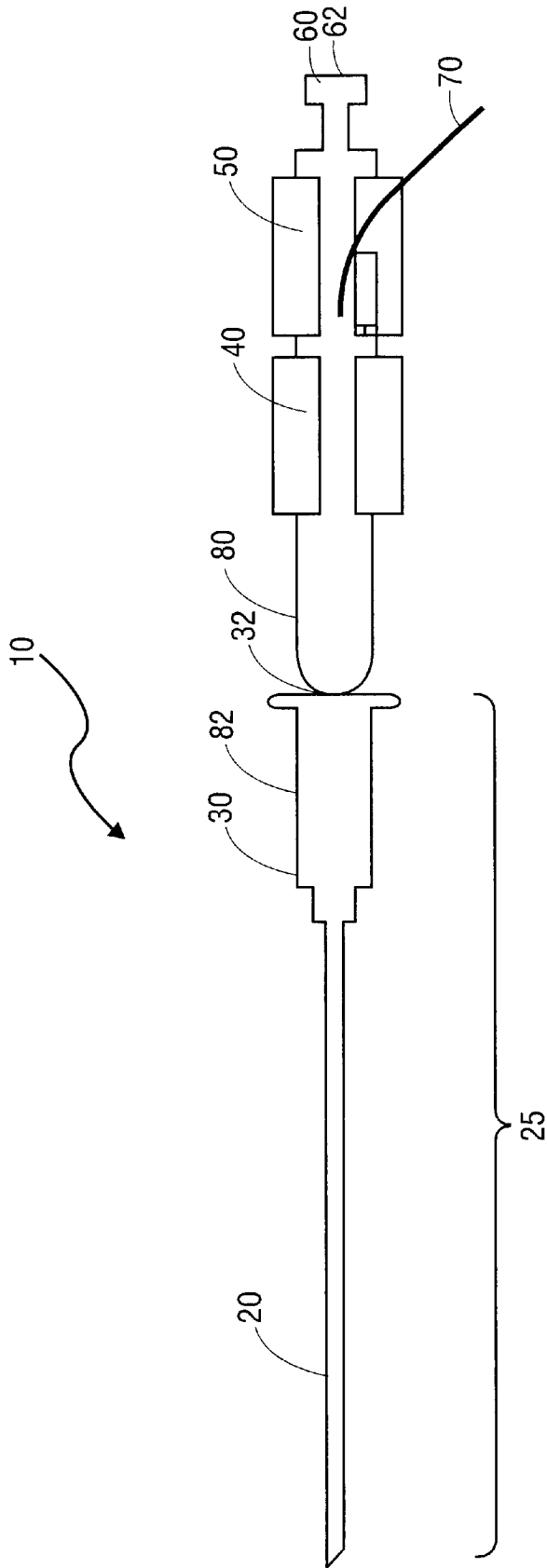


FIG. 1

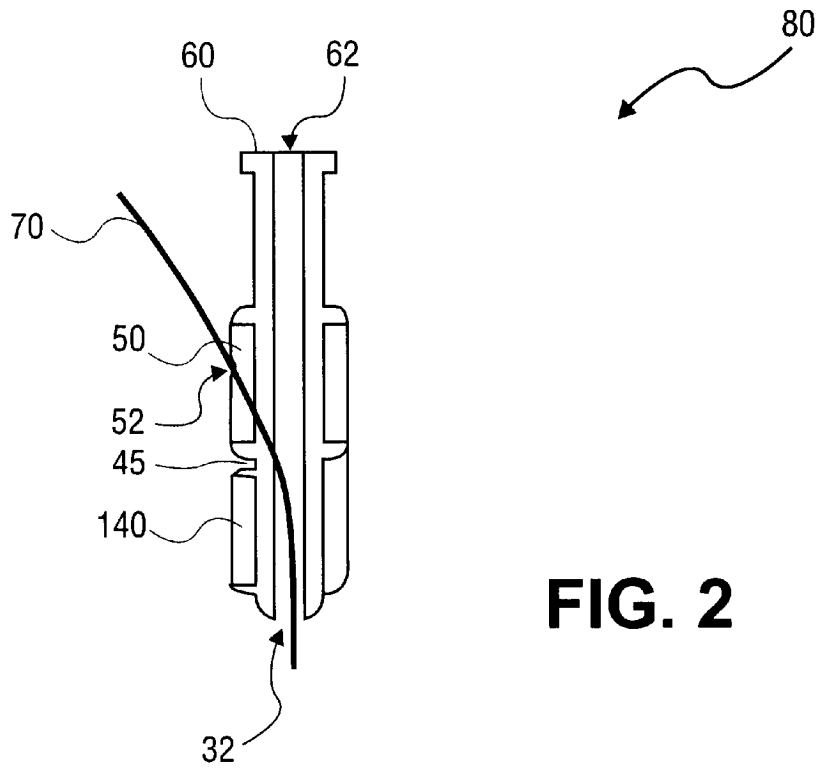


FIG. 2

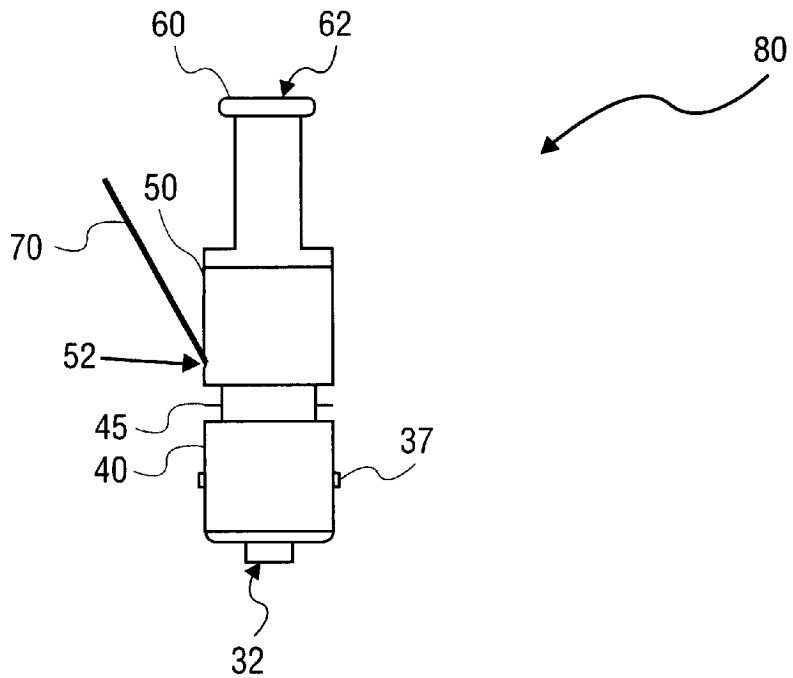


FIG. 3

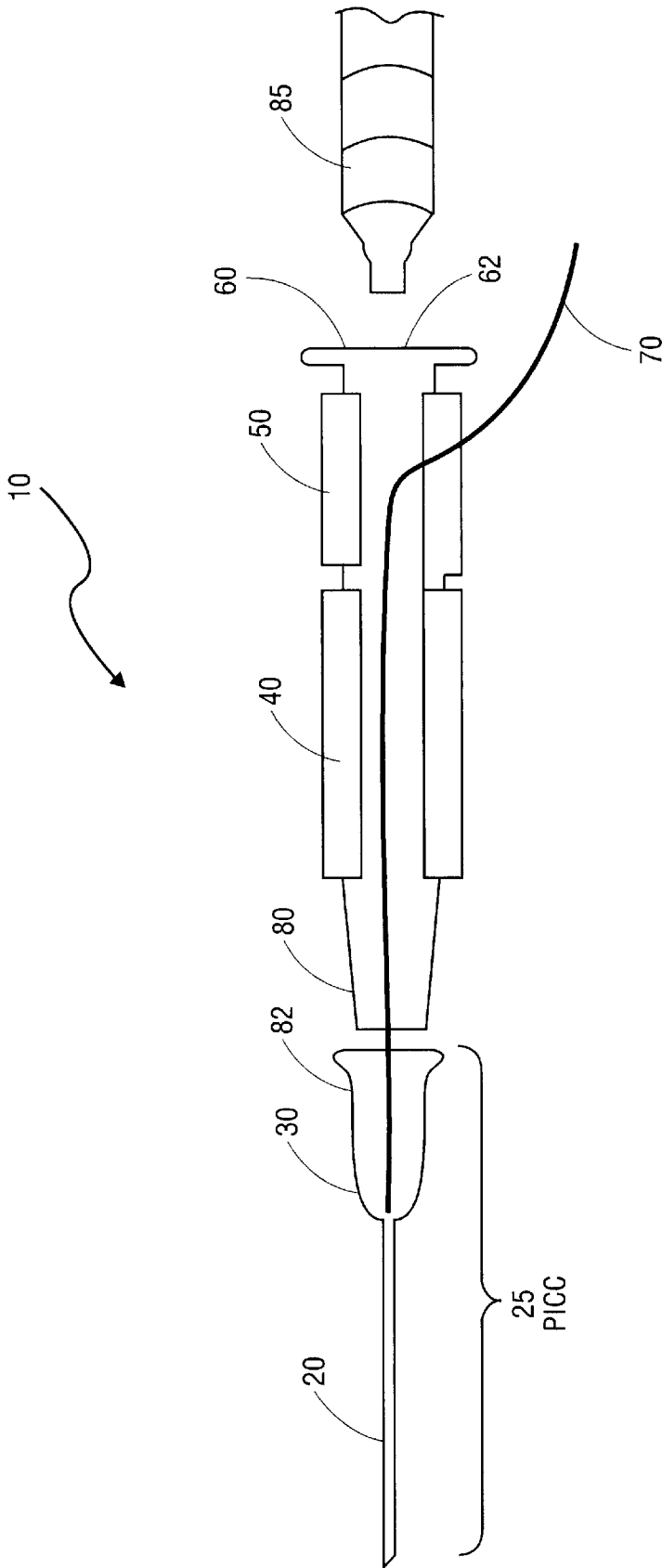
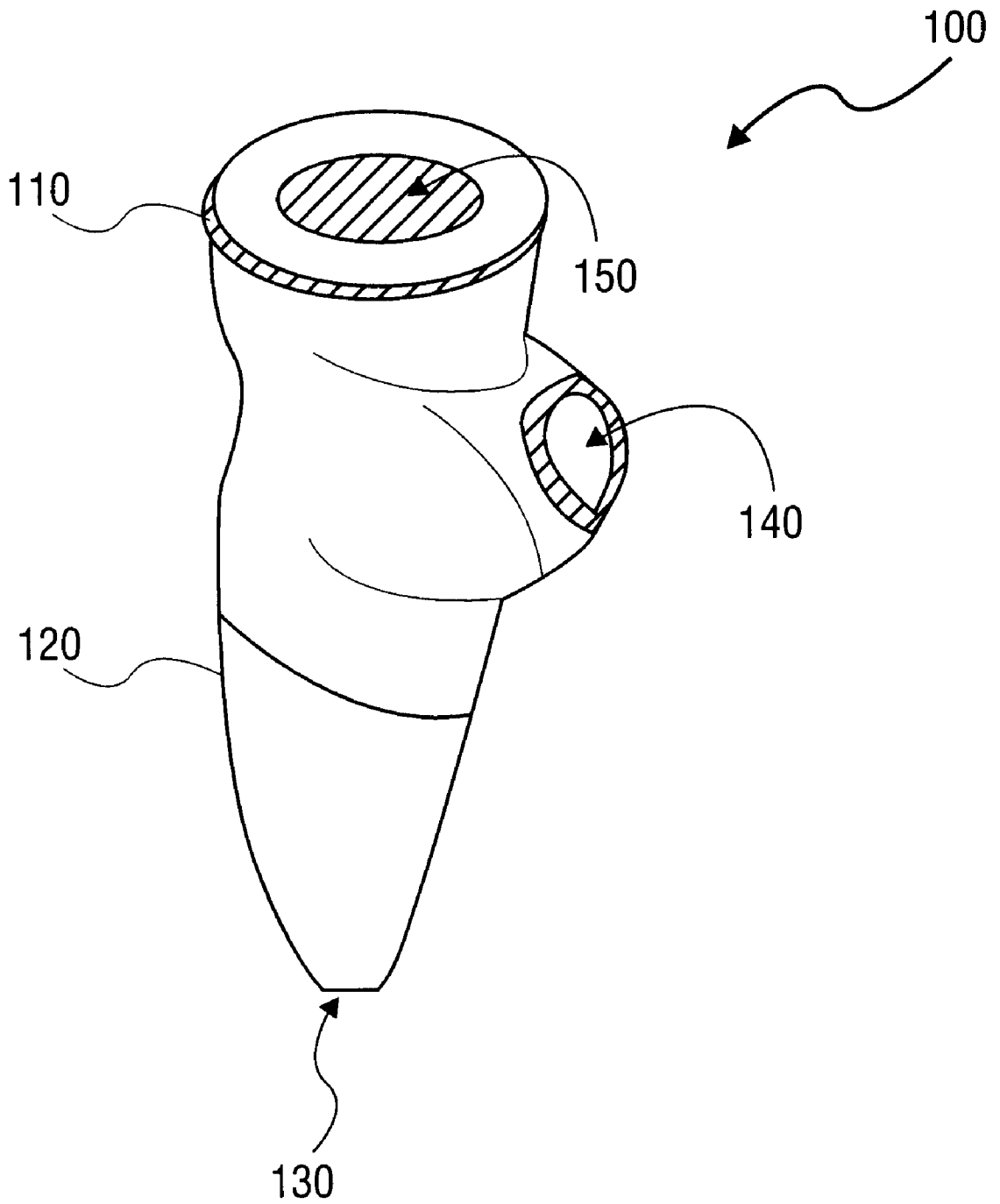


FIG. 4



**FIG. 5**

**1**  
**FLUSHABLE HUB**

**BACKGROUND OF THE INVENTION**

1. Field of the Invention

The present invention relates generally to medical devices and more particularly to a connector such as a hub of a catheter.

2. Description of Related Art

Despite significant advances made in intravascular devices such as catheters, blood or other bodily fluids that collects in a flash chamber may escape from a catheter thereby potentially exposing a healthcare worker or another person to blood-borne pathogens. In view of the potential of healthcare workers contacting blood borne pathogens such as HIV and hepatitis, there exists a need to provide catheters that reduce this risk. Although existing devices are capable of reducing the risk that a person will contact blood-borne pathogens through inadvertent needle trauma, these prior devices or apparatus are not capable of being used with all types of catheters. Accordingly, there remains a need for the development of additional needle blunting devices and/or apparatus for preventing or reducing the risk of exposure to blood or other bodily fluids due to fluid escaping from the catheter.

Connectors for catheters are known in the art as shown by U.S. Pat. No. 5,357,961 issued to Fields. However, several disadvantages exist to using a Y-shaped connector or a L-shaped connector. First, these types of shapes of the connectors are bulky and may be caught in the dressing or clothing of a patient. If a catheter is caught on a dressing or some type of material, the catheter generally remains in its position while the patient moves. This results in discomfort to the patient. Second, the hub is bulky and is more difficult to handle by a health care worker. Third, conventional flushable hubs require more complex parts to be functional. For example, the leg of the L-shaped or Y-shaped hub causes the manufacturing process to be more complex. Fourth, the complexity of the process of manufacturing the L-shape and Y-shape connector is costly. Accordingly, it is desirable to produce a connector that addresses the problems associated with conventional connectors.

**SUMMARY OF THE INVENTION**

A catheter unit comprising a catheter having a hub and connector, the connector comprising a first port, a second port, and third port. The first port, located at the proximal end of the connector and protruding from the connector, is coupled to a lock member. The second port, located within a middle portion of the connector, is adapted to receive a guidewire. The third port is located at the distal end of the connector. Additional features, embodiments, and benefits will be evident in view of the figures and detailed description presented herein.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The features, aspects, and advantages of the invention will become more thoroughly apparent from the following detailed description, appended claims, and accompanying drawings in which:

FIG. 1 is a side view of an embodiment of an intravascular assembly in accordance with the present invention;

FIG. 2 is an enlarged sectional view of a hub in the present invention;

FIG. 3 is an enlarged view of the same hub as in FIG. 2; and

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FIG. 4 is a side view of an embodiment of an intravascular assembly in accordance with the present invention;

FIG. 5 is another embodiment of the invention wherein the hub has a guidewire port that protrudes from the hub.

**DETAILED DESCRIPTION OF THE INVENTION**

The following detailed description and the accompanying drawings are provided for the purpose of describing and illustrating presently preferred embodiments of the invention only, and are not intended to limit the scope of the invention in any way.

With reference to one embodiment of the invention shown in FIG. 1, there is provided assembly 10 that may be used to facilitate percutaneous insertion of an intravascular cannula, tube, and catheter 20. Intravascular assemblies include a variety of catheters such as peripherally central catheters (PICC) that allow for repeated access to the patient's vascular or venous system. Intravascular assembly 10 comprises a catheter 20, an introducer assembly 30, a male leir 40, a wire sealed tube 50, a female leir lock 60, and a connector 80.

PICC 25 comprises a hub 82 and catheter 20. Hub 82 and catheter 20 are fastened together to form a continuous and leakless assembly. Catheter 20 may be constructed of polyurethane, silicone rubber, or any other suitable material. PICC 25 is connected to a 3-way connector 80 by hub 82 sliding over the 3-way connector's outlet port 32. Hub 82 has appropriate dimensions allowing it to be securely fitted to outlet port 32. Outlet port 32 is in communication between the 3-way connector 80 and the proximal end of PICC 25. Connector 80 is also coupled to female leir lock 60 using conventional methods such as female leir lock 60 having a cylindrical portion that has an outer diameter smaller than the inner diameter of connector 80. Inlet port 62 of connector 80 is secured to syringe 85 for PICC 25 as shown in FIG. 4.

As shown in FIGS. 2 and 3, connector 80 has three ports—a guidewire port 52 that is located on the side of connector 80, an inlet port 62, and an outlet port 32. All three ports are preferably integral to each other and form a cavity.

One advantage to having connector 80 configured without an L-shape or Y-shape is that the catheter is easier to use especially when the catheter is repetitively used as in a PICC. This is due to the ease of inserting the catheter into the patient without obstruction. Flushing the intravascular assembly while moving the catheter through a patient's body is made easier by a connector configured without an L-shape or Y-shape. Another advantage of the invention is that an intravascular assembly that uses the connector is more easily "site cleaned" by a health care worker. For example, when the hub is in use, the hub should be cleaned to minimize the risk of infection. The various embodiments of the invention, by using an inline design, is more easily cleaned than conventional flushable guide wire hubs because there is no Y-leg or L-leg off of the connector. Another advantage to the device is that there are fewer and less complicated parts to manufacture. Therefore, there is a reduced risk of quality defects in the part because of the less parts needed making the device generally easier to manufacture. This in turn reduces the cost of manufacturing the device. Another advantage relates to the ease of using the device compared to conventional devices. Accordingly, the risk of misusing the device by a health care worker is reduced. Note that variations to the connector may consist of any modification to any type of design that eliminated the L-leg or Y-leg to the connector.

Connector **80** and catheter **20** are fastened together to form a continuous and generally leak-proof assembly. Catheter **20** can be constructed of any suitable material, such as polyurethane, silicone rubber, or other suitable self sealing material.

To insert intravascular assembly **10** of FIG. **4** into a patient, guidewire **70** is run through the length of catheter **20**. Guidewire **70** stiffens catheter **20** which allows the guidewire **70** to make its way through a patient's vascular system. Guidewire **70** comprises a hydrophilically coated stylet. Guidewire **70** may or may not have a handle at one end. However, it is preferred that guidewire **70** have a handle to make it easier to grip guidewire **70** while inserting catheter **20** through guidewire **70**.

Guidewire **70** passes through port **52** of connector **80** into guidewire hub **82**. Connector **80** is configured to receive guidewire **70** at an angle of less than 45°. Connector **80** may be comprised of a polymer such as plastic, polycarbonate, polyvinyl chloride, or other suitable material. Guidewire **70** then advances through hub **82** into catheter **20**. When completely inserted, guidewire **70** rests against the side of hub **82**. The initial guidewire **70** length is selected such that when it is completely inserted, its proximal tip rests approximately a ¼ inch from the catheter's **20** proximal tip. This in turn provides additional protection from vein puncture or irritation from guidewire **70**.

Guidewire **70** passes through wire sealed tube **50**. Wire sealed tube **50** has a seal disposed therein such that it makes a watertight seal around guidewire **70**. After guidewire **70** is placed through connector **80**, it can slide its full length through the wire sealed tube **50**, indentation **45**, and the male swivel leur **40**. Wire sealed tube **50** provides a slight resistance to the movement of guidewire **70**. This resistance in wire sealed tube **50** prevents guidewire **70** from being moved too quickly through connector **80** and catheter **20** thereby in reducing a patient's discomfort by having a guidewire **70** move too quickly.

Port **62**, used for flushing intravascular assembly **10**, provides a means for connecting a syringe **85**. Syringe **85** is connected to port **62** as shown in FIG. **4**.

Syringe **85** is filled with flushing solution that may include saline, or other suitable solution. After syringe **85** is coupled to port **62**, the flushing solution can be injected into the connector **80**. It will be appreciated that syringe **85** will not inject the flushing fluid until a device such as a plunger to the syringe is depressed.

Flushing assembly **10** is generally recommended with an aqueous solution before, during, and after catheter insertion to assist in the movement of the catheter through the body and also to check for catheter patency. Additionally, the chances of clotting occurring in the patient are reduced when a catheter is flushed while moving through the body. Catheter **20** has been properly flushed before insertion into a patient's body when drops of flushing solution begin to emerge from catheter **20**.

A user may then determine how long catheter **20** needs to be in order for the tip of the catheter to reach the desired location within a patient. The user may measure the distance between the insertion site and the desired tip location. If the necessary length for the catheter tip location is shorter than the length of the catheter **20**, catheter **20** must be trimmed or cut to the correct length.

Guidewire **70** is then placed next to the body of the user and the user grips neck **64**. Guidewire **70** is withdrawn through wire sealed tube **50** so that guidewire **70** is within the necessary length of catheter **20**. Catheter **20** portion of

assembly **10** may be trimmed using sterile scissors taking care to avoid cutting the guidewire **70**. Note that approximately one half of an inch of catheter **20** should remain that has no guidewire within it. The resulting assembly **10** has a catheter **20** of proper length. Because guidewire **70** has been withdrawn from assembly **10**, the guidewire handle will no longer rest against a user and a portion of the guidewire **70** will no longer be within the connector **80**.

After trimming the catheter **20**, but before installation, assembly **10** may be flushed again. Flushing prior to installation allows the user to recheck catheter patency and allows removal of any residue created during catheter **20** trimming.

It may be necessary to flush the catheter guidewire flushing apparatus **10** during insertion of the catheter. Flushing during installation can also assist in removing blood or other bodily fluids that may accumulate inside the lumen of assembly **10**. Once installed in the patient, guidewire **70** can be left in assembly **10** in order to verify placement through radiographically. After verification, guidewire **70** is removed from assembly **10**. In order to remove guidewire **70**, guidewire's proximal end is pulled. If resistance is felt, assembly **10** should be flushed. The flushing solution lubricates the guidewire **70**. Assembly **10** allows for flushing to take place without any guidewire **70** manipulation and at any time. Additionally, flushing may occur with a PICC assembly without having to reattach the syringe containing flushing solution.

FIG. **5** shows another embodiment of a connector used in an intravascular assembly. Connector **100** has an inlet port **150**, a guidewire port **140**, and an outlet port **130**. Connector **100** has a wall **110** thickness of approximately 0.035 to 0.050 inches. The hub (not shown in FIG. **4**) has an inner cavity that is substantially circular or elliptical in shape at the proximal portion of the connector **100** and the inner diameter of the hub narrows at the distal end of the hub. The inner diameter of inlet port **150**, guide port **140**, and outlet port **130** is 0.169 inches, 0.050 inches, 0.070 inches, respectively. While moving in the distal direction of connector **100**, the lower portion of connector **100** begins to taper. Guidewire port **140** protrudes from the bottom portion of connector **100** approximately in the range of 0.10 to 0.15 inches. Guidewire port **140** slightly is also coupled to a syringe and operates in a similar fashion as that described above.

The ports described in connector **100** perform the same function as that which was described above. One of the advantages to a substantially spherical in shape connector is that it allows the intravascular assembly to move with greater ease when the patient moves and reduces the opportunity of connector **100** being caught in bedding or other like materials as that which happens with an L-shape or a Y-shape connector.

Connector **100** is coupled to a female leur lock **60** and to hub **82**. Hub **82** is further coupled to PICC **25** which includes a catheter **20**. It should be noted that connector **100** is secured to female leur lock **60** using conventional methods such as a snap fit or an adhesive. Furthermore, connector **100** is connected to hub **82** by hub **82** fitting securely within the inner diameter of connector **100**. Conventional methods are used to attach hub **82** with connector **100**.

In the preceding detailed description, the invention is described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention as set forth in the claims. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

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What is claimed is:

1. A method of installing a catheter in a patient comprising:

attaching a connector without a L-configuration or a Y-configuration to a catheter, the connector having a first port located at a proximal end of the connector, a second port located at a middle portion of the connector, and a third port located at a distal end of the connector;

filling a syringe with a flushing solution;

injecting an amount of the flushing solution into the catheter, thereby flushing the catheter;

cutting a portion of the catheter so that only a desired length remains;

inserting a guidewire into the second port;

advancing the catheter into a patient by use of the guidewire; and

withdrawing the guidewire from the catheter and the hub.

2. The method of claim 1, further comprising:

coupling a syringe to the first port.

3. An assembly comprising:

a hub having a proximal end and a distal end;

a catheter coupled to the distal end of the hub;

a connector coupled to the proximal end of the hub, the connector not having a Y-configuration or an L-configuration, the connector having a proximal end and a distal end and including a first port located at the proximal end of the connector, a second port located within a middle portion of the connector, and a third port located at the distal end of the connector; and

a guidewire disposed through the second port.

4. The intravascular assembly of claim 3, wherein the connector is substantially cylindrical in shape.

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5. The intravascular assembly of claim 3, wherein the connector has a substantially cylindrical body and the second port is flush with the cylindrical body.

6. The intravascular assembly of claim 5, wherein the second port is an in-line port.

7. The intravascular assembly of claim 3, further comprising:

a member lock coupled to a neck portion of the hub.

8. The intravascular assembly of claim 3, wherein the second port is adapted to receive the guidewire at about a 10° to 45° angle to the catheter.

9. An assembly comprising:

a hub having a proximal end and a distal end;

a catheter coupled to the distal end of the hub;

a connector coupled to the proximal end of the hub,

the connector not having a Y-shaped or an L-shaped configuration, and the connector having a first port located at a proximal end of the connector, a second port located within a middle portion of the connector having a guidewire disposed therethrough, and wherein the guidewire is directed through a channel toward a third port located at a distal end of the connector;

a locking mechanism coupled to the first port to secure a syringe.

10. The intravascular assembly of claim 9, wherein the catheter is removably coupled to the outer surface of the distal end of the hub.

11. The intravascular assembly of claim 9, further comprising:

a watertight seal between the second port and third port to slidably dispose a guidewire therethrough.

12. The intravascular assembly of claim 9, further comprising:

a syringe coupled to the first port.

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