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(54) **DEVICES FOR REENTERING A TRUE LUMEN FROM A SUBINTIMAL SPACE**

VORRICHTUNGEN ZUM WIEDEREINTRETEN IN EINE ECHTES LUMEN AUS EINEM SUBINTIMA-RAUM

DISPOSITIF PERMETTANT DE REENTRER DANS UNE LUMIERE VERITABLE DEPUIS UN ESPACE SOUS-ENDOTHELIAL

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention is directed to devices and methods for cutting tissue. In a specific application, the present invention is directed to devices and methods for re-entering the true lumen from a subintimal space such as a dissection plane or so-called "false lumen."

[0002] Guidewires and other interventional devices are used to treat vessels and organs using endovascular approaches. A guidewire is typically guided through blood vessels to the treatment site and the device is then advanced over the guidewire. For example, angioplasty and stenting are generally accomplished by first introducing a guidewire to the desired site and then advancing the angioplasty or stent catheter over the guidewire.

[0003] When attempting to advance a guidewire or other interventional device through a highly stenosed region or chronic total occlusion (CTO), the guidewire or device may inadvertently enter into the wall of the vessel to create a sub-intimal space. Once in a sub-intimal space, it can be difficult to re-enter the vessel true lumen. Devices for reentering a vessel true lumen from a subintimal location are described in WO 02/45598.

[0004] US2002/0103459 discloses a catheter system for vascular re-entry from a sub-intimal space.

[0005] US2001/000041 teaches a method and apparatus for crossing occluded blood vessels using a re-directable wire.

BRIEF SUMMARY OF THE INVENTION

[0006] According to the present invention there is provided a device for re-entering a lumen during an endovascular procedure when in a subintimal space, comprising: an elongate body having first and second lumens, a distal end of the first lumen opening from the body at a first opening; a rotating cutter used for cutting tissue; and an energy emitter which emits energy to locate a lumen when in a subintimal space adjacent to the lumen; the cutter being movable to a cutting position which exposes part of the cutter through the first opening so that the cutter may create a path from the subintimal space to the lumen; characterised in that the device further comprises: a window in the body between the first lumen and an exterior of the body, the window being spaced from the first opening; and wherein a distal end of the second lumen of the elongate body open from the body at a second opening, the second lumen being sized to receive a guidewire; the rotating cutter extends within the first lumen; and the energy emitter emits energy through the window.

[0007] These and other aspects of the invention will become apparent from the following description, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 shows a view of the system of the present invention.

Fig. 2 shows a guidewire positioned proximate to a total occlusion.

Fig. 3 shows a subintimal space created adjacent a true lumen by the guidewire.

Fig. 4 shows a reentry device of the present invention advanced over the guidewire to the subintimal space.

Fig. 5 shows a guidewire positioned in the true lumen.

Fig. 6 shows the reentry device with the cutting element in a stored position.

Fig. 7 shows the reentry device with the cutting element in a cutting position.

Fig. 8 is a side view of the reentry device of Fig. 7.

Fig. 9 shows another reentry device with the cutting element in a stored position.

Fig. 10 shows the reentry device of Fig. 9 with the cutting element in a cutting position and the distal portion bent.

Fig. 11 shows the reentry device of Figs. 9 and 10 with the cutting element advanced to another cutting position which exposes even more of the cutting element and also bends the distal tip further.

Fig. 12 shows another reentry device which has a bendable distal portion.

Fig. 13 shows the reentry device of Fig. 12 with the distal portion bent.

Fig. 14 shows still another reentry device with a cutting element which may be tilted.

Fig. 15 shows the reentry device of Fig. 14 with the cutting element tilted to expose more of the cutting element and to move the cutting element through the opening in the body of the device.

FIG. 16 shows the reentry device of FIG. 6 having a junction leading to two separate guidewire outlets with the guidewire positioned in the first outlet during advancement of the device over the guidewire.

FIG. 17 shows the reentry device of FIG. 16 with the guidewire extending through the second outlet for directing the guidewire into the true lumen.

FIG. 18 shows a catheter having a lumen for receiving a guidewire and another lumen which receives the reentry device.

FIG. 19 shows another catheter having a single lumen through which the guidewire and reentry device pass.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Referring to FIGS. 1-8, a system 2 and device 4 for reentering a true lumen from a subintimal space, dissection plane or so-called false lumen is shown. The

device 4 includes a cutting element 6 coupled to a torque transmitting element 8, such as a wire 10, which rotates the cutting element 6. The device 4 has an opening 12 at a distal end 14 with the cutting element 6 movable between a stored position (FIG. 6) and a cutting position (FIGS. 7 and 8) which exposes the cutting element 6. The cutting element 6 may be any suitable cutting element 6 such as the cutting element 6 described in patents mentioned above. The cutting element 6 has a circular cutting edge which has a diameter of about 1 mm although any suitable size may be used depending upon the particular application. The cutting element 6 may also be any other type of cutter such as a laser, ultrasound, RF or other type of cutter without departing from various aspects of the present invention.

[0010] The device 4 has a flexible body 16 to navigate through blood vessels or other body lumens to a target location. The body 16 may be made of any suitable material as is known in the art such as Pebax. The torque transmitting element 8 extends through a lumen 18 in the body 16. The body 16 may have more lumens for various reasons such as introduction of fluids, such as contrast, or for delivery of another device 4 such as a guidewire or interventional device. The torque transmitting element 8 is coupled to a driver 20 which rotates the torque transmitting element 8 at a variable or fixed speed.

[0011] The device 4 may also have an energy emitting element 22, such as an ultrasound element 25, which emits (and may receive) energy to determine the location of the true lumen as explained below. The energy emitting element 22 is coupled to the cutting element 6 so that the energy emitting element 22 and cutting element 6 are rotated together. The cutting element 6 is in the stored position when locating the true lumen so that the cutting element 6 is not exposed and will not cut or damage tissue. The energy emitting element 22 is positioned adjacent a window 24 which may be a side opening 26 or may simply be a portion of the sidewall which transmits a sufficient amount of the energy therethrough. Any suitable energy emitting element 22 may be used such as the ultrasound emitting element available from Boston Scientific and is marketed under the name Atlantis™. The cutting element 6 may be mounted to a collar which is then mounted to an ultrasound element holder 28 or the cutting element 6 may be integrally formed with the ultrasound element holder 28.

[0012] The device 4 has an atraumatic tip 34 which is relatively flexible to prevent damaging tissue. The tip 34 may be a separate piece laminated or glued to the body 16. The tip 34 is preferably made out of a relatively soft, flexible material, such as tecothane, and may be used for blunt dissection as necessary. A reinforcing element 36 is encapsulated in the tip 34 to help the tip 34 maintain it's general shape. The tip 34 may also have one or more guidewire lumens 38 or any of the guidewire features described herein.

[0013] The opening 12 in the distal portion may be designed to expose over 180 degrees of the cutting element 6 and may even expose 220 degrees or even 270 degrees of the cutting element 6 as defined by the axis of rotation. This provides advantages over WO 02/45598 which does not expose much of the cutting element 6 and requires invagination of the tissue within the opening to cut tissue. In another aspect of the invention, the cutting element 6 may be gradually exposed. For example, the cutting element 6 may be gradually exposed from 180-220 degrees or even 200-270 degrees. As explained below, this feature provides the user with the ability to change the amount of cutter 6 that is exposed depending upon the tissue thickness between the subintimal location and true lumen. The term opening 12 and amount of exposure of the cutting element 6 are defined by the outer bounds of the opening 12 and the axis of rotation. Referring to Figs. 7 and 8, the cutting element 6 is exposed relative to the outer bounds of the opening 12 due to the relatively open distal end.

[0014] Referring to Figs. 9-11, another device 4A for reentering a true lumen from a subintimal location is shown wherein the same or similar reference numbers refer to the same or similar structure. The device 4A also has an opening 12A at the distal end to expose the cutting element 6A. Fig. 9 shows the cutting element 6A in a stored position, Fig. 10 shows the cutting element 6A in a first cutting position and Fig. 11 shows the cutting element 6A in a second cutting position which further exposes the element 6A. The device 4A also has the window 24 through which the energy emitting element 22, such as the ultrasound element, may emit energy when the cutting element 6A is in the stored position.

[0015] A distal portion 40 of the body can bend or articulate to further expose the cutting element 6A and to move the cutting element 6A toward true lumen. The body has slots 42 formed therein to increase the flexibility of the distal portion 40. The cutting element 6A has a surface 44 which engages a lip 46 on the body. As the cutting element 6A is advanced, the interaction between the surface 44 and lip 46 causes the distal portion 40 to deflect. Bending the distal portion 40 can be helpful in moving the cutting element 6A toward the tissue and may also expose more of the cutting element 6A. As also explained below, the tip 40 may also be bent to direct the device 4A itself or a guidewire into the true lumen. The cutting element 6A may also be gradually exposed as the cutting element 6A moves distally and may be gradually exposed in the same manner described above.

[0016] Referring to Figs. 12 and 13, another reentry device 4B is shown which has a distal portion or tip 60 which bends or articulates. The tip 60 may be articulated and actuated in any suitable manner. For example, the tip 60 may be bent upon longitudinal movement of the cutting element 6 (as shown above) or a separate actuator, such as a pull wire 62, may be used. As can be appreciated from Fig. 13, the tip 60 is bent or articulated to move the cutting element 6 toward the true lumen and to expose more of the cutting element 6. The device 4B may also be bent to direct the device 4B itself or another

device or guidewire through the guidewire lumen 38 to the access path into the true lumen as described further below.

[0017] Referring to Figs. 14 and 15, still another device 4C for cutting tissue is shown wherein the same or similar numbers refer to the same or similar structure. The device 4C includes a cutting element 6C, an energy emitting element 22C and a torque transmitter 8C for rotating the elements. The device 4C has an opening 64 along one side. The cutting element 6C is contained within the opening 64 in the stored position of Fig. 14 and extends out of the opening 64 in the cutting position of Fig. 15. The cutting element 6C is moved out of the window 24 using an actuator 6B, such as a wire 70, which tilts a bearing 72 supporting the shaft of the rotatable cutting element 6C. Of course, any other suitable structure may be used to move the cutting element 6C outside the opening 64 such as those described in U.S. Patent No. 6,447,525. Furthermore, the cutting element 6C may be moved out of the opening 64 by bending the distal portion or tip as described herein.

[0018] Use of the devices 4, 4A-C is now described with reference to the device 4 although it is understood that any of the devices 4, 4A-C may be used. As mentioned above, the device 4 may be used to perform any suitable procedure to cut from one location to another in the body such as a procedure to reenter a true lumen. The device 4 is initially advanced to a position within a subintimal space SS. As described above, the subintimal space SS may be inadvertently created during an endovascular procedure with a guidewire GW or other device creating the subintimal space SS as shown in Figs. 2 and 3. The device 4 may be introduced over the same guidewire GW or device which created the subintimal space SS as shown in Figs. 4 and 5. Of course, the device 4 may also be advanced over the guidewire GW to a position proximate to the subintimal space SS after which the device 4 is then advanced by itself into the subintimal space SS.

[0019] After the device 4 is positioned at the appropriate location in the subintimal space SS, the energy emitting element 22 is used to determine the location of the true lumen. When using the ultrasound element 28, for example, the ultrasound element 28 is rotated while emitting ultrasound energy and the energy emitted through the window 24 and reflected back through the window 24 is processed as is known in the art. The entire device 4 is rotated within the subintimal space SS to orient the window 24 until the true lumen is located. The angular orientation of the device 4 is then maintained so that the opening 12 and window 24 are directed toward the true lumen.

[0020] The cutting element 6 is then moved to the cutting position to expose the cutting element 6. The cutting element 6 may be rotated with the driver 20 during this time so that cutting is initiated as the cutting element 6 is exposed. In another aspect of the invention, the entire device 4 itself may be moved through the subintimal space to cut tissue. This provides advantages over the method of WO 02/45598 which requires invagination of tissue through a window to attempt a cut at one location. If the tissue does not invaginate sufficiently into the window, such as when the tissue is too thick, the device of WO 02/45598 will not be able to cut completely through the tissue to create the access path to the true lumen. The user must then move the device and again attempt to invaginate enough tissue to cut an access path. The present invention provides the ability to move the entire device 4 through the subintimal space to create the access path rather than attempting a cut at a single discrete location as in WO 02/45598. Of course, the device 4 may also be used by moving only the cutting element 6 rather than the entire device 4 without departing from the invention.

[0021] The cutting element 6 may also be exposed to varying degrees, as described above, until enough of the cutting element 6 is exposed to cut through to the true lumen. For example, the user may choose to expose half of the cutting element 6 and attempt to create an access path to the true lumen. If an access path is not created, the user may then choose to expose more of the cutting element 6 and again attempt to create an access path. This procedure can be repeated until the access path is formed to the true lumen. The device 4A, 4B may be also have a distal tip or portion 40, 60 which bends to move the cutting element 6 toward the tissue and/or expose more of the cutting element 6 during cutting.

[0022] After successfully creating the access path into the true lumen, the device 4 itself or part thereof may be directed toward or through the access path. Referring to Fig. 9-13, for example, the distal portion or tip 40, 60 may be bent to help direct the device 4A, 4B itself or the guidewire GW through the access path.

[0023] Referring to Figs. 16 and 17, another device 4D, similar to device 4, is shown which has a guidewire lumen 74 having a junction 76 so the guidewire can be directed through either a first lumen 77 having a first outlet 78 or a second lumen 79 having a second outlet 80. The first outlet 78 directs the guidewire substantially longitudinally for advancing the device 4D over the guidewire to the target area in a conventional manner. The second outlet 80 directs the guidewire at an angle relative to the longitudinal axis, such as 30-75 degrees, to direct the guidewire through the access path into the true lumen.

[0024] The junction 76 may include a feature which directs the guidewire into the second outlet 80. Referring to Fig. 17, for example, the junction 76 may include a flap or stop 82 which closes and prevents or inhibits the guidewire from passing through the first outlet 78 after the guidewire has been withdrawn proximal to the junction 76. When the guidewire is advanced again as shown in Fig. 17, the guidewire passes through the second outlet 80 due to the stop 82. The device 4 and/or guidewire GW are then manipulated to direct the guidewire GW through the access path. Although the stop 82 may be provided, the junction 76 may also simply be a relatively open junc-

tion 76 with the user manipulating and rotating the guidewire GW to direct the guidewire GW through the desired outlet 78, 80. The device is rotated about 180 degrees after creating the access path to direct the GW through outlet 80 and into the true lumen.

[0025] Referring to Figs. 18 and 19, the system 2 may also include a sheath or catheter 90 which is advanced proximal to the treatment site. The sheath 90 may help provide better control of the guidewire GW and devices 4 of the present invention during manipulation in the subintimal space. The sheath 90 may also used to deliver contrast solution to the treatment site from a source of contrast 97 (see Fig. 1) or may be coupled to a pressure sensor 94. The pressure sensor 94 may be part of the contrast delivery system 97 or may be a separate component. Deliver of contrast and/or pressure monitoring may be used to determine when the access path has been created.

[0026] The sheath 90 may include only one lumen 92 with fluid delivery and pressure sensing being accomplished in the annular space between the device and sheath as shown in Fig. 19. The sheath 90 may also have first and second lumens 96, 98 for separate delivery of the device 4 and guidewire GW. As mentioned above, the devices 4 of the present invention may be advanced over the same guidewire or device that created the subintimal space or may be advanced over another guidewire or even through the sheath 90 by itself.

[0027] After accessing the true lumen, another interventional device may be introduced into the true lumen for the intended therapy or procedure. For example, a stent catheter, angioplasty catheter, or atherectomy device may be used to treat the occlusion. The present invention has been described for reentering a true lumen from a subintimal space but, of course, may be used for other purposes to gain access from one space to another anywhere within the body.

[0028] The present invention has been described in connection with the preferred embodiments, however, it is understood that numerous alternatives and modifications can be made within the scope of the present invention as defined by the claims.

Claims

1. A device (4) for re-entering a vascular lumen during an endovascular procedure when in a subintimal space, comprising:

an elongate body (16) having first and second lumens (18,38), a distal end of the first lumen (18) opening from the body at a first opening (12);
a rotating cutter (6) used for cutting tissue; and an energy emitter (22) which emits energy to locate a vascular lumen when in a subintimal space adjacent to the lumen;
the cutter (6) being movable to a cutting position which exposes part of the cutter (6) through the first opening (12) so that the cutter (6) may create a path from the subintimal space to the lumen;
characterised in that the device (4) further comprises:

a window (24) in the body between the first lumen (18) and an exterior of the body, the window (24) being spaced from the first opening (12); and wherein
a distal end of the second lumen (38) of the elongate body opens from the body at a second opening (78), the second lumen (38) being sized to receive a guidewire;
the rotating cutter extends within the first lumen (18); and
the energy emitter (22) emits energy through the window (24).

2. The device (4) of claim 1, wherein:

the energy emitter (22) is coupled to the cutter (6), the cutter (6) and energy emitter (22) being coupled to a torque transmitting element which rotates the cutter (6) and the energy emitter (22) together.

3. The device (4) of claim 1, wherein: the cutting element (6) may be gradually exposed so that the amount of exposure may be varied in the cutting position.

4. The device (4) of claim 1, wherein: the cutting element (6) is exposed over 180 degrees relative to an axis of rotation when in the cutting position.

5. The device (4) of claim 1, wherein: the cutting element (6) is exposed over 270 degrees relative to the axis of rotation when in the cutting position.

6. The device (4) of claim 1, wherein: the elongate body has a distal portion which bends when the elongate body is moved to cut tissue with the cutter(6).

7. The device (4) of claim 1, wherein: the energy emitter (22) is an ultrasound emitting element.

8. The device (4) of claim 1, wherein: the elongate body is wider along a portion adjacent to the cutting element (6) to urge tissue toward the cutting element (6).

9. The device (4) of claim 1, wherein: the elongate body is moved within the subintimal space to move the cutter (6) when the cutter creates the path back into the lumen (6).

10. The device (4) of claim 1 wherein the window (24) comprises a third opening (26) in a sidewall of the elongate body.

11. The device (4) of claim 1 wherein the first opening (12) is at a distal end (14) of the elongate body.

12. The device (4) of claim 1 wherein the first opening (12) is distal of the window (24).

Patentansprüche

1. Vorrichtung (4) zum Wiedereintreten in ein Gefäßlumen während eines endovaskulären Eingriffs in einem Subintima-Raum, umfassend:

einen länglichen Körper (16) mit einem ersten und zweiten (18, 38) Lumen, wobei sich ein distales Ende des ersten Lumens (18) von dem Körper an einer ersten Öffnung (12) öffnet;
eine Drehschneide (6) zum Schneiden von Gewebe; und
eine Energieabgabeeinrichtung (22), die Energie abgibt, um ein Gefäßlumen in einem Subintima-Raum benachbart zu dem Lumen zu lokalisieren;
wobei die Schneide (6) in eine Schneidstellung bewegbar ist, in der ein Teil der Schneide (6) durch die erste Öffnung (12) freigelegt ist, derart, dass die Schneide (6) einen Weg aus dem Subintima-Raum zu dem Lumen herstellen kann;
dadurch gekennzeichnet, dass die Vorrichtung (4) ferner Folgendes umfasst:

ein Fenster (24) in dem Körper zwischen dem ersten Lumen (18) und einem Äußeren des Körpers, wobei das Fenster (24) von der ersten Öffnung (12) beabstandet ist; und wobei
sich ein distales Ende des zweiten Lumens (38) des länglichen Körpers von dem Körper an einer zweiten Öffnung (78) öffnet, wobei das zweite Lumen (38) dazu bemessen ist, einen Führungsdraht aufzunehmen;
wobei sich die Drehschneide in dem ersten Lumen (18) erstreckt; und

wobei die Energieabgabeeinrichtung (22) Energie durch das Fenster (24) abgibt.

2. Vorrichtung (4) nach Anspruch 1, wobei:

die Energieabgabeeinrichtung (22) an die Schneide (6) gekoppelt ist, wobei die Schneide (6) und die Energieabgabeeinrichtung (22) an ein Drehmomentübertragungselement gekoppelt sind, das die Schneide (6) und die Energieabgabeeinrichtung (22) gemeinsam dreht.

3. Vorrichtung (4) nach Anspruch 1, wobei: das Schneidelement (6) allmählich freigelegt werden kann, derart, dass der Expositionsgrad an der Schneidposition variiert werden kann.

4. Vorrichtung (4) nach Anspruch 1, wobei: das Schneidelement (6) in der Schneidposition über 180 Grad im Verhältnis zu einer Drehachse freigelegt wird.

5. Vorrichtung (4) nach Anspruch 1, wobei: das Schneidelement (6) in der Schneidposition über 270 Grad im Verhältnis zu einer Drehachse freigelegt wird.

6. Vorrichtung (4) nach Anspruch 1, wobei: der längliche Körper einen distalen Abschnitt aufweist, der sich biegt, wenn der längliche Körper bewegt wird, um mit der Schneide (6) Gewebe zu schneiden.

7. Vorrichtung (4) nach Anspruch 1, wobei: die Energieabstrahleinrichtung (22) ein Ultraschallabgabeelement ist.

8. Vorrichtung (4) nach Anspruch 1, wobei: der längliche Körper an einem Abschnitt benachbart zu dem Schneidelement (6) breiter ist, um Gewebe zum Schneidelement (6) zu drängen.

9. Vorrichtung (4) nach Anspruch 1, wobei: der längliche Körper in dem Subintima-Raum bewegt wird, um die Schneide (6) zu bewegen, wenn die Schneide den Weg zurück in das Lumen (6) herstellt.

10. Vorrichtung (4) nach Anspruch 1, wobei das Fenster (24) eine dritte Öffnung (26) in einer Seitenwand des länglichen Körpers umfasst.

11. Vorrichtung (4) nach Anspruch 1, wobei die erste Öffnung (12) an einem distalen Ende (14) des länglichen Körpers liegt.

12. Vorrichtung (4) nach Anspruch 1, wobei die erste Öffnung (12) distal von dem Fenster (24) angeordnet ist.

Revendications

1. Dispositif (4) de réintroduction d'un lumen vasculaire pendant une procédure endovasculaire ayant lieu dans un espace subintimal, comprenant :

un corps allongé (16) comportant un premier et un deuxième lumens (18, 38), une extrémité distale du premier lumen (18) s'ouvrant depuis le corps au niveau d'une première ouverture (12) ;
un couteau rotatif (6) utilisé pour couper les

tissus ; et
un émetteur d'énergie (22) qui émet de l'énergie pour situer un lumen vasculaire quand on est dans un espace subintime adjacent au lumen ; le couteau (6) étant mobile jusqu'à une position de coupe qui expose une partie du couteau (6) à travers la première ouverture (12) de sorte que le couteau (6) puisse créer une voie à partir de l'espace subintime jusqu'au lumen ;
caractérisé en ce que le dispositif (4) comprend en outre :

une fenêtre (24) dans le corps entre le premier lumen (18) et une partie extérieure du corps, la fenêtre (24) étant espacée de la première ouverture (12) ; et dans lequel

une extrémité distale du deuxième lumen (38) du corps allongé s'ouvre à partir du corps au niveau d'une deuxième ouverture (78), le deuxième lumen (38) étant dimensionné pour recevoir un fil de guidage ;
le couteau rotatif s'étend dans le premier lumen (18) ; et
l'émetteur d'énergie (22) émet de l'énergie à travers la fenêtre (24).

2. Dispositif (4) selon la revendication 1, dans lequel :

l'émetteur d'énergie (22) est couplé au couteau (6), le couteau (6) et l'émetteur d'énergie (22) étant couplés à un élément de transmission de couple qui fait tourner le couteau (6) et l'émetteur d'énergie (22) ensemble.

3. Dispositif (4) selon la revendication 1, dans lequel : l'élément de coupe (6) peut être exposé progressivement de sorte que la quantité d'exposition peut être variée dans la position de coupe.

4. Dispositif (4) selon la revendication 1, dans lequel : l'élément de coupe (6) est exposé à plus de 180° par rapport à un axe de rotation quand il est dans la position de coupe.

5. Dispositif (4) selon la revendication 1, dans lequel : l'élément de coupe (6) est exposé à plus de 270° par rapport à un axe de rotation quand il est dans la position de coupe.

6. Dispositif (4) selon la revendication 1, dans lequel : le corps allongé a une partie distale qui se courbe quand le corps allongé est déplacé pour couper un tissu à l'aide de l'élément de coupe (6).

7. Dispositif (4) selon la revendication 1, dans lequel : l'émetteur d'énergie (22) est un élément d'émission d'ultrasons.

8. Dispositif (4) selon la revendication 1, dans lequel : le corps allongé est plus large le long d'une partie adjacente à l'élément de coupe (6) pour pousser le tissu vers l'élément de coupe (6).

9. Dispositif (4) selon la revendication 1, dans lequel : le corps allongé est déplacé dans l'espace subintimal pour déplacer le couteau (6) quand le couteau crée le chemin de retour dans le lumen (6).

10. Dispositif (4) selon la revendication 1, dans lequel la fenêtre (24) comprend une troisième ouverture (26) dans une paroi latérale du corps allongé.

11. Dispositif (4) selon la revendication 1, dans lequel la première ouverture (12) se trouve à une extrémité distale (14) du corps allongé.

12. Dispositif (4) selon la revendication 1, dans lequel la première ouverture (12) est distale de la fenêtre (24).

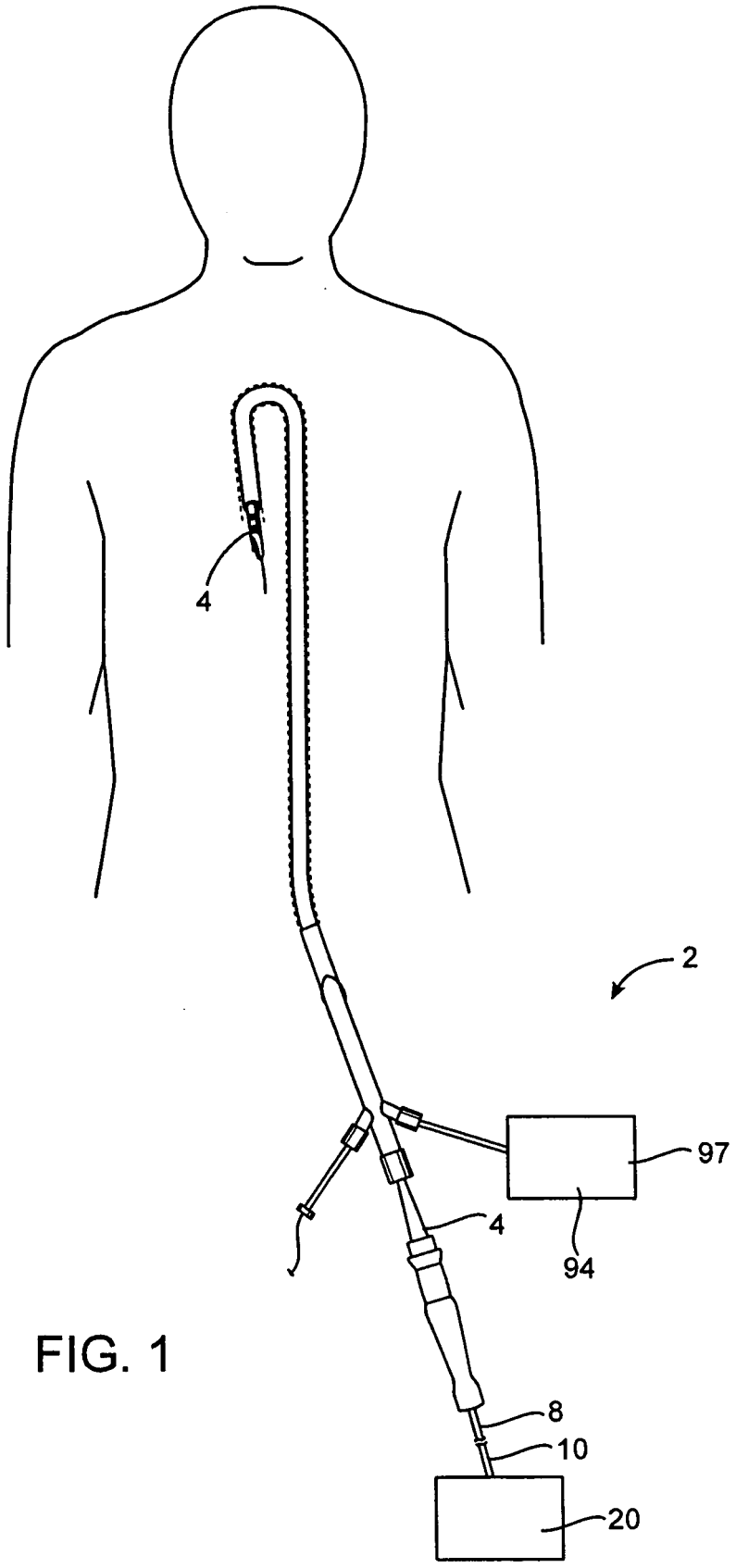


FIG. 1

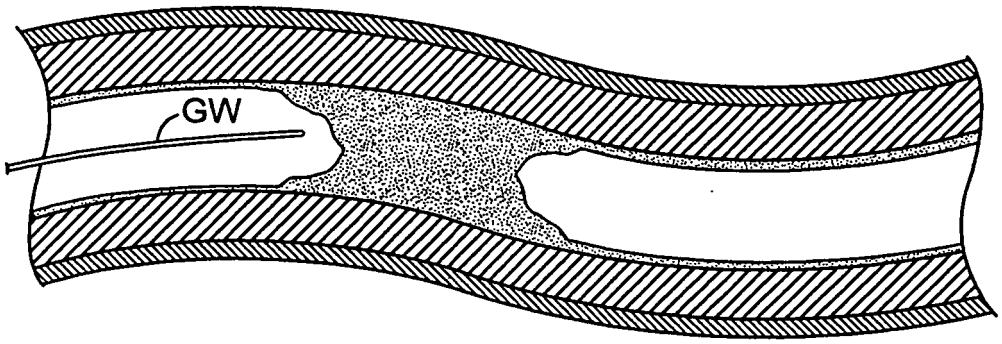


FIG. 2

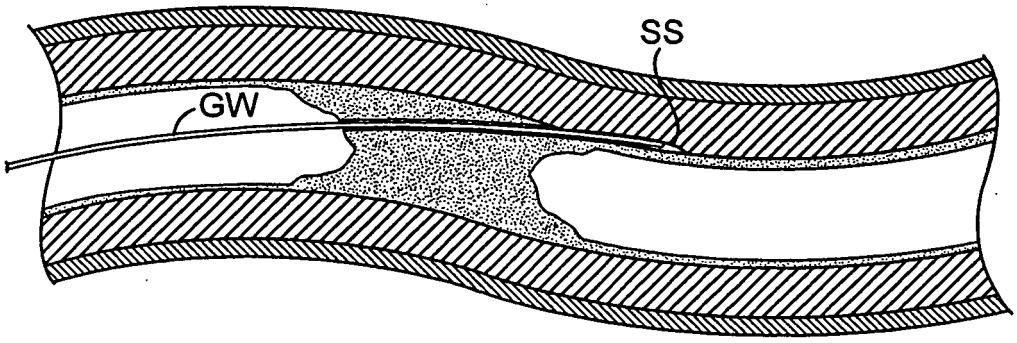
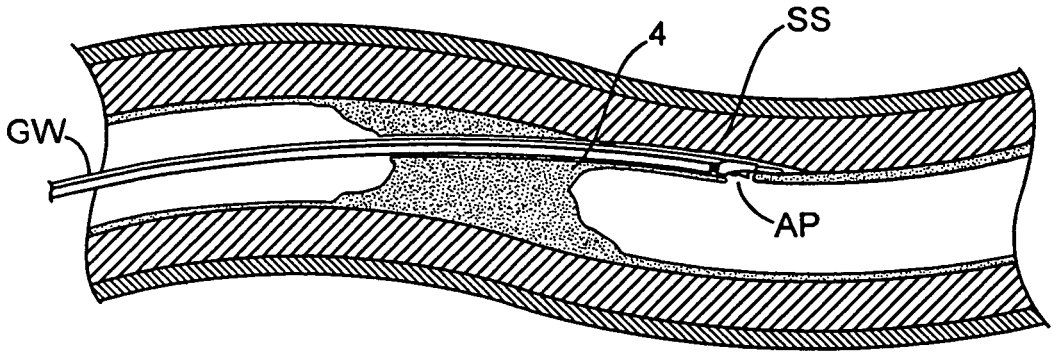


FIG. 3



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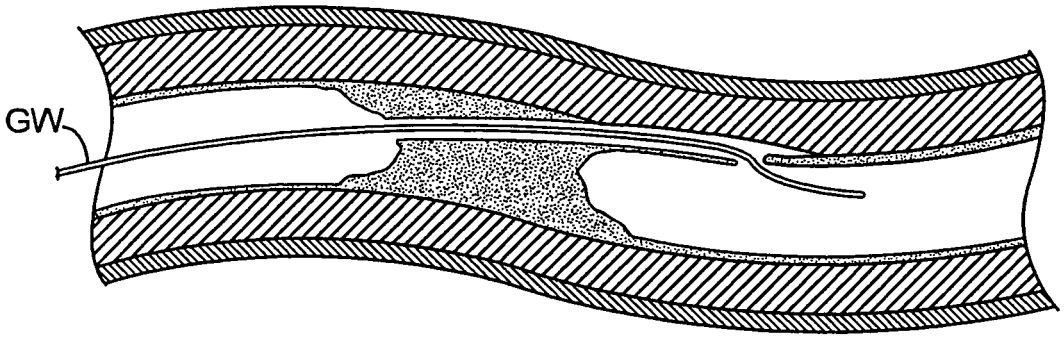

FIG. 5

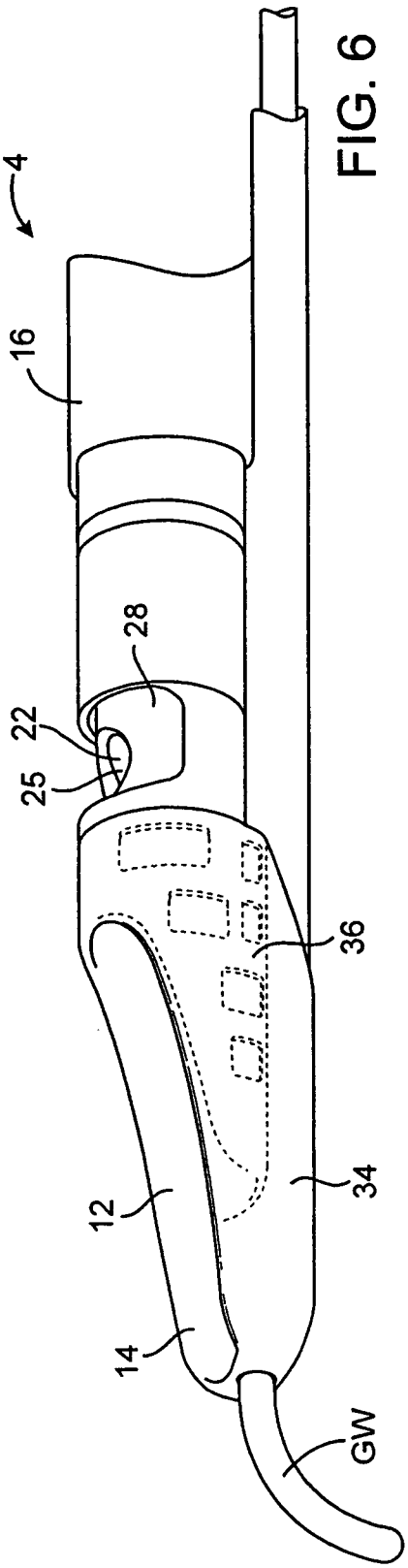

FIG. 6

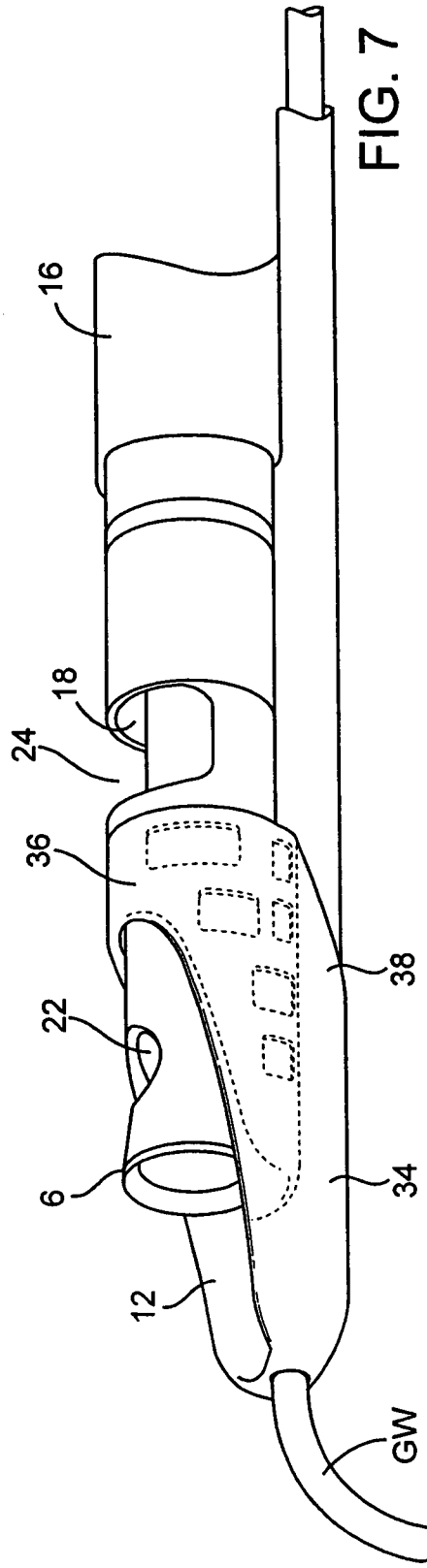

FIG. 7

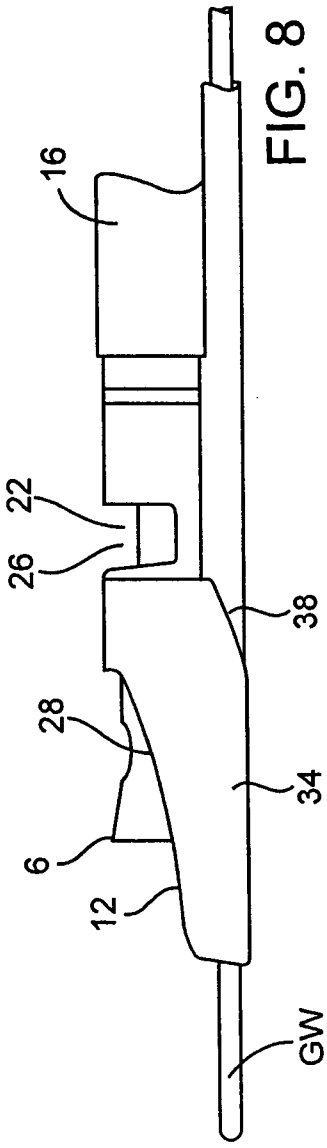

FIG. 8

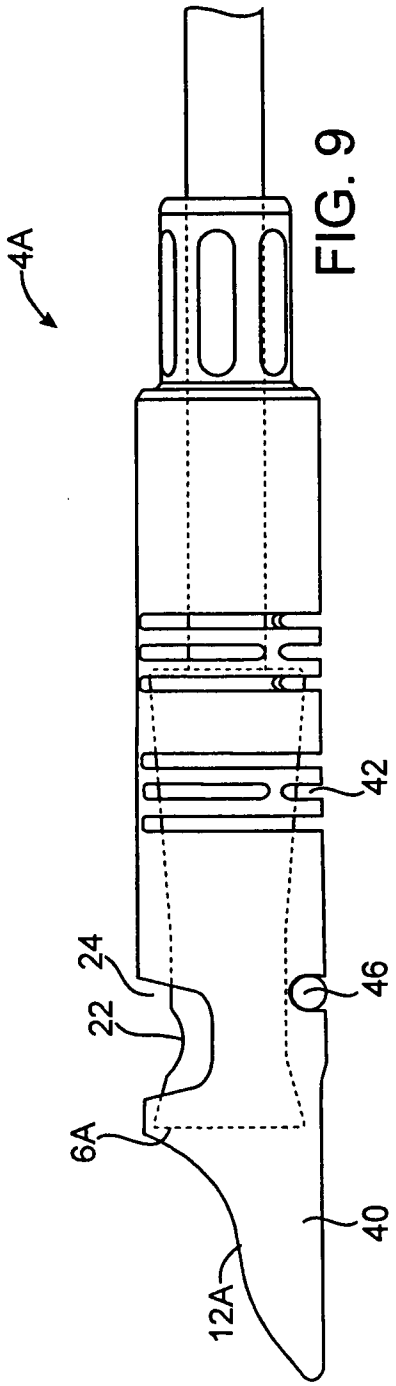

FIG. 9

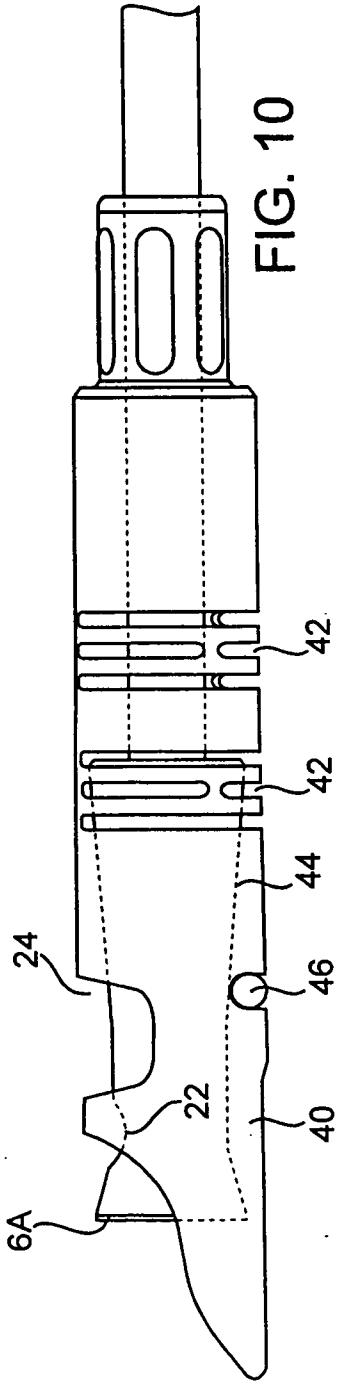

FIG. 10

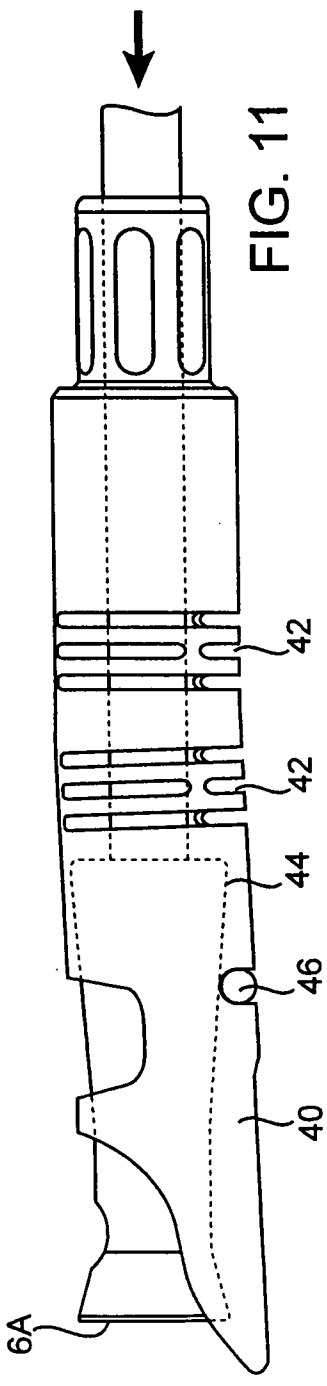

FIG. 11

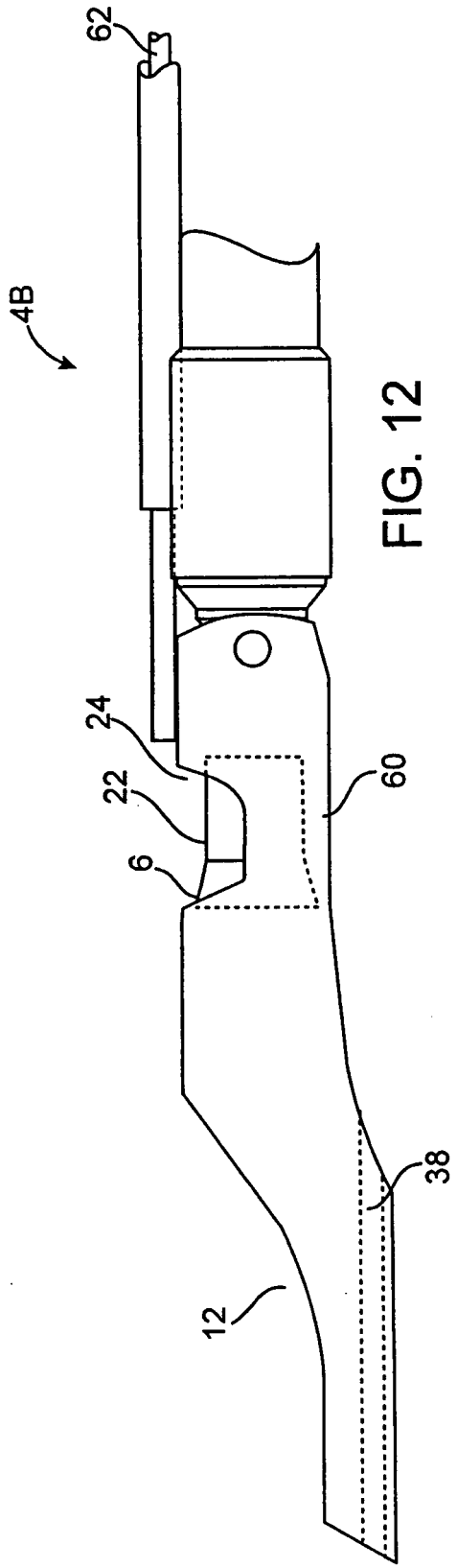

FIG. 12

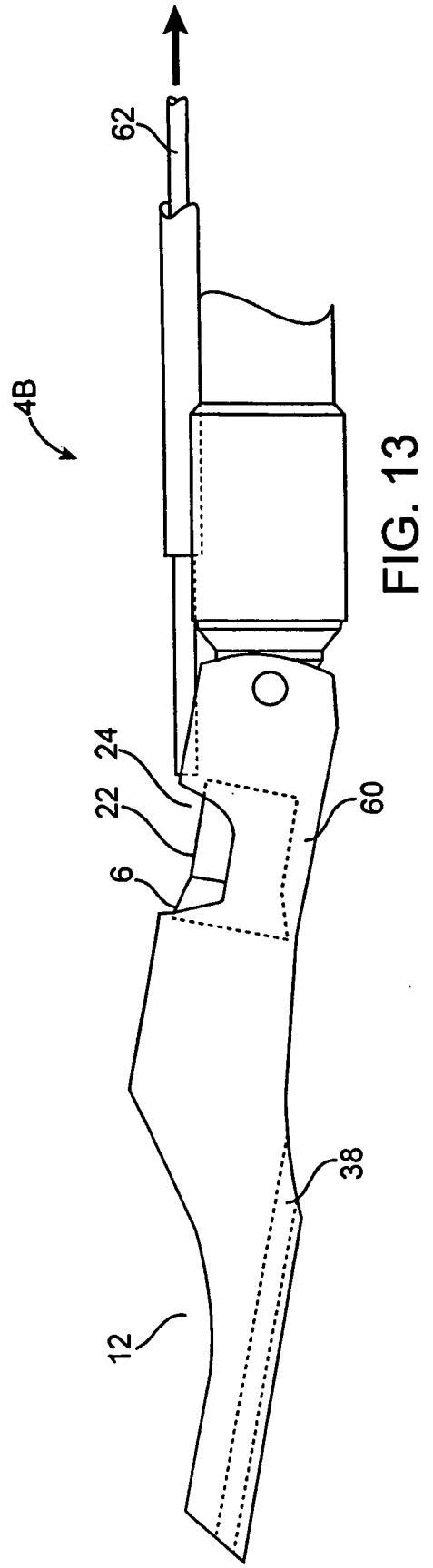

FIG. 13

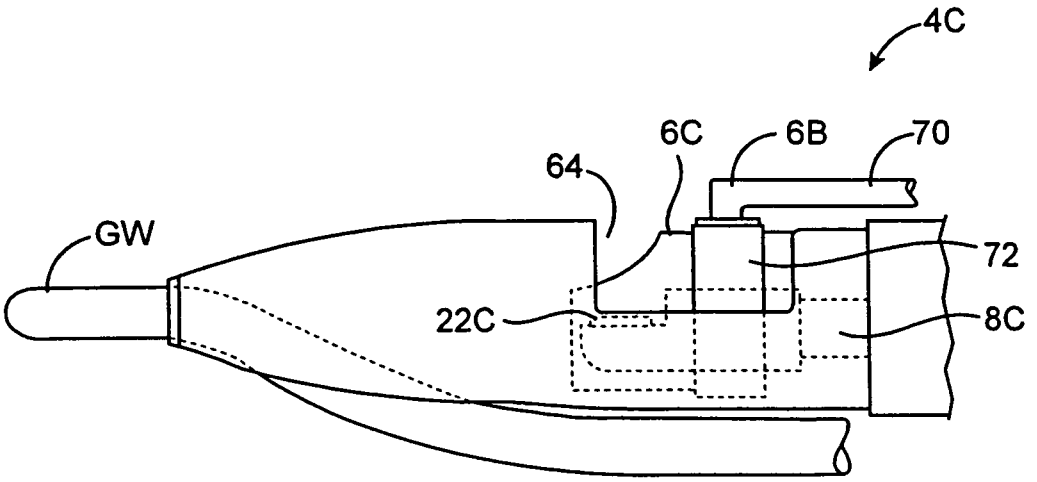

FIG. 14

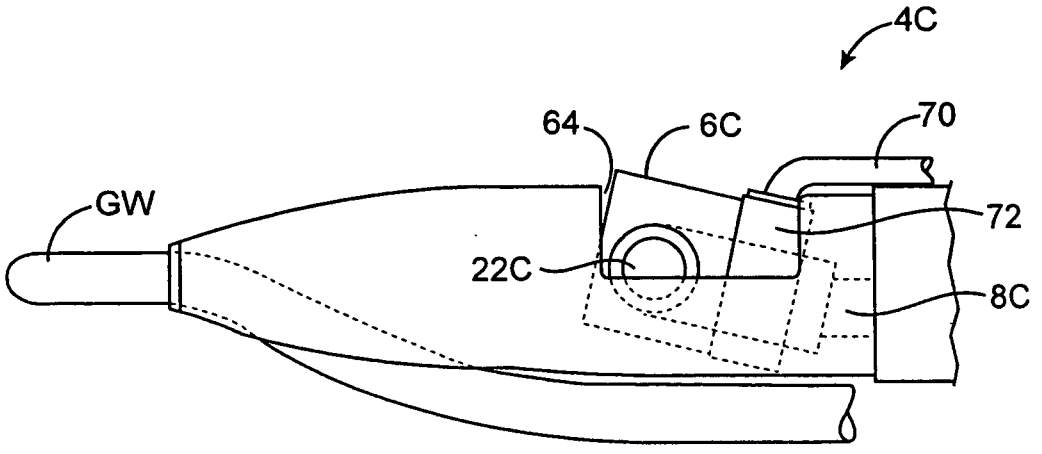

FIG. 15

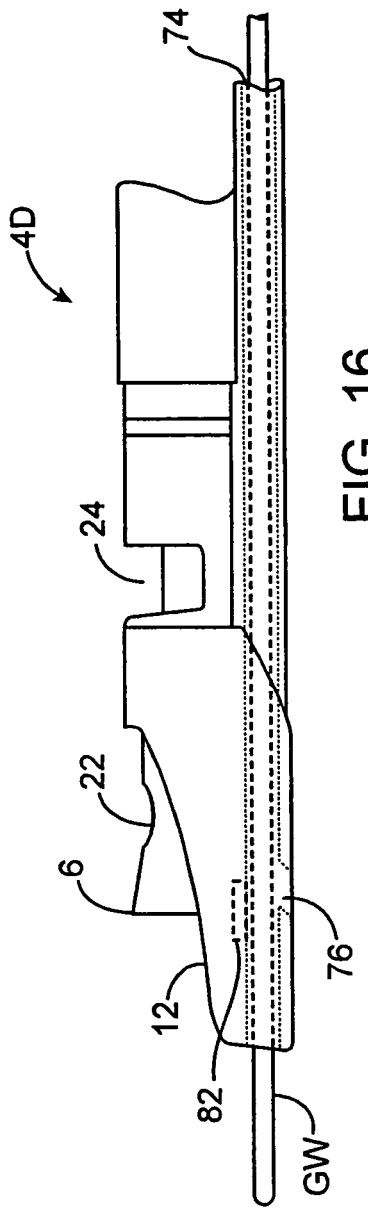

FIG. 16

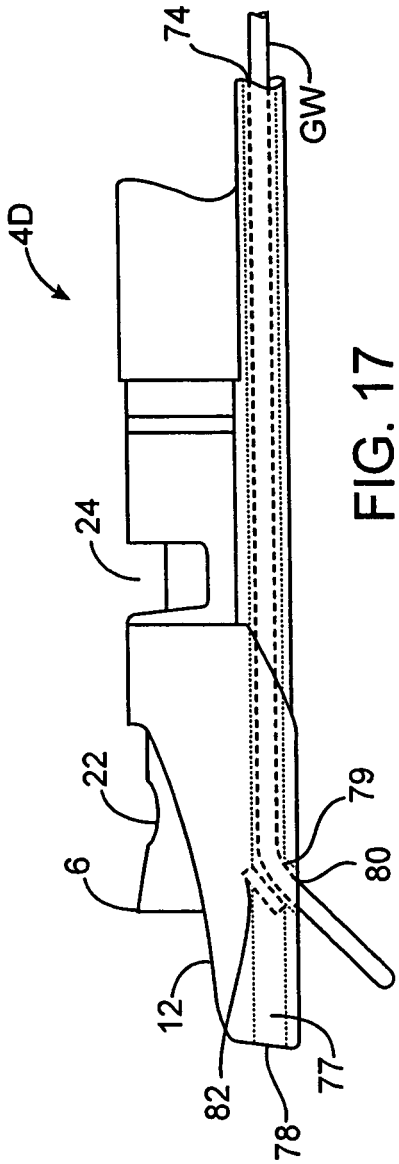

FIG. 17

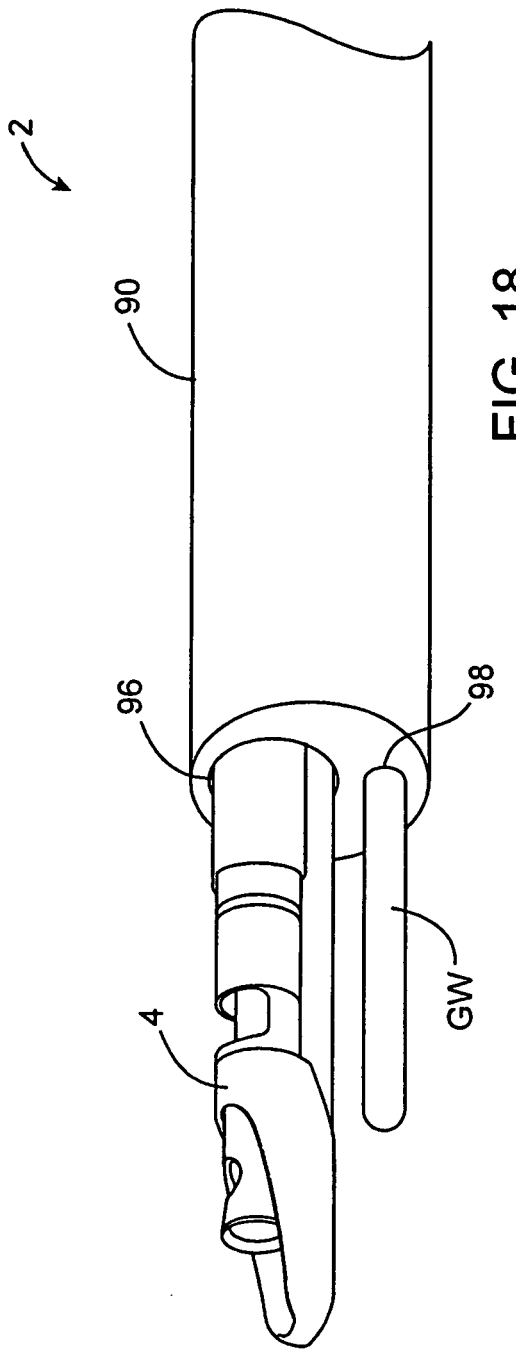

FIG. 18

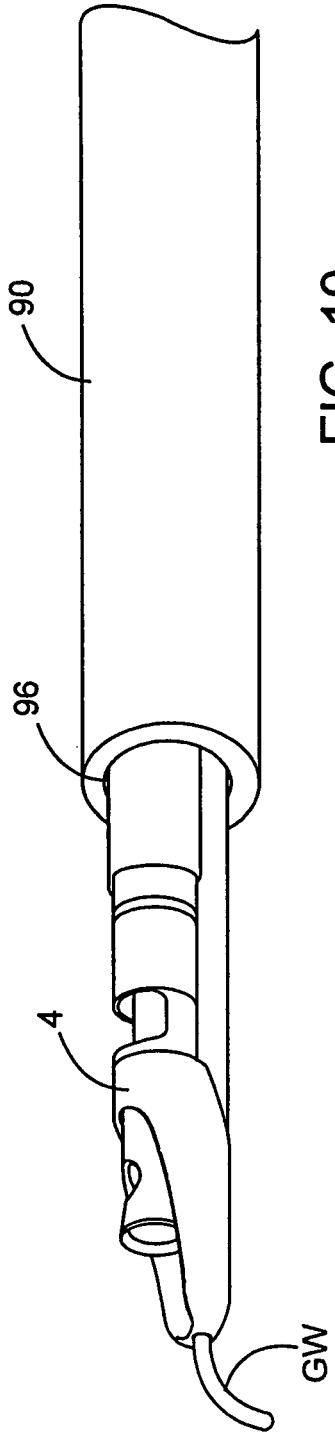

FIG. 19

REFERENCES CITED IN THE DESCRIPTION

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- US 20020103459 A **[0004]**
- US 2001000041 A **[0005]**
- US 6447525 B **[0017]**

专利名称(译)	用于从内膜下空间重新进入真腔的装置		
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[标]申请(专利权)人(译)	福克斯霍洛TECH		
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IPC分类号	A61B17/32 A61B A61B17/00 A61B17/22 A61B17/28		
CPC分类号	A61B17/320758 A61B17/320783 A61B2017/00685 A61B2017/22094 A61B2017/22095 A61B2017/2927 A61B2017/320032 A61B2090/064		
代理机构(译)	灰色，JAMES		
优先权	10/421980 2003-04-22 US		
其他公开文献	EP1622501A4 EP1622501A2		
外部链接	Espacenet		

摘要(译)

用于从内膜下位置重新进入真腔的装置包括旋转切割元件和能量发射元件。发射能量以确定真腔的位置，并且切割元件暴露以切割到真腔的进入路径。切割元件可以逐渐暴露，并且远端部分可以弯曲或铰接，以使切割元件朝向待切割的材料移动。

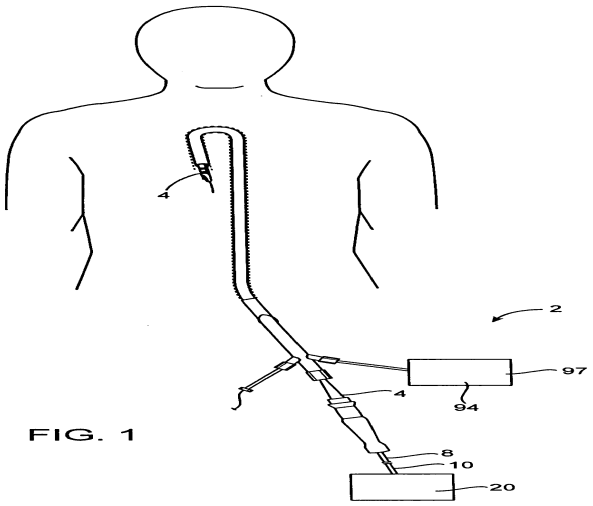

FIG. 1