

[54] **ANGIOPLASTY APPARATUS
FACILITATING RAPID EXCHANGES**

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[21] **Appl. No.:** 548,200
[22] **Filed:** Jul. 5, 1990

Related U.S. Application Data

[63] Continuation of Ser. No. 361,676, Jun. 1, 1989, abandoned, which is a continuation of Ser. No. 117,357, Oct. 27, 1987, abandoned, which is a continuation of Ser. No. 852,197, Apr. 15, 1986, abandoned.
[51] **Int. Cl.:** A61M 25/00
[52] **U.S. Cl.:** 606/194; 604/96
[58] **Field of Search** 604/96, 101, 102;
606/192, 193, 194

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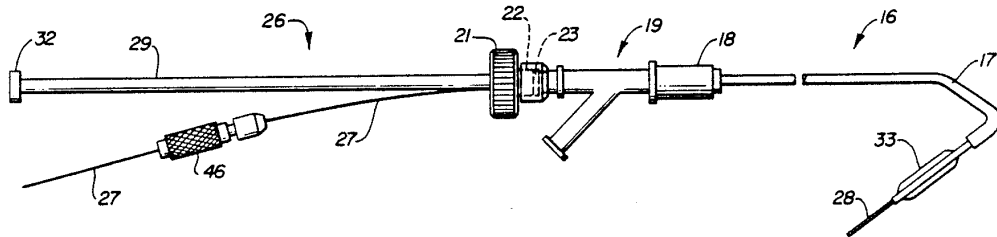
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Primary Examiner—Michael H. Thaler
Attorney, Agent, or Firm—Fulwider, Patton, Lee & Utecht

[57] **ABSTRACT**

Apparatus for introduction into the vessel of a patient comprising a guiding catheter adapted to be inserted into the vessel of the patient and a device adapted to be inserted into the guiding catheter. The device includes a flexible elongate member and a sleeve carried by the flexible elongate member near the distal extremity thereof and extending from a region near the distal extremity to a region spaced from the distal extremity of the flexible elongate element. The device also includes a guide wire adapted to extend through the sleeve so that the guide wire extends rearwardly of the sleeve extending alongside of and exteriorly of the flexible elongate element into a region near the proximal extremity of the flexible elongate element.

6 Claims, 3 Drawing Sheets



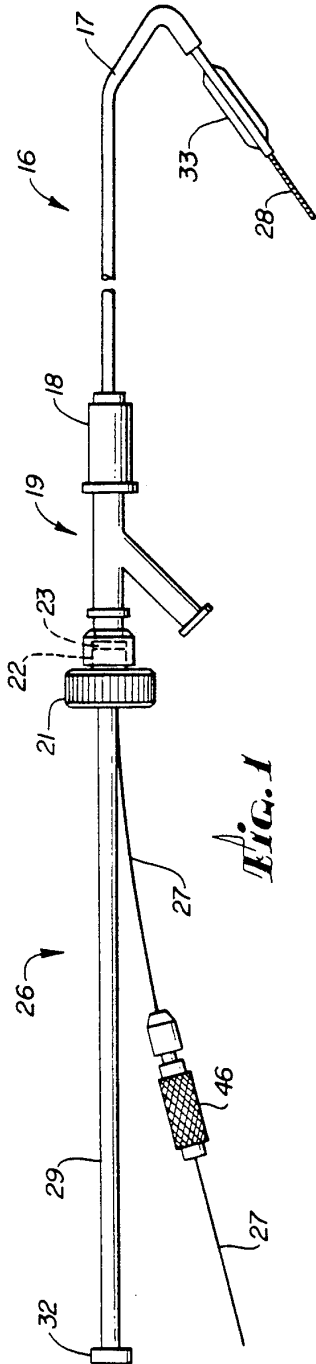


FIG. 1

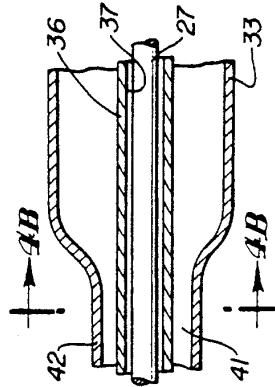


FIG. 4A

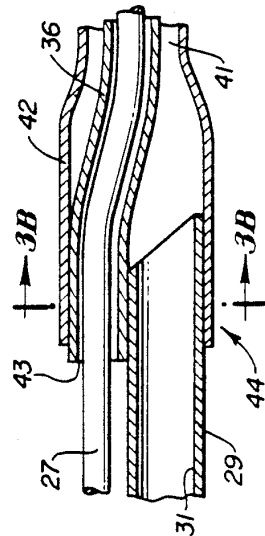


FIG. 3A

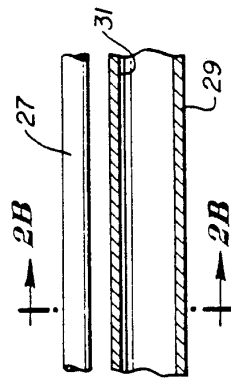


FIG. 2A

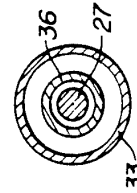


FIG. 4B

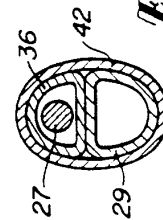


FIG. 3B

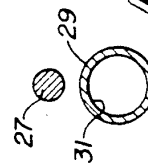


FIG. 2B

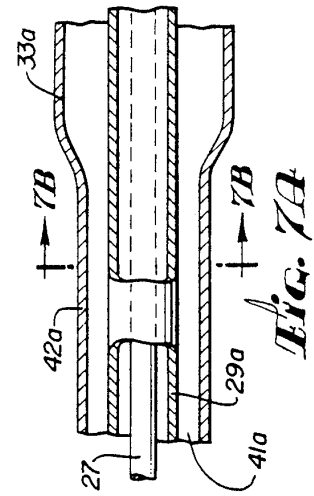


FIG. 7A

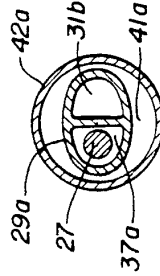


FIG. 7B

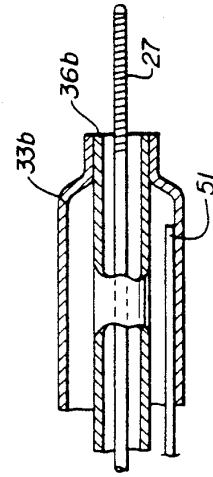


FIG. 9

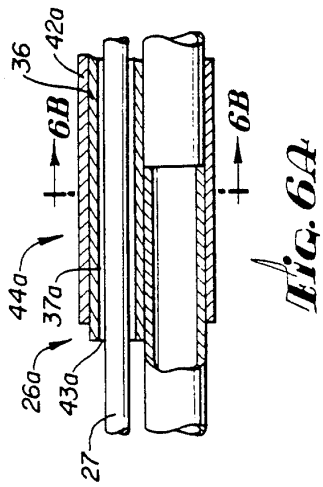


FIG. 6A

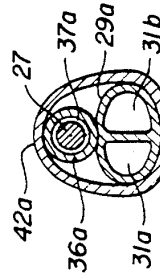


FIG. 6B

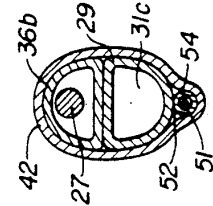


FIG. 8B

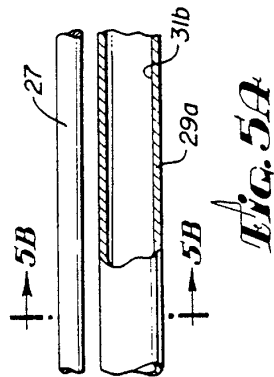


FIG. 5A

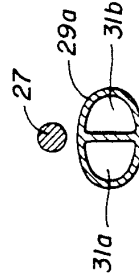


FIG. 5B

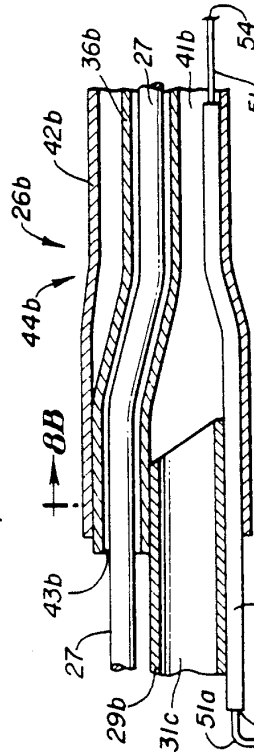


FIG. 8A

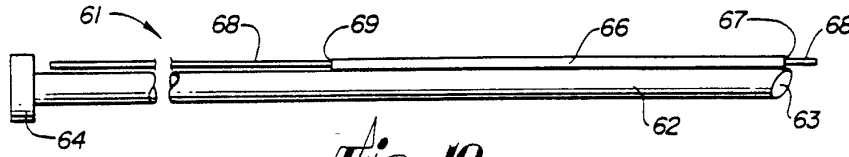


Fig. 10

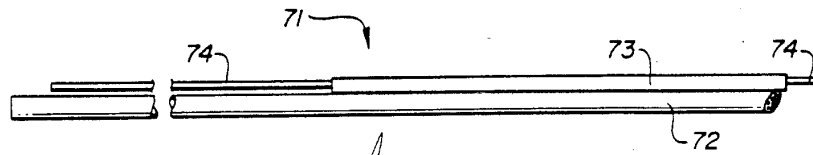


Fig. 11

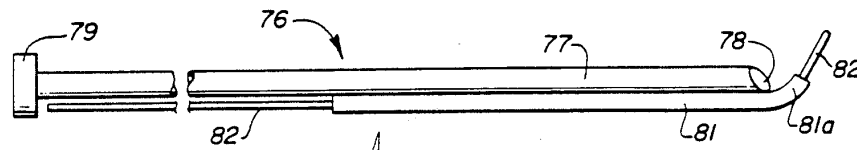


Fig. 12

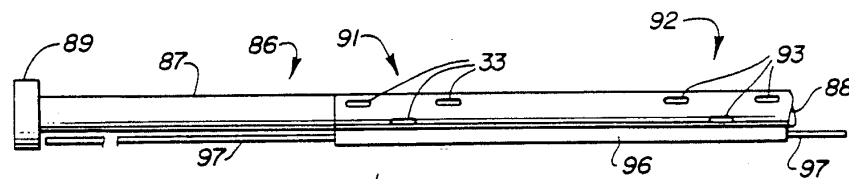


Fig. 13

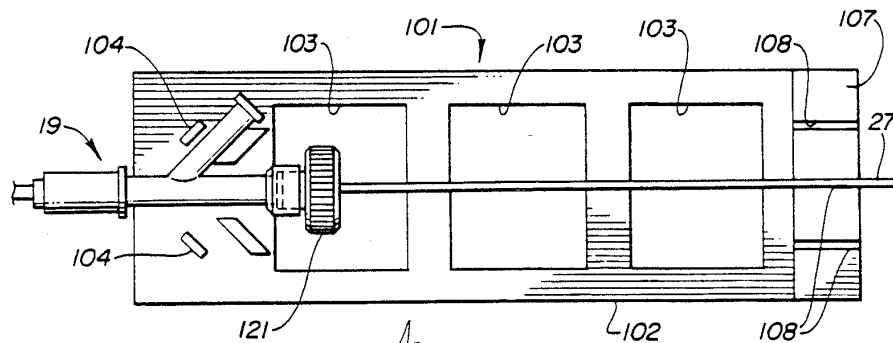


Fig. 14

ANGIOPLASTY APPARATUS FACILITATING RAPID EXCHANGES

This application is a continuation of application Ser. No. 361,676, filed June 1, 1989, now abandoned, which was a continuation of Ser. No. 117,357, filed Oct. 27, 1987, now abandoned, which was a continuation of Ser. No. 852,197 filed Apr. 15, 1986, now abandoned.

This invention relates to angioplasty apparatus facilitating rapid exchanges and a method for making rapid exchanges of angioplasty devices.

At the present time in practicing angioplasty, it is often necessary to exchange one dilatation catheter for another. In doing so, it has been necessary to utilize long exchange wires having a length of approximately 300 centimeters which typically requires two operators to perform the procedure. During this procedure, it is necessary that the operators communicate with each other which makes the procedure time consuming. In addition, since the exchange wire is so long it often is awkward to handle and for that reason may come in contact with the floor or become contaminated which necessitates removing the entire apparatus being utilized for the angioplasty procedure. There is therefore a need for a new and improved angioplasty apparatus which overcomes such difficulties.

In general, it is an object of the present invention to provide an angioplasty apparatus and a method which facilitates rapid exchanges of various types of devices.

Another object of the invention is to provide an angioplasty apparatus and method of the above character which greatly facilitates exchanges of dilatation catheters.

Another object of the invention is to provide an angioplasty apparatus and method of the above character which can be utilized for the positioning of flexible elongate members.

Another object of the invention is to provide an angioplasty apparatus and method of the above character which can be utilized with various types of devices utilizing flexible elongate members.

Another object of the invention is to provide an angioplasty apparatus and method in which dye injection and pressure measurements can be made.

Additional objects and features of the invention will appear from the following description in which the preferred embodiments are set forth in conjunction with the accompanying drawings.

FIG. 1 is a side elevational view of an angioplasty apparatus incorporating the present invention.

FIGS. 2A, 3A and 4A are partial cross sectional views of the shaft, transition and balloon regions of the balloon dilatation catheter utilized in the embodiment of the invention shown in FIG. 1.

FIGS. 2B, 3B and 4B are cross sectional views taken along the lines 2B—2B, 3B—3B and 4B—4B of FIGS. 2A, 3A and 4A respectively.

FIGS. 5A, 6A and 7A are cross sectional views corresponding to FIGS. 2A, 3A and 4A of another embodiment of a balloon dilatation catheter incorporating the present invention.

FIGS. 5B, 6B and 7B are cross sectional views taken along the lines 5B—5B, 6B—6B and 7B—7B of FIGS. 5A, 6A and 7A respectively.

FIGS. 8A and 9 are cross sectional views of the transition and balloon regions of another balloon dilatation catheter incorporating the present invention.

FIG. 8B is a cross sectional view taken along the line 8B—8B of FIG. 8A.

FIG. 10 is a side elevational view of a dedicated dye injection/pressure measurement catheter incorporating the present invention.

FIG. 11 is a side elevational view of a fiber optic cable incorporating the present invention.

FIG. 12 is a side elevational view of a dedicated dye injection/pressure measurement catheter incorporating the present invention and having specific guiding means for facilitating entering acute bends in arterial vessels.

FIG. 13 is a side elevational view of a bail out catheter incorporating the present invention.

FIG. 14 is a plan view of a holder utilized in connection with the present invention.

In general, the angioplasty apparatus of the present invention is designed for introduction into the vessel of a patient. It consists of a guiding catheter which is adapted to be inserted into the vessel of the patient. It also consists of a device which is adapted to be inserted into the guiding catheter. The device includes a flexible elongate member, a sleeve is secured to the flexible elongate member near the distal extremity thereof and extends from the distal extremity into a region spaced from the distal extremity of the flexible elongate member. The device also includes a guide wire which is adapted to extend through the sleeve from the distal extremity of the flexible elongate element, through the sleeve and rearwardly of the sleeve alongside of and exteriorly of the flexible elongate element.

More particularly as shown in FIGS. 1—4, the angioplasty apparatus 16 for facilitating rapid exchanges of dilatation catheters consists of a conventional guiding catheter 17 which is provided with a rotatable hemostatic adapter 18 mounted on a proximal end and a y or two-arm connector or adapter 19 which is mounted on the rotatable adapter 18. The y-connector 19 is provided with a knurled knob 21 which carries a threaded valve member 22 that carries an O-ring 23 which is adapted to be urged into sealing engagement with a balloon dilatation catheter 26 and a guide wire 27 extending through the y-adapter 19 and through the guiding catheter 17 as shown in FIG. 1.

The balloon dilatation catheter 26 is of a single lumen type and is provided with a flexible elongate tubular member 29 which has a lumen 31 extending there-through. The flexible tubular member 29 can be formed of a suitable material such as plastic. A Luer-type fitting 32 is mounted on the proximal extremity of the flexible tubular member 29 and is adapted to be connected to a syringe or other type of instrument for introducing a radiographic contrast liquid into the flexible tubular member 29. A balloon 33 is mounted on the distal extremity of another flexible tubular member 36 which also is formed of a suitable material such as plastic. The distal extremity of the balloon 33 is bonded to the distal extremity of the flexible tubular member 36 to form an air-tight and liquid-tight seal with respect to the same. The balloon 33 is coaxial with the tubular member 36 or sleeve as shown in FIG. 4B. The flexible tubular member 36 is provided with a guide wire lumen 37 through which the guide wire 27 carrying its flexible tip 28 can extend.

Means is provided for forming a balloon inflation lumen 41 substantially concentric with the flexible tubular member 36 and extends toward the distal extremity of the flexible tubular member 36. As can be seen from FIGS. 3B and 4B, the balloon inflation lumen 41 is

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