(12) UK Patent Application (19) GB (11) 2 065 479 A

(21) Application No **8039899**
(22) Date of filing **12 Dec 1980**
(30) Priority data
(31) **7930847**
(32) **17 Dec 1979**
(33) **France (FR)**
(43) Application published **1 Jul 1981**
(51) **INT CL³ A61M 25/00**
(52) Domestic classification **A5R GB**
(56) Documents cited **GB 1503429**
GB 1446450
(58) Field of search **A5R**
(71) Applicants **Technological Supply S.A.,**
36 rue Notre-Dame,
Luxembourg-Ville
(72) Inventor **Pierre Simonet**
(74) Agents **Gill, Jennings & Every**
53 to 64 Chancery Lane,
London,
WC2A 1HN

(54) **Devices for introducing a catheter or a probe into a blood vessel**

(57) A device for introducing a catheter or a probe into a blood vessel, comprises a hollow needle capable of being pierced into the vessel, a flexible guide capable of being introduced into the vessel through the needle, a dilator capable of being introduced into the vessel and around the guide after withdrawal of the needle, and a flexible cannula capable of being introduced into the vessel and around the dilator to permit, after withdrawal of the dilator, the introduction of the catheter or probe into the vessel, and is characterised by the provision of a non-return valve (30) which is capable of being fitted on the proximal end (28) of the cannula (24) and which is designed to prevent all outward flow of blood during the withdrawal of the dilator, of the catheter or of the probe or during the insertion of a catheter or probe of external diameter less than the internal diameter of the cannula.

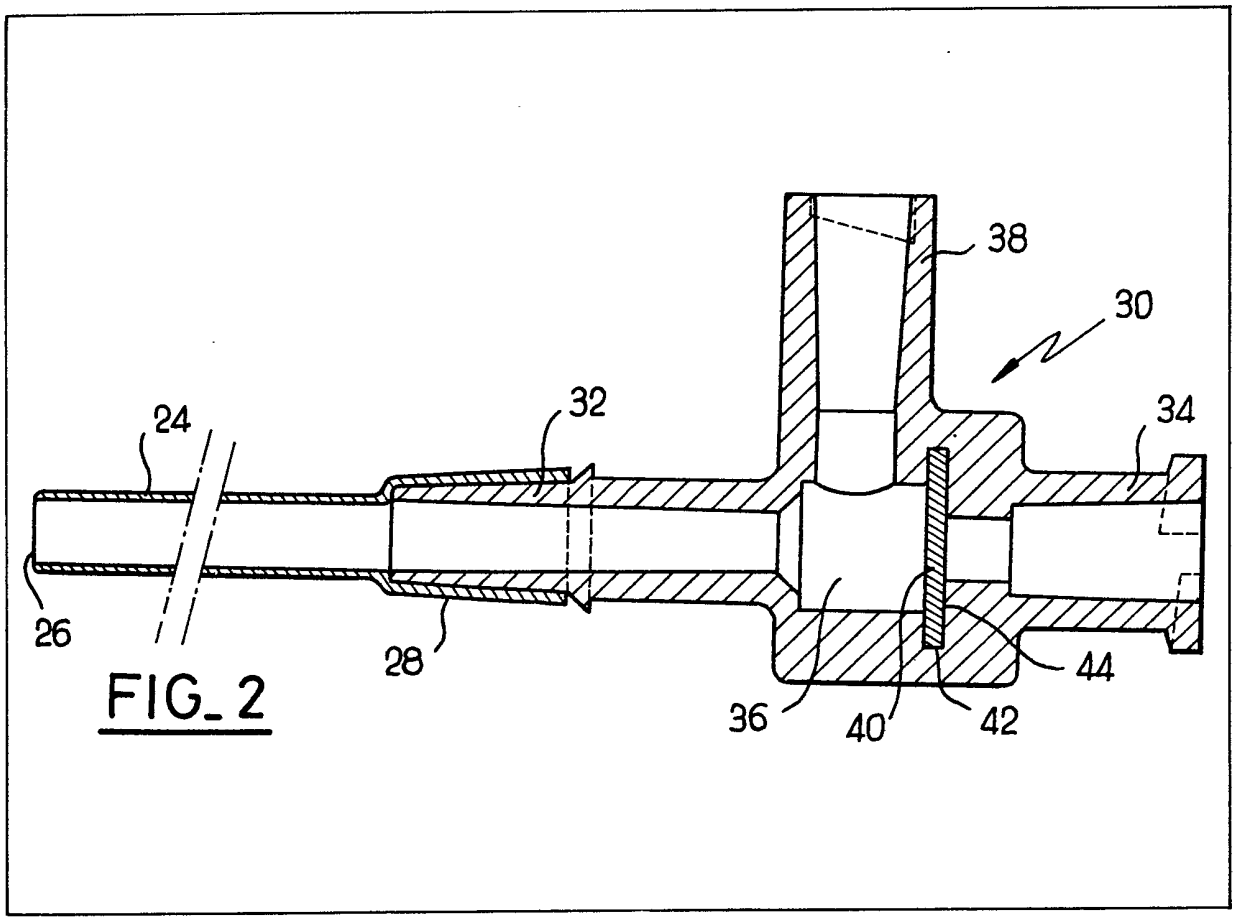

FIG_2

GB 2 065 479 A

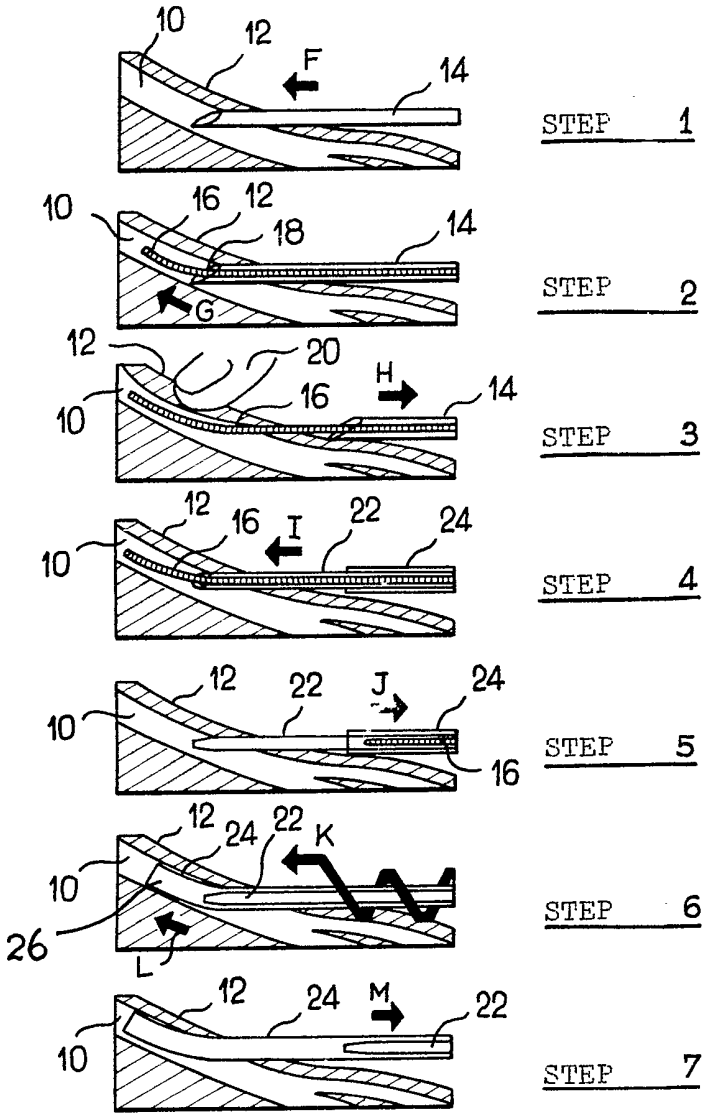
10
12
F
14
STEP 1
10
16
12
18
14
G
STEP 2
12
20
10
16
H
14
STEP 3
12
16
I
22
24
10
STEP 4
12
22
J
24
10
16
STEP 5
12
24
22
K
10
26
L
STEP 6
12
24
M
22
10
STEP 7

FIG_1

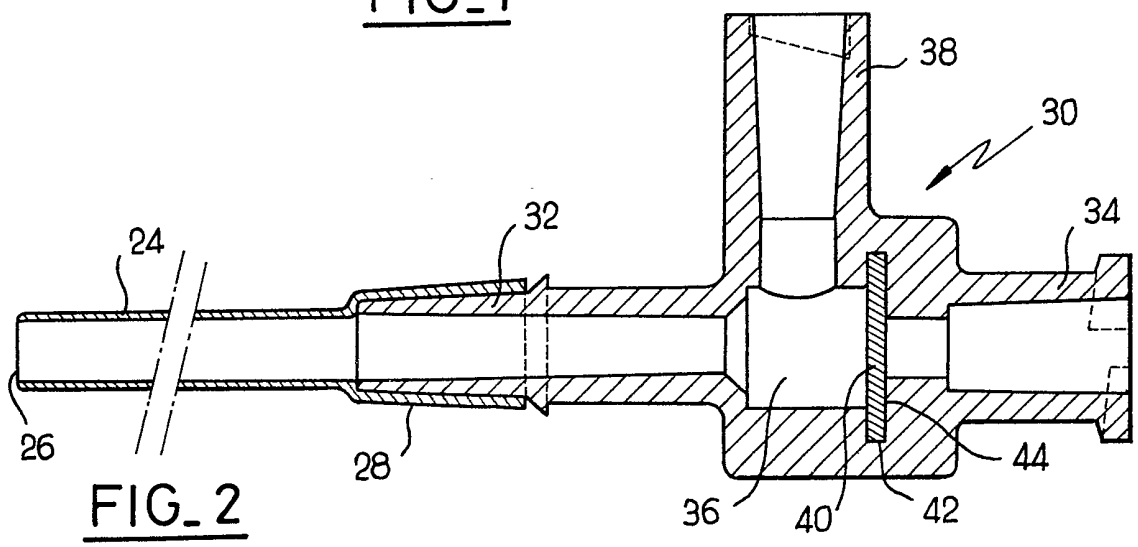
38
30
34
32
24
26
28
44
36
40
42

FIG_2

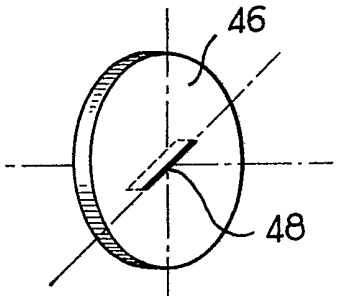

FIG_3

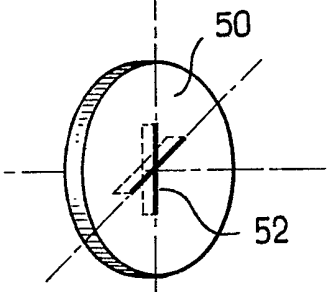

FIG_4

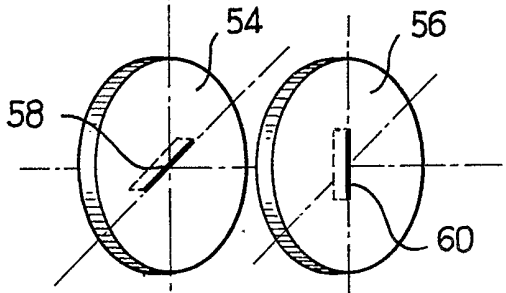

FIG_5

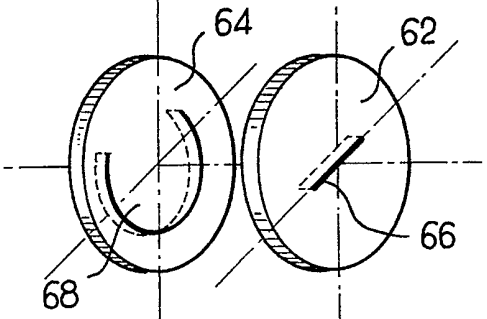

FIG_6

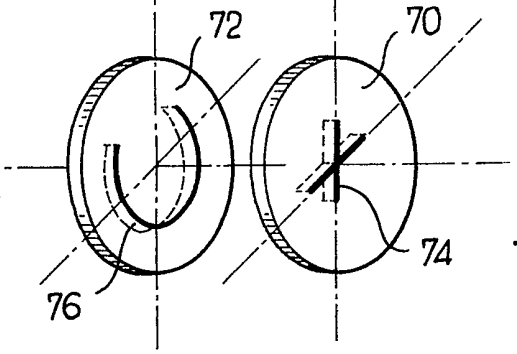

FIG_7

SPECIFICATION

Devices for introducing a catheter or a probe into a blood vessel

The present invention concerns devices for introducing a catheter or a probe into a blood vessel.

It is known in the prior art to introduce a catheter or a probe into a blood vessel (vein or artery) by the method known as "Desilets-Hoffmann".

This method consists in introducing into the blood vessel a tube, called "a cannula", permitting one subsequently to pass through it and to withdraw from it any catheter or probe, without excessively traumatising this vessel.

For this purpose, one uses a device comprising a hollow needle capable of being pierced into the vessel, a flexible guide capable of being introduced into the vessel through the needle, a dilator capable of being introduced into the vessel and around the guide after withdrawal of the needle, and a flexible cannula capable of being introduced into the vessel and around the dilator to permit, after withdrawal of the dilator, the introduction of the catheter or probe into the vessel.

To use such a device, one proceeds according to the following steps:

—one pierces the blood vessel with the aid of the needle;

—one introduces through this needle the flexible guide which one pushes sufficiently far into the vessel;

—one withdraws the needle while leaving the guide in position and one mounts on the latter the dilator, on which the cannular is positioned concentrically and externally;

—one pushes the dilator and the cannula simultaneously into the vessel;

—one withdraws the dilator and the guide while leaving in place in the vessel only the cannula which will permit one subsequently to introduce easily any catheter or probe the external diameter of which is less than or equal to the internal diameter of the cannula.

The inconvenience of such a device lies in the possibility of an outward flow of blood, on the one hand during the withdrawal of the dilator, of the catheter or of the probe, and on the other hand during the insertion of a catheter or probe of a diameter less than the internal diameter of the cannula which, in consequence, does not completely obstruct the internal passage of this cannula.

The present invention aims to avoid this inconvenience in proposing a device of the kind described above and which is characterised by the fact that it comprises a non-return valve which is capable of being fitted on the proximal end of the cannula, and which is designed to prevent all outward flow of blood during the withdrawal of the dilator, of the catheter or of the probe or during the insertion of a catheter or probe of external diameter less than the internal diameter of the cannula.

In a preferred embodiment of the invention, the non-return valve comprises a connection provided with two opposed ferrules: one able to fit on the cannula and the other able to receive the dilator, the catheter or the probe; a non-return member placed between the two opposed ferrules; and a lateral ferrule opening between the ferrule which fits onto the cannula and the non-return member. The coupling can be made of a thermoplastic material, such as polyvinylchloride for example.

This lateral ferrule is capable of receiving a stopper or a valve or being connected to a transfusion line.

Advantageously the non-return member comprises at least one membrane constituted by a disc which is pierced or split, made of an elastic material, for example an elastomer.

Other features and advantages of the invention will be better understood on reading the description which will follow and which refers to the accompanying drawings, given simply by way of illustrative example, and in which:

—figure 1 illustrates the different successive steps of inserting a known device for introducing a catheter or a probe according to the Desilets-Hoffmann method;

—figure 2 is a section of a device according to the invention showing the cannula equipped with the non-return connection; and

—figures 3 to 7 illustrate different forms of construction of the non-return member of the device of the invention.

Reference will now be made to figure 1 to show the introduction of a catheter or probe according to the known method called Desilets-Hoffmann.

According to this method, one pierces a blood vessel (vein or artery) 10 through the skin 12 of a patient with the aid of a hollow needle 14 introduced in the direction of the arrow F (step 1). Then one introduces through the needle 14 a flexible guide 16 which one pushes sufficiently far into the blood vessel 10 so that it passes beyond the end 18 of the needle, following the direction of the vessel 10, as shown by the arrow G (step 2). Then one withdraws the needle 14, as shown by the arrow H, while leaving the guide 16 in place in the vessel 10 and pressing with the finger 20 to prevent the guide coming out of the vessel 10 (step 3). Then one mounts on the guide 16 a dilator 22 on which is concentrically and externally positioned a flexible cannula 24; and one pushes the dilator 22 and the cannula 24 simultaneously into the vessel 10 as shown by the arrow I (step 4). Then one withdraws the guide 16 as indicated by the arrow J (step 5). One continues the introduction of the cannula 24 into the vessel 10, around the dilator 22, by pushing this cannula in the direction of the arrow K so that the distal extremity 26 of the cannula takes up the direction of the blood vessel 10 as indicated by the arrow L (step 6). Then one withdraws the dilator 22, as indicated by the arrow M, while leaving the cannula 24 in the vessel 10 (step 7). One can then introduce into the blood vessel 10, through the cannula 24, any catheter or probe of which the external diameter is less than or equal to the internal diameter of the cannula.

To prevent an outflow of blood, notably during the withdrawal of the dilator (step 7 above), the invention envisages providing the cannula with a non-

return valve as shown in figure 2.

In figure 2 is shown the cannula 24 of a device for introduction of a catheter or a probe into a blood vessel, the distal extremity 26 of which is intended to be introduced into the vessel, according to the method indicated above with reference to figure 1, and of which the proximal extremity 28 is intended to be provided with a non-return valve according to the invention, indicated in general by the reference 30.

This non-return valve 30 comprises a three-way connection provided with two opposed ferrules: a ferrule 32 which can be fitted onto the proximal extremity 28 of the cannula 24, and a ferrule 34 which can receive a dilator and later a catheter or a probe (not shown). The two ferrules 32 and 34 define between them a generally cylindrical passage 36 into which opens a ferrule 38 placed laterally, that is to say at right-angles with respect to the axis of the previously-mentioned ferrules 32 and 34.

The non-return valve also comprises a non-return member 40 placed within the connection and between the two ferrules 32 and 34, in such a way that the lateral ferrule 38 opens between the ferrule 32 which can receive the cannula and the non-return member 40. This non-return member, which will be described in detail below with reference to figures 3 to 7, is designed to prevent all outflow of blood from the ferrule 32 towards the ferrule 34 while permitting one to pass through it a dilator and thereafter a catheter or a probe. This non-return member 40 is constituted by at least one membrane in the shape of a disc placed in an annular groove 42 and abutting against a shoulder 44 arranged on the side towards the ferrule 34.

The lateral ferrule 38 can be provided with a stopper or a valve, or be connected to a transfusion line.

In figures 3 to 7 there are shown different ways of making a non-return valve suitable for use in the device shown in Figure 2.

Figure 3 shows a membrane constituted by a disc 46 pierced by a simple slit 48.

Figure 4 shows a membrane constituted by a disc 50 slit in a cross 52.

Figure 5 shows two membranes intended to be placed one beside the other in the interior of the connection of the non-return valve. These two membranes are constituted by two discs 54 and 56 provided respectively with slits 58 and 60 placed at 90° relatively to one another.

Figure 6 shows two membranes intended to be placed one beside the other and constituted by discs 62 and 64 of which one is pierced by a simple slit 66 and of which the other is cut through in an arc of a circle so as to form a flap 68 which engages against the slit 66 of the disc 62.

Figure 7 shows two membranes intended to be placed side-by-side and constituted by two discs 70 and 72, provided respectively with a cross slit 74 and a slit in the form of a flap 76 analogous to the flap 68 of figure 6.

All the membranes shown in figures 3 to 7 are made of a resilient elastomer material having the necessary qualities to constitute a non-return member, that is to say endowed with a sufficient resilience that the edges of the slits tend to meet again after deformation or to fit closely around the dilator, the catheter or the probe which passes through the slit.

As a resilient material, one may use an elastomer material, for example latex, rubber, silicone rubber, natural or other neoprene, etc.

The device according to the invention is used in the same way as the standard devices as are shown in figure 1. The only difference lies in the fact that the cannula is previously provided with the non-return valve.

The device according to the invention thus prevents all outflow of blood during the withdrawal of the dilator or during the withdrawal of a catheter or a probe. It likewise prevents all outflow of blood during the insertion of a catheter or a probe of nominal diameter less than the nominal diameter of the cannula. For this purpose it is sufficient to reduce the lengths of the slits of the membranes acting as the non-return member to ensure tightness against leakage when a catheter or a probe of small dimension is introduced through the non-return valve.

Furthermore, the device according to the invention, thanks to the lateral ferrule, permits a continuous transfusion or a removal of blood in the presence or absence of a catheter or probe. Furthermore, in the absence of any catheter or probe, one can perform a discontinuous injection through the non-return valve, notably with the help of a syringe.

The device according to the invention thus finds application as medico-surgical equipment for the introduction of a catheter or a probe into a blood vessel.

The invention is not limited to the embodiment particularly described and shown, and one can imagine other variations of construction, without going outside the scope of the invention.

CLAIMS

1. Device for introducing a catheter or a probe into a blood vessel, this device comprising a hollow needle capable of being pierced into the vessel, a flexible guide capable of being introduced into the vessel through the needle, a dilator capable of being introduced into the vessel and around the guide after withdrawal of the needle, and a flexible cannula capable of being introduced into the vessel and around the dilator to permit, after withdrawal of the dilator, the introduction of the catheter or the probe into the vessel, characterised by the fact that it comprises a non-return valve which is capable of being fitted on the proximal end of the cannula, and which is designed to prevent all outward flow of blood during the withdrawal of the dilator, of the catheter or of the probe or during the insertion of a catheter or probe of external diameter less than the internal diameter of the cannula.

2. Device according to claim 1, characterised by the fact that the non-return valve comprises a connection provided with two opposed ferrules: one able to fit on the cannula and the other able to receive the dilator, the catheter or the probe; a non-return member placed between the two opposed ferrules; and a lateral ferrule opening between the ferrule which fits onto the cannula and the non-return

member.

3. Device according to claim 2, characterised by the fact that the lateral ferrule is capable of receiving a stopper or a valve or being connected to a transfusion line.

4. Device according to claim 2, characterised by the fact that the non-return member comprises at least one membrane constituted by a disc which is pierced or split, made of an elastic material.

5. Device according to claim 4, characterised by the fact that the membrane is made of an elastomer material.

6. Device according to claim 1, substantially as described with reference to Figure 2 plus any of Figures 3 to 7 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1981.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.