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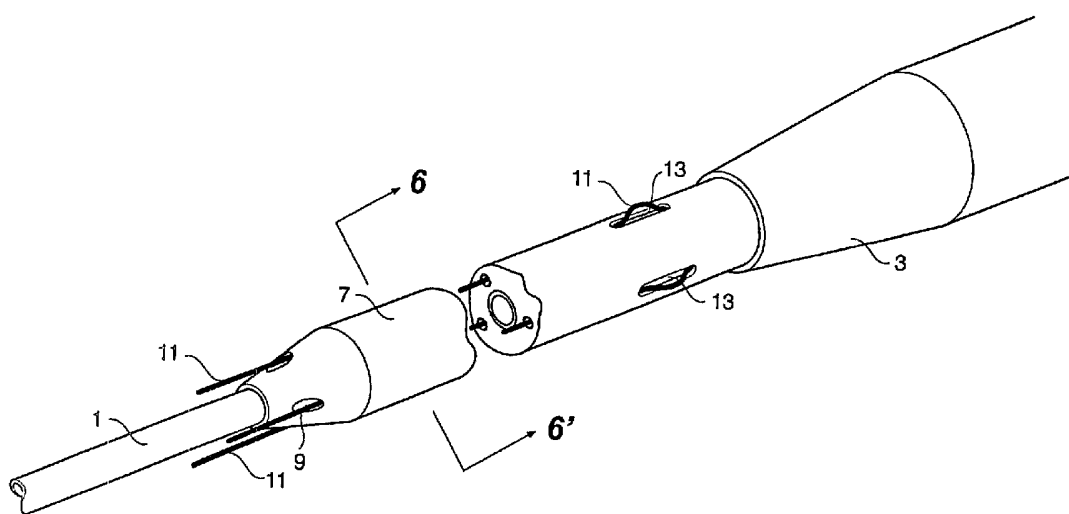
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- (71) Applicants: **WILLIAM A. COOK AUSTRALIA PTY. LTD.** [AU/AU]; 12 Electronics Street, Brisbane Technology Park, Eight Mile Plains, Brisbane, QLD 4113 (AU). **COOK INCORPORATED** [US/US]; 750 North Daniel's Way, P.O. Box 489, Bloomington, IN 47402-0489 (US).
- (72) Inventors: **HARTLEY, David, Ernest**; 2 View Street, Subiaco, W.A. 6008 (AU). **MILLS, Edward, Graham**; 10 Damon Road, Lutwyche, QLD 4113 (AU). **RASMUSSEN, Erik, Edelboe**; Vesyerhaven 1, DK-4200 Slagelse (DK). **SCHULTZ, Jens, Vejby**; Morelvej 51, DK-2740 Skovlunde (DK).
- (74) Agent: **GODLEWSKI, Richard, J.**; P.O. Box 2269, Bloomington, IN 47402-2269 (US).
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(54) Title: TRIGGER WIRE SYSTEM FOR A PROSTHESIS DEPLOYMENT DEVICE



(57) Abstract: A trigger wire guide (7) for a prosthesis deployment device. The prosthesis deployment device has a proximal end (22) extending to a proximal nose cone dilator (3) and having a trigger wire or wires (11) and trigger wire release mechanism (38, 42) to retain the proximal end of a prosthesis (19) adjacent the nose cone dilator. The trigger wire guide retains the trigger wire or wires to prevent fouling of the trigger wire with a prosthesis when the prosthesis is carried on the deployment device. The guide can be crimped or soldered to a guide wire catheter or concentric with it.

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TRIGGER WIRE SYSTEM FOR A PROSTHESIS DEPLOYMENT DEVICE

DescriptionTechnical Field

This invention relates to a prosthesis deployment device and more particularly to a trigger wire arrangement used on such devices to release a prosthesis when it is in a body lumen.

Background of the Invention

Deployment devices are used to deploy prostheses and in particular prostheses incorporating self expanding stents within lumens in the human body. This invention will generally be discussed in relation to the deployment of prostheses within the aorta but the invention is not so limited and may be used for other of deployment sites as well.

In some forms of deployment device trigger wires are used to retrain a prosthesis in a particular position on a deployment device or to retain self expanding stents of the prosthesis in a retracted state. In the region of the deployment device in which the prosthesis is carried, trigger wires can foul or catch with stents on the deployment device, particularly when the deployment device is bent to pass through convolutions in the lumen, therefore causing inaccurate deployment and perhaps jamming or breakage of the trigger wire.

Throughout this specification the term distal with respect to a prosthesis and a deployment device for prosthesis is the end of the prosthesis or deployment device which in use is furthest away in the direction of blood flow from the heart and the term proximal refers to the end of the prosthesis or deployment device which in use is nearest to the heart. When applied to other vessels corresponding terms such as caudal and cranial should be understood.

It is the object of this invention to provide an arrangement by which a trigger wire on a deployment device can be more safely routed to its destination or to at least provide a practitioner with a useful alternative.

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Summary of the Invention

In one form therefore, although this may not necessarily be the only or broadest form, the invention is said to reside in a trigger wire guide for a prosthesis deployment device, the prosthesis deployment device being of a type having a guide wire catheter extending to a proximal nose cone dilator and having a trigger wire and trigger wire release mechanism adapted to retain the proximal end of a prosthesis distally of the nose cone dilator, the trigger wire guide being characterized by a duct along at least part of the length of the guide wire catheter, the duct having at least one lumen for a trigger wire and an aperture in the duct adjacent the nose cone dilator for the trigger wire to exit the duct to engage the prosthesis, a stent of the prosthesis or a suture retaining the prosthesis to thereby retain the prosthesis.

In a preferred embodiment of the invention the duct is coaxial with and surrounding the guide wire catheter.

In a preferred embodiment of the invention the trigger wire guide has three lumens for trigger wires but the invention is not so limited to this number of lumens.

In an alternative embodiment the duct may be formed by a concentric tube around the guide wire catheter and crimped thereto to define a trigger wire lumen.

In a further alternative embodiment the duct may be formed by a V shape cross section component soldered to the guide wire catheter to define a trigger wire lumen.

Preferably the trigger wires are formed from stainless steel or other metal coated with polytetrafluoroethylene to provide a wire that will move easily.

In an alternative form the invention comprises a prosthesis deployment device having a guide wire catheter extending to a proximal end and a trigger wire and trigger wire release mechanism adapted to retain the proximal end of a prosthesis distally of the proximal end, the trigger wire release mechanism being characterized by a duct along at least part of the length of the guide wire catheter,

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the duct having at least one lumen for a trigger wire and an aperture in the duct adjacent the proximal end for the trigger wire to exit the duct to engage the prosthesis, a stent of the prosthesis or a suture retaining the prosthesis to thereby retain the prosthesis.

Preferably the device includes a region in which the prosthesis is retained and the duct extends along at least part of the region. The duct may be coaxial with and surrounding the guide wire catheter. The duct may have three lumens for trigger wires.

The duct may be formed by a concentric tube around the guide wire catheter and crimped thereto or by a V shape cross section component retained to the guide wire catheter.

Alternatively the invention resides in a prosthesis deployment device having a deployment catheter extending to a proximal end with an elongate region of the catheter in which a prosthesis is retained and a trigger wire and trigger wire release mechanism adapted to retain the proximal end of the prosthesis distally of the proximal end, the trigger wire release mechanism being characterized by a trigger wire guide along at least part of the length of the region, the duct having at least one lumen for a trigger wire and an aperture in the duct adjacent the proximal end to enable the trigger wire to exit the duct.

In an alternative form the invention may be said to reside in a trigger wire guide for a prosthesis deployment device, the prosthesis deployment device being of a type having a proximal end extending to a proximal nose cone dilator and having a trigger wire or wires and trigger wire release mechanism adapted to retain the proximal end of a prosthesis adjacent the nose cone dilator, characterized by a trigger wire guiding means to retain the trigger wire or wires to prevent fouling of the trigger wire with the prosthesis when the prosthesis is carried on the deployment device.

PCT Patent Publication No. WO 98/53761 entitled "A Prosthesis and a Method of Deploying a Prosthesis" discloses an introducer for a prosthesis which retains the prosthesis so that each end can be moved independently. These features

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and other features disclosed in PCT Patent Publication No. WO 98/53761 could be used with the present invention and the disclosure of PCT Patent Publication No. WO 98/53761 is herewith incorporated in its entirety into this specification.

PCT Patent Application No. PCT/US02/34348 entitled " Prostheses for Curved Lumens" discloses prostheses with arrangements for bending the prosthesis for placement into curved lumens. This feature and other features disclosed in PCT Patent Application No. PCT/US02/34348 could be used with the present invention and the disclosure of PCT Patent Application No. PCT/US02/34348 is herewith incorporated in its entirety into this specification.

Australian Provisional Patent Application No. PS3215 entitled "A Stent-Graft Fastening Arrangement" discloses arrangements for fastening stents onto grafts particularly for exposed stents. This feature and other features disclosed in Australian Provisional Patent Application No. PS3215 could be used with the present invention and the disclosure of Australian Provisional Patent Application No. PS3215 is herewith incorporated in its entirety into this specification.

Australian Provisional Patent Application No. PR9617 entitled "Improving Graft Adhesion" discloses arrangements on stent grafts for enhancing the adhesion of such stent grafts into walls of vessels in which they are deployed. This feature and other features disclosed in Australian Provisional Patent Application No. PR9617 could be used with the present invention and the disclosure of Australian Provisional Patent Application No. PR9617 is herewith incorporated in its entirety into this specification.

US Patent No. 5,387,235 entitled "Endovascular Transluminal Prosthesis For Repair Of Aneurysms" discloses apparatus and methods of retaining grafts onto deployment devices. These features and other features disclosed in US Patent No. 5,387,235 could be used with the present invention and the disclosure of US Patent No. 5,387,235 is herewith incorporated in its entirety into this specification.

US Patent No. 5,720,776 entitled "Stent Barb" discloses improved barbs with various forms of mechanical attachment to a stent. These features and other features disclosed in US Patent No. 5,720,776 could be used with the present

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invention and the disclosure of US Patent No. 5,720,776 is herewith incorporated in its entirety into this specification.

US Patent No. 6,206,931 entitled "Graft Prosthesis Materials" discloses graft prosthesis materials and a method for implanting, transplanting replacing and repairing a part of a patient and particularly the manufacture and use of a purified, collagen based matrix structure removed from a submucosa tissue source. These features and other features disclosed in US Patent No. 6,206,931 could be used with the present invention and the disclosure of US Patent No. 6,206,931 is herewith incorporated in its entirety into this specification.

Australian Provisional Patent Application No. PS3243 entitled "Thoracic Deployment Device" discloses introducer devices adapted for deployment of stent grafts particularly in the thoracic arch. This feature and other features disclosed in Australian Provisional Patent Application No. PS3243 could be used with the present invention and the disclosure of Australian Provisional Patent Application No. PS3243 is herewith incorporated in its entirety into this specification.

Australian Provisional Patent Application No. 2002950951 entitled "Asymmetric Stent Graft Attachment" discloses retention arrangements for retaining onto and releasing prostheses from introducer devices. This feature and other features disclosed in Australian Provisional Patent Application No. 2002950951 could be used with the present invention and the disclosure of Australian Provisional Patent Application No. 2002950951 is herewith incorporated in its entirety into this specification.

Brief Description of the Drawing

This then generally describes the invention but to assist with understanding reference will now be made to the accompanying drawings which show preferred embodiments of the invention.

Figure 1 shows a typical deployment device incorporating a trigger wire guide of the present invention in the ready to deploy state;

Figure 2 shows the embodiment in Figure 1 with a prosthesis partially deployed;

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Figure 3 shows schematically the problem to which the present invention is directed;

Figure 4 shows schematically how the problem is overcome by the use of a trigger wire guide according to one embodiment of the invention;

Figure 5 shows a detail of part of the deployment device incorporating the trigger wire guide of one embodiment of the present invention;

Figure 6 shows a transverse cross section of the guide along the line 6-6' shown in Figure 5;

Figure 7 shows a cross sectional view of a deployment device incorporating a trigger wire guide of the present invention retaining self expanding stents of a prosthesis;

Figure 8 shows a similar view to Figure 7 but with a different method of retaining the self expanding stents of the prosthesis;

Figure 9 shows a detail of part of a deployment device incorporating the trigger guide wire of an alternative embodiment of the present invention;

Figure 10 shows a cross-sectional view of the embodiment shown at Figure 9 at the region 10, 10', 10'';

Figure 11 shows a cross-sectional view of the embodiment shown in Figure 9 at the region 11, 11', 11'';

Figure 12 shows a detail of part of a deployment device incorporating the trigger guide wire of a further alternative embodiment of the present invention;

Figure 13 shows a cross sectional view of the embodiment shown in Figure 12;

Figure 14 shows a detail of part of a deployment device incorporating the trigger guide wire of a further alternative embodiment of the present invention; and

Figure 15 shows a cross sectional view of the embodiment shown in Figure 14.

Detailed Description

Now looking more closely to the drawings and in particular the embodiment shown in Figures 1 and 2 there is shown a prosthesis deployment device upon which the trigger wire guide of the present invention may be used.

The prosthesis deployment device of this invention comprises a guide wire catheter 1 extending between a distal end 20 and a proximal end 22 of the deployment device. In use the distal end 20 is adapted to remain outside the body of a patient and the proximal end 22 with its nose cone dilator 3 is adapted in use to be inserted into the arteries of a patient such as for treatment of an aortic aneurism. For such a treatment the deployment device is inserted through an incision into the femoral artery and through the iliac arteries to the aorta. The deployment device is usually deployed over a guide wire (not shown). There is a recess 24 between the nose cone dilator 3 and catheter body 26. The recess 24 is adapted to retain a prosthesis 19 in a compressed state with a sheath 28 extending from a sheath termination point 30 to the nose cone dilator 3 and assisting in holding the prosthesis in the compressed state. The hollow guide wire catheter 1 extends from a distal syringe attachment point 32 to the nose cone dilator so that manipulation of the guide wire catheter with respect to the catheter body 28 will move the nose cone dilator with respect to the catheter body. Manipulation can be either rotational or longitudinal movement.

A pin vice 34 at the distal end of the deployment catheter 26 locks the position of the guide wire catheter 1 with respect to the deployment catheter 26.

The deployment catheter 26 is surrounded by the sheath 28 extending from the sheath termination point 30 on the deployment catheter forward to the nose cone dilator 3. The sheath termination 30 includes a side tube 36 which has a hypodermic syringe attachment point (not shown) so that angiographic contrast fluids can be supplied into the sheath termination to travel between the sheath 20 and the catheter body 1.

The hypodermic syringe connection point 32 at the distal end of the guide wire catheter is adapted for the supply of contrast angiographic fluid through the

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guide wire catheter to the nose cone dilator where it is adapted to be ejected through ports 4 in the sides of the nose cone dilator 3.

A trigger wire arrangement which incorporates three trigger wires 11 as will be discussed in relation to the embodiment shown in Figure 5, for instance, extends from a trigger wire release mechanism 42 and then the trigger wires extend between the deployment catheter 26 and the guide wire catheter 1 and then through the recess 24 to the proximal end of the prosthesis 19. After the guide wires exit from the lumen between the central catheter 26 and the guide wire catheter 1 into the recess 24 they enter the trigger wire guide 7 until they exit through the aperture 13 (Figure 5) thereby preventing fouling of the trigger wires with a prosthesis which is held retained by the sheath 28. The trigger wire release mechanism 42 has a thumb screw 41 which can be rotated to release the release mechanism to enable withdrawal of the three trigger wires 11.

Another trigger wire 14 is deployed between the guide wire catheter 1 and the catheter body 26 and extends from a trigger wire release mechanism 38 to the distal end of the prosthesis 19 where the distal end of the prosthesis 19 is retained to the trigger wire 14 by a mooring loop 16. The trigger wire release mechanism 38 has thumb screw 40 which can be rotated to release the trigger wire retention mechanism to withdraw the distal trigger wire 14 and hence release the distal mooring loop 16 to free the distal end of the prosthesis 19.

As shown in Figure 2 the sheath 28 has been withdrawn by moving the sheath termination point 30 towards the distal end 20 of the prosthesis deployment device until the prosthesis 19 has been fully deployed except that at the proximal end the stents 17 are still retained by the loop 15 of trigger wire 11 (see Figure 7). The distal trigger wire assembly 38 and mooring loop 16 also retains the distal end of the prosthesis 19. The proximal end can be deployed, when the nose cone dilator has been manipulated so that the graft is in the correct position, by removal of the trigger wire 11 by actuation of the proximal trigger wire release mechanism 42 and then subsequently the distal end of the prosthesis 19 can be released by removal of the trigger wire 14 by actuation of the trigger wire release mechanism 38. For

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some situations it may be preferable to release the distal end of the stent graft before the proximal end and in such a situation the distal trigger wire assembly 38 and the proximal trigger wire release mechanism 42 would be mounted in the opposite order.

Figure 3 shows schematically the problem to which the present invention is directed and Figure 4 shows schematically how the problem is overcome by the use of a trigger wire guide according to one embodiment of the invention. The prosthesis deployment device is shown in a more realistic configuration as it would be in a curved lumen of a patient such as the thoracic arch of the patient at the stage of deployment as shown in Figure 2.

As shown in Figure 3, without the trigger wire guide of the present invention, the trigger wire or wires 11 extend from the lumen between the guide wire catheter 1 and the deployment catheter body 26 to a proximal mooring loop 18 for the prosthesis 19. The proximal mooring loop 18 retains the exposed stents 17 adjacent the nose cone dilator 3 in a retracted condition. The guide wire 11 does not follow, however, the curve of the guide wire catheter 1 but goes in a more straight line and in doing so fouls with the wall 25 of the prosthesis 19 and can be more difficult to withdraw when required and in serious cases can tangle with stents associated with the prosthesis and jam or break.

The problem is solved as shown in Figure 4 with the use of a trigger wire guide 7 extending along that portion of the guide wire catheter 1 which is within the recess 24. By this arrangement the trigger wire 11 cannot foul with the prosthesis 19.

In Figures 5 to 7 a part of the prosthesis deployment device is shown and includes the guide wire catheter 1 which extends the length of the deployment device and at the proximal end of the guide wire catheter 1 is the nose cone dilator 3.

Extending back from the nose cone dilator 3 and surrounding the guide wire catheter 1 is a trigger wire guide 7. The trigger wire guide 7 is coaxial with the

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guide wire catheter 1 and includes three lumens 9 through which, in use, pass trigger wires 11.

Just distal of the nose cone dilator 3 there are apertures 13 in the trigger wire guide 7 extending into each lumen 9 and out of which aperture 13 extends the guide wire 11 in a loop 15 so that it can engage the zig zag stents 17 of a prosthesis 19 (see Figure 7). The trigger wire 11 continues along the lumen 9 to terminate within the region of the nose cone dilator 3. When it is desired to release the stent 17 the trigger wire 11 is pulled out as is discussed in relation to Figures 1 and 2.

The prosthesis is also shown in Figure 7. In this embodiment the proximal stent 17 of the prosthesis 19 is a covered stent whereas in Figure 2 an uncovered proximal stent is shown. The principle of retention using the trigger wire 11 is the same however, except that in Figure 7 the trigger wire 11 in its loop 15 passes through the graft material as well.

As an alternative to the use of the loop 15 to engage directly into the stent and graft material the arrangement as shown in Figure 8 can be used. In Figure 8 a piece of thread 16 such as a monofilament or woven suture material is used with a loop around the trigger wire 11, the stent 17 and the graft material 19 with a knot 18. The stent 17 and the graft material 19 is released from the trigger wire 11 when the trigger wire is withdrawn. In such a situation the loop of thread 16 would stay attached to the stent 17 or the graft material 19.

In the embodiment shown in Figures 9, 10 and 11, it will be seen that a deployment device according to this embodiment includes a guide wire catheter 50 which extends along the length of the deployment device and at the proximal end of the guide wire catheter 50 is a nose cone dilator 52. Extending back from the nose cone dilator and surrounding the guide wire catheter is a trigger wire guide generally shown as 54. The trigger wire guide 54 is coaxial with the guide wire catheter 50 and includes an enlarged portion generally shown as 56 and a thinner tubular portion 58. In the region of the tubular portion 58 there is an annular lumen

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between the guide wire catheter 50 and the tubular portion 58 through which the trigger wire or wires 11 pass.

In the region 56 adjacent the nose cone dilator 52 the trigger wires extend from a central annular lumen 62 which is continuous with the lumen 60 and then pass out through elongate apertures 64 in the form of a loop 66 and then continue on through the lumen 62. The loop 66 is adapted to engage a stent or graft material of a prosthesis to hold the proximal end of the prosthesis in a retracted or constrained condition until it is desired to release it. Alternatively the trigger wire 1 can engage a suture tied to a stent of a prosthesis to hold it in a retracted or constrained condition until it is desired to release it.

When it is desired to release the prosthesis the trigger wire 11 is pulled out as was discussed in relation to Figures 4 and 5.

In this embodiment of the deployment device the tubular portion 58 extends back into the lumen 68 of the deployment catheter 70 so that no portion of the guide wire would be visible in the region of the deployment device into which the stent graft or prosthesis is received in use.

Figure 12 shows a detail of part of a deployment device incorporating the trigger guide wire of a further alternative embodiment of the present invention and Figure 13 shows a cross sectional view of the embodiment shown in Figure 12.

In this embodiment the guide wire catheter 80 of the deployment device has soldered or otherwise fastened along at least a part of its length an inverted V shape cross section component 82 which with the guide wire catheter defines a lumen 84 between them. In this case solder 83 is used to fasten the V shape cross section component 82 to the guide wire catheter. A trigger wire 85 can pass along the lumen 84 and exit in a loop 86 in the region 88 where the V shape cross section component 81 is not present. The loop 86 can engage a stent of a prosthesis to hold the stent until it is desired to release it or to engage a suture tied to a stent of a prosthesis.

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Figure 14 shows a detail of part of a deployment device incorporating the trigger guide wire of a further alternative embodiment of the present invention and Figure 15 shows a cross sectional view of the embodiment shown in Figure 14.

In this embodiment the guide wire catheter 90 of the deployment device has a concentric metal tube 91 placed around it and crimped at points 92 and 93 to the guide wire catheter 90 to clamp it to the catheter and thereby with the guide wire catheter defining a lumen 94 for the passage of trigger wires. In this case there are three trigger wires but there could be only a single trigger wire or other configuration of trigger wires. The trigger wires 96 can pass along the lumen 94 and exit in loops 97 in the region 98 where there is a cut-out 99 in the crimped tube 91. The loops 97 can engage a stent of a prosthesis to hold the stent until it is desired to release it or to engage a suture tied to a stent of a prosthesis.

Throughout this specification various indications have been given as to the scope of this invention but the invention is not limited to any one of these but may reside in two or more of these combined together. The examples are given for illustration only and not for limitation.

Throughout this specification unless the context requires otherwise the words comprise and include and variations such as comprising and including will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

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Claims

1. A trigger wire guide for a prosthesis deployment device, the prosthesis deployment device being of a type having a guide wire catheter extending to a proximal nose cone dilator and having a trigger wire and trigger wire release mechanism adapted to retain the proximal end of a prosthesis distally of the nose cone dilator, wherein the trigger wire guide comprises a duct along at least part of the length of the guide wire catheter, the duct having at least one lumen for a trigger wire and an aperture in the duct adjacent the nose cone dilator for the trigger wire to exit the duct to engage the prosthesis, a stent of the prosthesis or a suture retaining the prosthesis to thereby retain the prosthesis.
2. A trigger wire guide as in Claim 1 wherein the duct is coaxial with and surrounding the guide wire catheter.
3. A trigger wire guide as in Claim 1 wherein the duct has three lumens for trigger wires.
4. A trigger wire guide as in Claim 1 wherein the duct is formed by a concentric tube around the guide wire catheter and crimped thereto.
5. A trigger wire guide as in Claim 1 wherein the duct is formed by a V shape cross section component retained to the guide wire catheter.
6. A trigger wire guide for a prosthesis deployment device, the prosthesis deployment device being of a type having a proximal end extending to a proximal nose cone dilator and having a trigger wire or wires and trigger wire release mechanism adapted to retain the proximal end of a prosthesis adjacent the nose cone dilator, comprising a trigger wire guide device disposed on the deployment to retain the trigger wire or wires to prevent fouling of the trigger wire with a prosthesis when the prosthesis is carried on the deployment device.
7. A prosthesis deployment device having a guide wire catheter extending to a proximal end and a trigger wire and trigger wire release mechanism adapted to retain the proximal end of a prosthesis distally of the proximal end, the trigger wire release mechanism comprising a duct along at least part of the length of the guide wire catheter, the duct having at least one lumen for a trigger wire and an

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aperture in the duct adjacent the proximal end for the trigger wire to exit the duct to engage the prosthesis, a stent of the prosthesis or a suture retaining the prosthesis to thereby retain the prosthesis.

8. A prosthesis deployment device as in Claim 7 wherein the device includes a region in which the prosthesis is retained and the duct extends along at least part of the region.

9. A prosthesis deployment device as in Claim 7 wherein the duct is coaxial with and surrounding the guide wire catheter.

10. A prosthesis deployment device as in Claim 7 wherein the duct has three lumens for trigger wires.

11. A prosthesis deployment device as in Claim 7 wherein the duct is formed by a concentric tube around the guide wire catheter and crimped thereto.

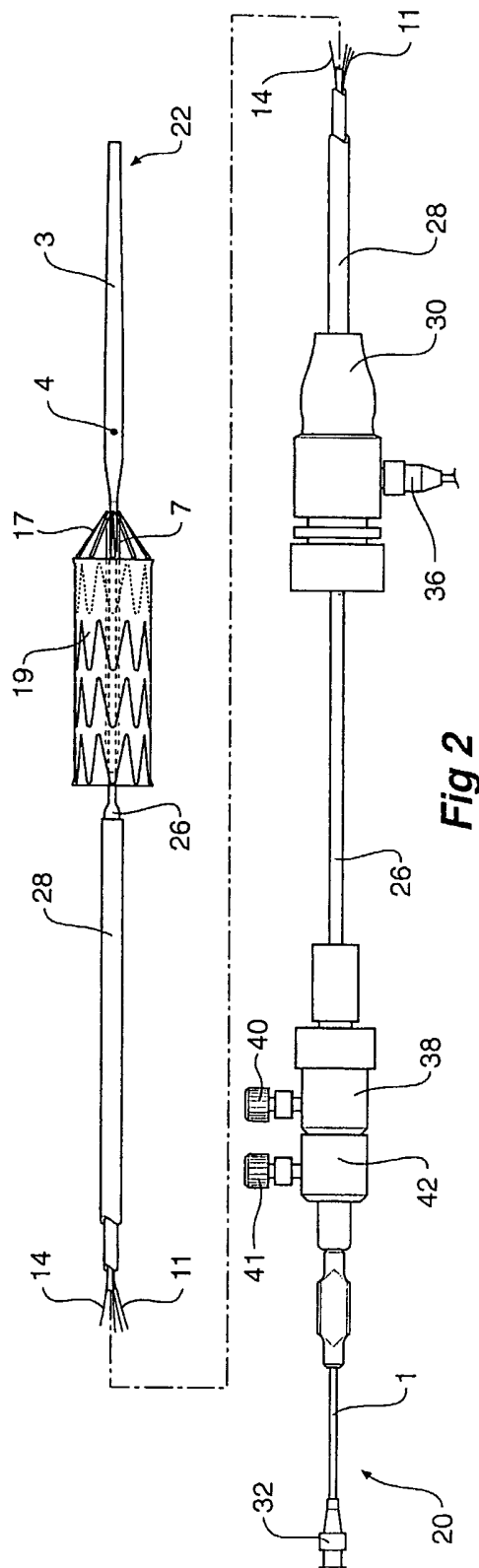
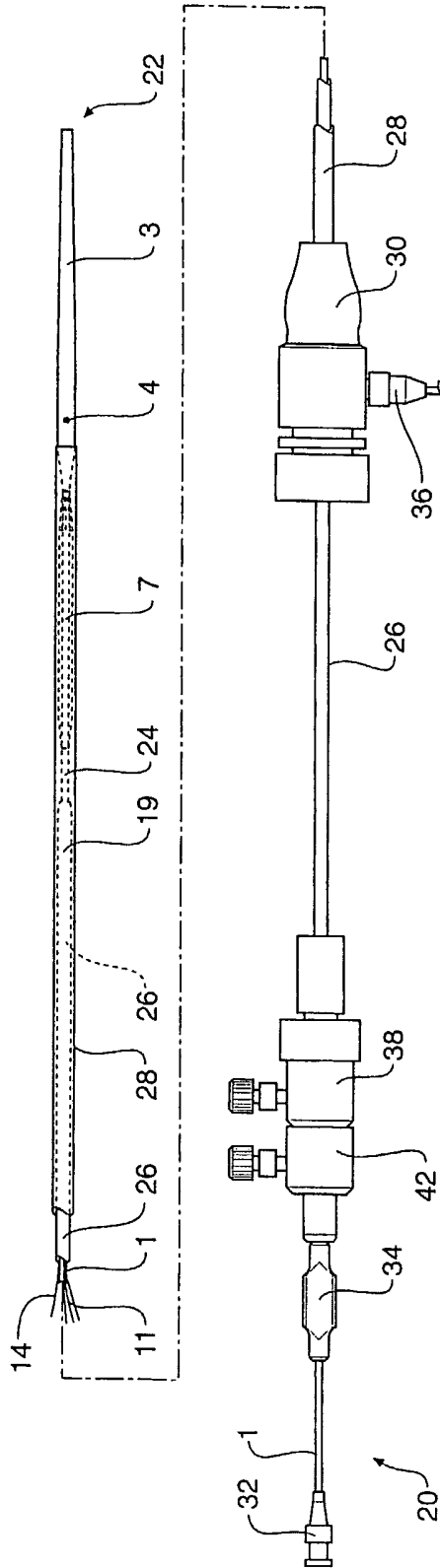
12. A prosthesis deployment device as in Claim 7 wherein the duct is formed by a V shape cross section component retained to the guide wire catheter.

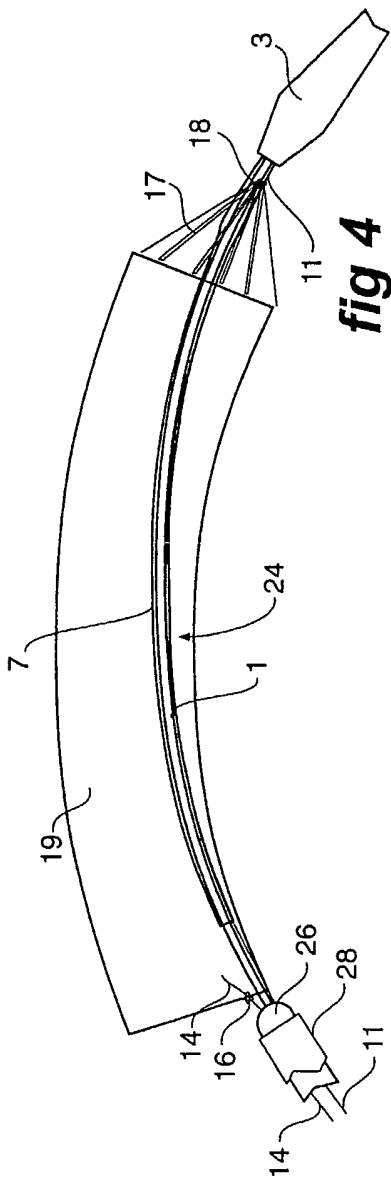
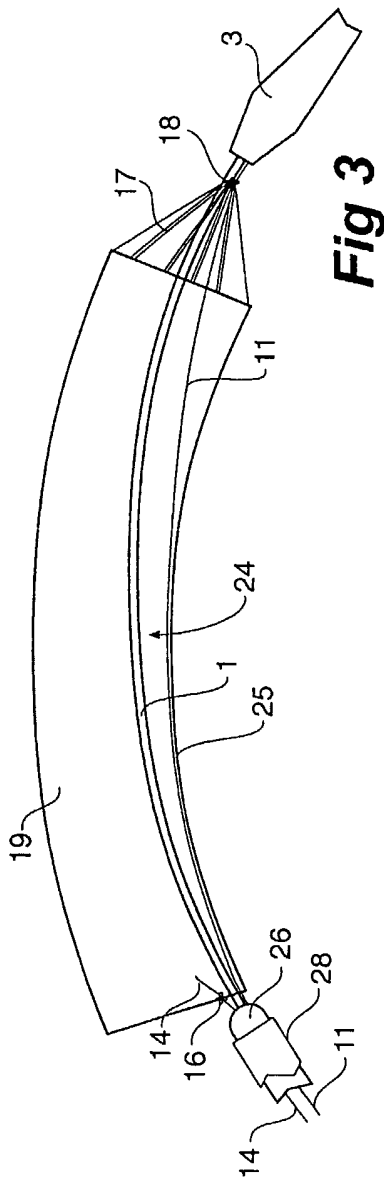
13. A prosthesis deployment device having a deployment catheter extending to a proximal end with an elongate region of the catheter in which a prosthesis is retained and a trigger wire and trigger wire release mechanism adapted to retain the proximal end of the prosthesis distally of the proximal end, the trigger wire release mechanism comprising a trigger wire guide along at least part of the length of the region, the duct having at least one lumen for a trigger wire and an aperture in the duct adjacent the proximal end to enable the trigger wire to exit the duct.

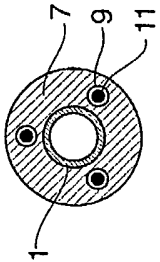
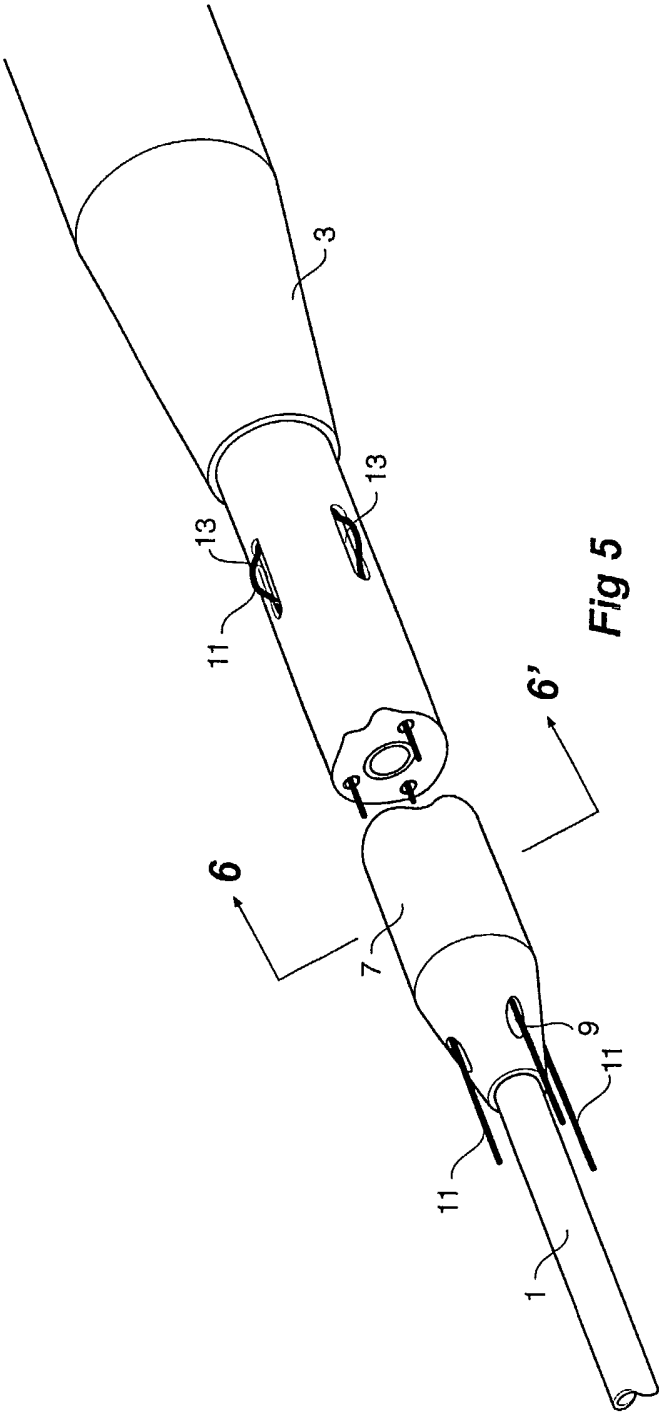
14. A prosthesis deployment device as in Claim 13 wherein the trigger wire guide has three lumens for trigger wires.

15. A prosthesis deployment device as in Claim 13 wherein region includes a guide wire catheter and the trigger wire guide is coaxial with and surrounding the guide wire catheter.

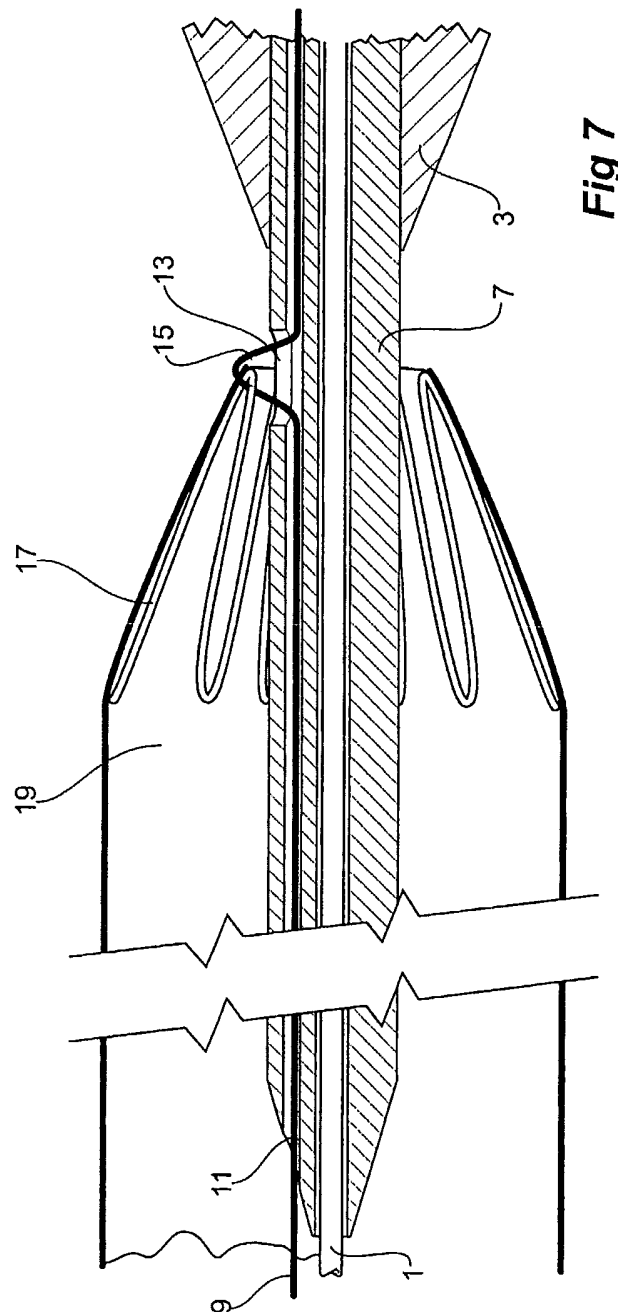
16. A prosthesis deployment device as in Claim 15 wherein the trigger wire guide is formed by a concentric tube around the guide wire catheter and crimped thereto.







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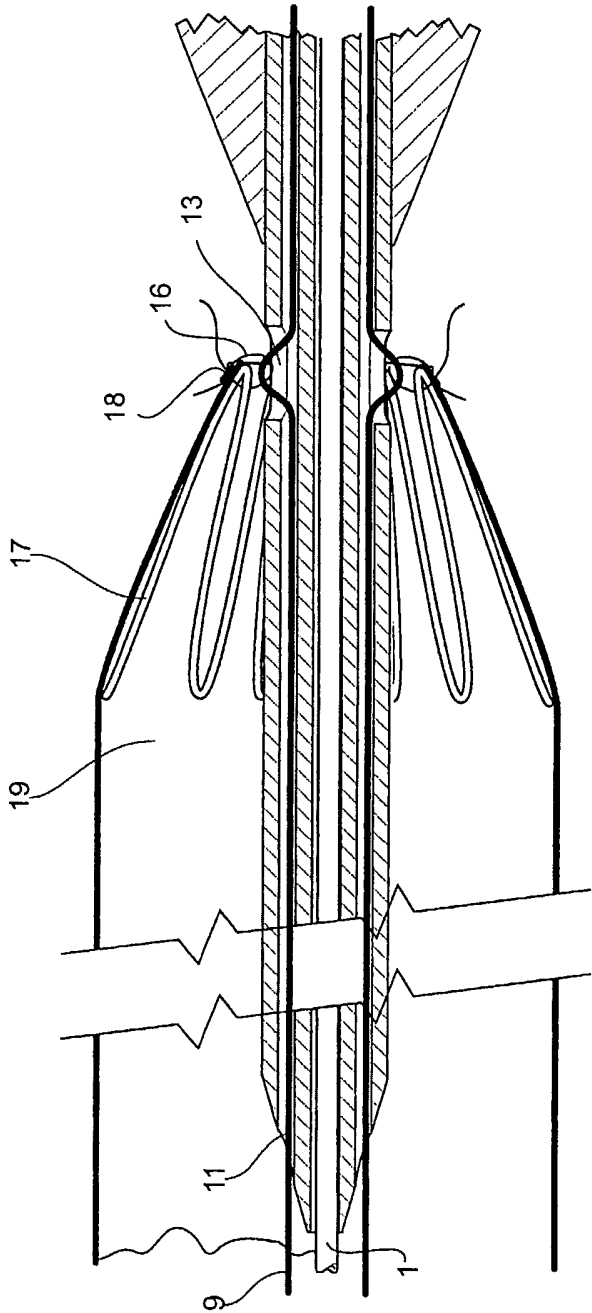


Fig 8

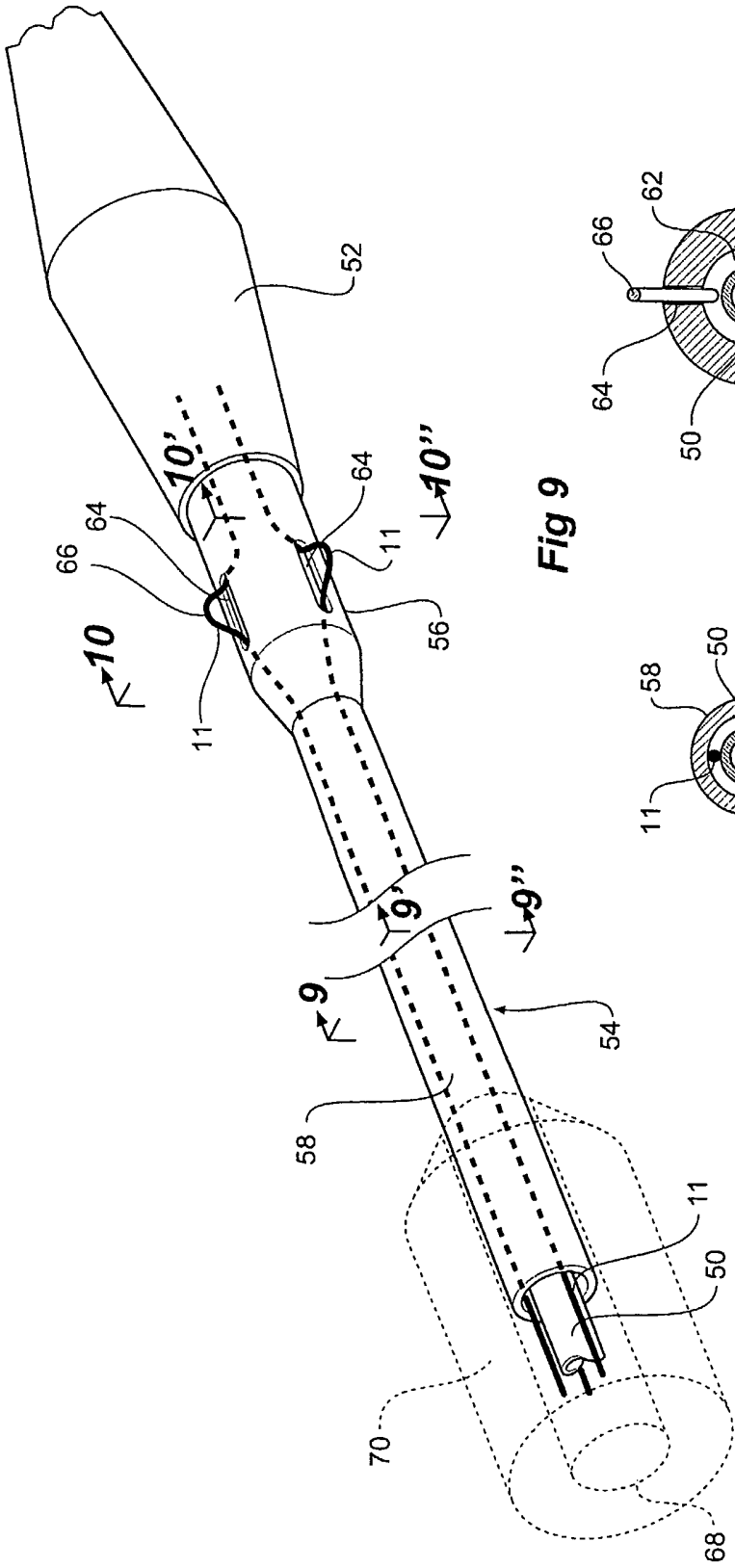


Fig 9

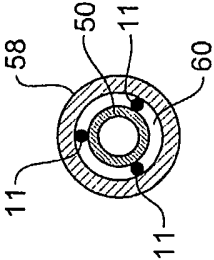


Fig 10

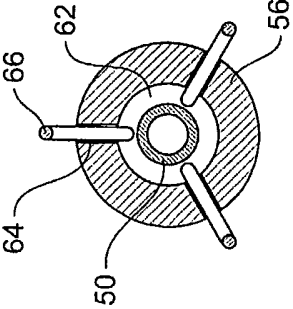
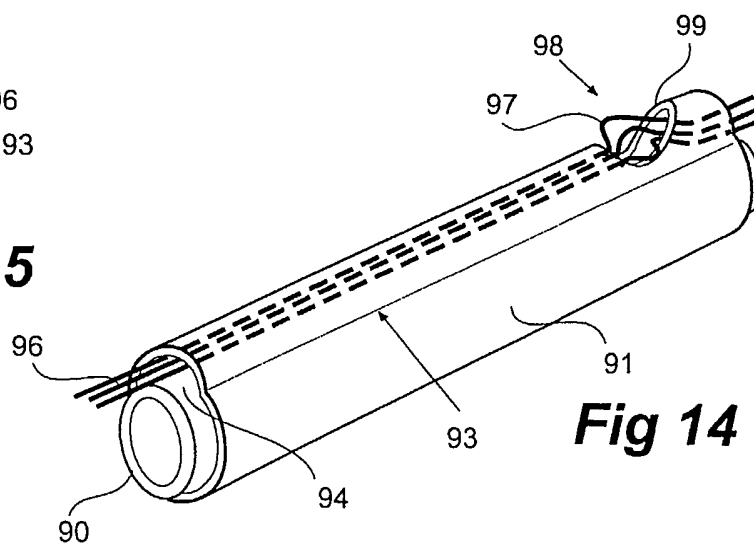
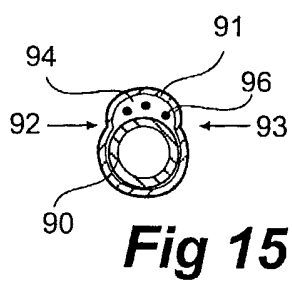
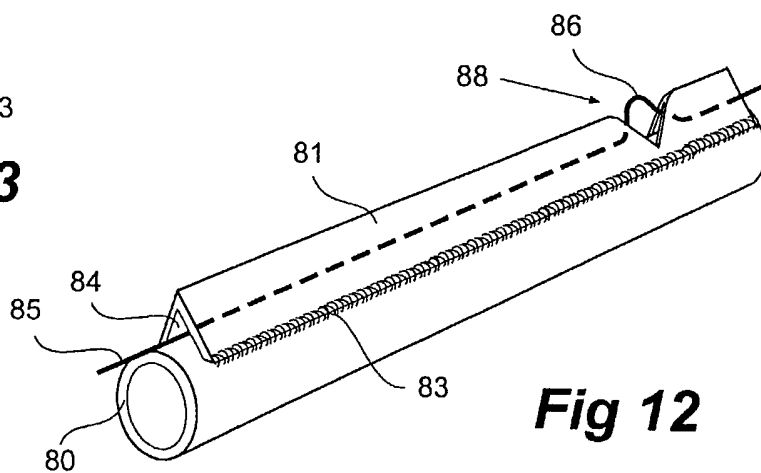
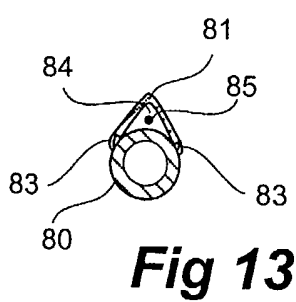


Fig 11

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INTERNATIONAL SEARCH REPORT

Int ☐ National Application No

PCT/US 03/16791

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A61M25/00 A61F2/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61M A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 12436 A (INSTENT INC) 2 May 1996 (1996-05-02) page 6, line 22 -page 7, line 8; figures 8,9	1,7,8,13
A	WO 01 34061 A (DORN JUERGEN ;FEESER JOERG (DE); ANGIOMED GMBH & CO (DE)) 17 May 2001 (2001-05-17) the whole document	1-16



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

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)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

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

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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.

G document member of the same patent family

Date of the actual completion of the international search

27 August 2003

Date of mailing of the international search report

30/09/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Cuiper, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/16791

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